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Pre-commercial procurement: regulatory effectiveness?

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Pre-commercial procurement – regulatory effectiveness?

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Preliminaries

What does this legal research aim to achieve?

Background

The challenges of our century (climate change, increased and ageing population, shortage of natural resources, global food security, increasing competition from developing countries etc.) may require revolutionary changes in every aspect of our life. In the face of these challenges, European policy-makers consider that innovation is the key to maintain Europe's economic leadership and to maintain the welfare of its citizens.[1] Based on widely embraced economic theories, European policy-makers believe that innovation leads to increased productivity and to sustained economic growth. They moreover believe that innovation can ensure Europe the means to develop solutions for the above mentioned challenges.[2]

In this context, the European policy-makers have since 2000 re-evaluated the innovation policy in the European Union ('EU'). They realized that EU's innovation policy did not target solutions to the above mentioned challenges, but stimulated economic competitiveness in general. They also noted that the employed innovation policy instruments (supply-side measures such as subsidies, tax measures etc.), which identified broad areas of interest and left the selection of specific research topics to the innovator, were unable to incentivize increased private research and development ('R&D') investments or to steer private R&D efforts towards the necessary innovations.[3]

Against this background, EU's innovation policy shifted focus towards stimulating the creation of solutions to the above mentioned European challenges and introduced new demand-side instruments.[4] Among the various demand-side instruments, public procurement of R&D services was identified as a useful mechanism for enhancing private innovators' efforts towards publicly desirable solutions and for enhancing the global competitiveness of European companies.[5]

Before introducing public procurement of R&D services into EU's innovation policy, the European Commission hired experts to investigate whether the use of this instrument in the ICT sector can indeed contribute to the above mentioned objectives. The ICT sector was singled

[1] Presidency Conclusions, Lisbon European Council, 23 and 24 March 2000 <http://ue.eu.int/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm> accessed 12 November 2012.

[2] Innovation is not a goal in itself, but broadly accepted by economists as one of the key potential inputs/driving forces for sustainable economic growth. See for example Gillian Hadfield, 'Producing Law and Innovation' in Robert E Litan, (Task Force organizer),' *Rules for Growth: Promoting Innovation and Growth Through Legal Reform'* (Ewing Marion Kauffman Foundation 2011); Michael Spence, '*The next Convergence – The Future of Economic Growth in a Multispeed World'* (Farrar, Straus and Giroux 2011) 36.

[3] Jakob Edler, Luke Georghiou, 'Public Procurement and innovation – Resurrecting the demand side', *Research Policy* 36 (2007) 958.

[4] J Edler et al, 'Evaluating the demand side: New challenges for evaluation' (2012) 21 Research Evaluation 33

[5] For a description of the policy documents which concluded on the need to use public procurement as innovation policy instrument, see Chapter 2, section 2.2.

out due to its perceived responsiveness to public demand and due to the already existent competitive advantages held by European ICT companies in international markets. [6]

The experts pointed out that other competing economies such as the United States ('US') succeed relatively better in 'pulling' R&D into the commercialization phase and in enhancing the international competitiveness of their domestic suppliers.[7] The experts attributed this success to the use of public procurement of R&D, which was a strategic part of the US Small Business Innovation Research ('SBIR') programme. According to the experts, high-risk R&D procurements performed by the US Department of Defense ('DoD') led to the creation of new industries (e.g. the semiconductors industry, the Internet etc.) in which US companies became world market leaders. In their opinion, the US had used procurement of R&D strategically, '*to provide a strong home market for their domestic supplier base in well-defined areas of desired international competitiveness*'.[8] Compared to the US, considerable less funds were dedicated in Europe to public procurement of R&D.[9]

Based on the experts' recommendations, the European Commission attempted in 2007 to emulate the success of the US SBIR. To this end, it drafted a dedicated procedure and called it "pre-commercial procurement" (PCP). This procedure was described in the 2007 PCP Communication.[10]

Problem and research questions

According to the PCP Communication, PCP represents one approach to the procurement of R&D services, compliant with the applicable EU legal rules in the field of public procurement and State aid.[11]

The European Commission 'translated' the SBIR policies into the PCP instrument, without questioning the effectiveness of the US government intervention through the SBIR-type of action. It assumed that government action is needed to spur innovation. At the same time, the European Commission adapted PCP to the existing EU regulatory framework made of:

- EU rules meant to maximize EU-wide competition in public contracts;
- EU State aid legislation meant to minimize public aid to national businesses.

[6] ISTAG, 'Shaping Europe's Future through ICT" (2006) <http://www.cordis.lu/ist/istag.htm> accessed 26 January 2012. Aho, E., Cornu, J., Georghiou, L. and Subira, A. 'Creating an Innovative Europe' (2006) (Aho Report) <http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm> accessed 26 March 2013; 'The EU Economy Yearly Review' 70 <http://ec.europa.eu/economy_finance/publications/publ_page8701_en.htm> accessed 12 December 2012.
[7] National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation, 'Pre-commercial Procurement of Innovation: A Missing Link in the European Innovation Cycle' (March 2006) (PCP Expert Group (2006)) <ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/precommercial-procurement-of-innovation_en.pdf>, accessed 12 November 2012.
[8] PCP Expert Group (2006).
[9] PCP Expert Group (2006).
[10] Commission, 'Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe' COM (2007) 799 final (PCP Communication (2007)).
[11] PCP Communication (2007) 2.

As a consequence, the resulting EU instrument embodies major differences when compared to its US counterprogram. Some of the more important differences include:

- the non-binding implementation of PCP;

- the obligation to share the risks and benefits of the performed R&D services between the contracting authority and the R&D service provider;[12]

- the limited procedural flexibility;[13] and

- the obligation to purchase the PCP innovative results through a separate competitive procedure in compliance with the Procurement Directives.[14]

The European Commission did not perform an extensive analysis on what impact these differences may have on the potential of PCP to achieve its envisaged policy objectives. Neither were the economic, political and sociological conditions in Europe considered when defining the PCP procedure. Yet, it is common knowledge that policies need to be tailored to the specific economic, political and sociological context of their implementation.[15] Nevertheless, the EU policy-makers simply assumed that PCP and SBIR would function equally well.

Despite these political expectations, PCP has so far not achieved the desired results in practice. On the one side, PCP is not being widely deployed. According to evaluations,[16] the PCP procedure does not appeal to individual contracting authorities who can potentially act as first customers of the innovative products/services. Despite efforts of the European Commission,[17] mostly PCP-'like' initiatives have been implemented in the EU. Besides being

[12] Art 16(f) of Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts [2004] OJ L134/114 (Public Sector Directive) and art 24(e) of Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors [2004] OJ L134/1 (Utilities Directive).

[13] According to case-law of the Court of Justice of the EU, the TFEU remains applicable to PCP projects which present a *'certain cross-border interest'*. *'Certain cross-border interest'* is present if a contract which is excluded from the application of the Procurement Directives would be of interest to economic operators from other Member States, due to its economic value, technical complexity or the location in a place which is likely to attract foreign operators etc.

[14] PCP Communication (2007) 9-10.

[15] For example David C Mowery and Nathan Rosenberg, 'The US national innovation system' in Richard R Nelson (ed), *National Innovation Systems: A comparative analysis* (OUP 1993) 29. They showed that new firms in the US have played a significant role in commercialising innovations, while new firms in Japan and Sweden had not taken that role upon themselves, partially due to the different characteristics of large firms (less inert and bureaucratic and less risk averse).

[16] Commission, Compilation of Results of the EC Survey on the Status of Implementation of Pre-Commercial procurement Across Europe (April 2011) < http://cordis.europa.eu/fp7/ict/pcp/pcp-survey.pdf> accessed 12 November 2012; Kincsö Izsak & Jakob Edler, 'Trends and Challenges in Demand-Side Innovation Policies in Europe Thematic Report 2011 under Specific Contract for the Integration of INNO Policy Trend Chart with ERAWATCH (2011-
2012)' (26 October 2011) 22-3 <http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=7011> accessed 2 February 2013; Eva Camerer and Henriette van Eijl, 'Demand-side innovation policies in the European Union', in '*Demand-side innovation policies*' (OECD 2011) 177-86.

[17] The European Commission tried to provide legal certainty on the applicable legal rules to PCP (see the PCP Communication). Moreover, Framework Program 7 (FP7) funded the costs incurred by procuring authorities during the organisation of cross-border collaborative PCP procedures.

scarce, these PCP-'like' initiatives remain the specialty of centralized innovation agencies in a handful of Member States. They are run in a national environment, with marginal EU-wide competition and often with limited involvement of end-customers.

Where PCP is (or has been) applied, no confirmation of its economic benefits in practice has become available. The few cases of deployed PCP-like initiatives have not yet proven their potential to trigger the benefits envisaged by EU policy-makers. The Innovation Union Scoreboard 2010[18] indicates that the gap between Europe on the one side, and the United States and Japan on the other, is widening along several dimensions of innovation (such as education, private investment in R&D and successful commercialization of technological knowledge), while Brazil and China are quickly catching up and may overtake the EU in the next few years.[19] Apparently, the EU has a problem with upholding its standards for innovation. Assuming that government action to spur innovation is needed and the SBIR-type of innovation policy measure is one of the best available measures, this problem – in so far it relates to regulatory conditions – is motivating my research project.

Against this background, the following central research question arises:

In how far do current legal and policy arrangements in the EU enable pre-commercial-procurement, as innovation policy instrument, to achieve its objectives to stimulate the competitiveness of European companies and to find solutions to Europe's public challenges ?

This research question is addressed by means of 6 sub-questions:

Q1: What is PCP and what are the gaps in PCP's framework conditions ?

Q2: What is the political context in which the PCP procurement was shaped and what are the economic prerequisites for its effective implementation ?

Q3: How does PCP differ from the US SBIR and in how far can these differences impact PCP's efficacy ?

Q4: What is the state of implementation of PCP in the EU and how are the economic prerequisites for an effective deployment of PCP reflected into the available PCP(-like) initiatives ?

Q5: How did the legal context shape and constrain the choices around the PCP features ?

[18] The Innovation Scoreboard 2010 does not evaluate the impact of the PCP instrument, but it is considered by the EU as a reliable indication of the impact achieved by its innovation policy.
[19] UNU-MERIT, 'Innovation Union Scoreboard 2010, The Innovation Union's performance scoreboard for Research and Innovation' (1 February 2011) < http://ec.europa.eu/research/innovation-union/pdf/iu-scoreboard-2010_en.pdf> accessed 8 August 2012.

Q6: How can the current legal and policy context be improved to stimulate the effective implementation of PCP ?

Structure of the research

Each of the sub-questions is addressed in one of the six chapters of this research. The chapters are structured as follows.

Chapter 1 (Pre-commercial procurement)

In order to answer Q1, I will analyze in Chapter 1 the objectives and features of PCP as described by the European Commission in its 2007 PCP Communication and the accompanying Staff Working Document. I will search complementary guidance on the interpretation of relevant concepts in documents endorsed by the European Commission (e.g. the Frascati Manual, the Expert Group report preceding the PCP Communication) and in other legislative areas of the EU (e.g. State aid). Finally, I will seek to identify how PCP differs from (and potentially complements) related innovation policy instruments. Based on this analysis, I will identify the ambiguities and the gaps in the guidance regarding the implementation of the PCP.

Chapter 2 (Institutional and economic backgrounds to the European PCP policies in the 21st century – revival of the demand-side policy in support of innovation)

In order to address Q2, I will study in Chapter 2 the policy documents emanating from the main actors involved in setting the EU innovation policy: the European Council, the European Commission and the European Parliament. The analysis goes back until 2000. Based on this documentary analysis, I will underline the rising interest in demand-side innovation policy instruments, followed by specific interest in public procurement, and eventually interest in PCP. I will also highlight how the perceived US success in deploying the SBIR programme influenced the policy choices around PCP.

In the same context, I will analyse how the policy expectations and the policy choices related to PCP resonate with economic theories on the public intervention(s) embraced by the EU. To this end, I will describe the economic assumptions that underlie EU's choices regarding PCP. Subsequently, I will compare these economic assumptions which underlie policy-makers' expectations that PCP is capable to achieve its objectives, against authoritative economic theories and empirical studies which are embraced by EU's innovation policy. Based on the same analysis, I will conclude on the economic prerequisites for PCP to achieve its objectives and I will clarify under which circumstances PCP cannot be economically effective and should therefore not be applied.

Chapter 3 (PCP – a poor imitation of the US SBIR)

I will address Q3 by comparing in Chapter 3 the PCP against its source of inspiration, the US SBIR. To this end, I will conduct a documentary analysis of relevant US legislation, policy guidelines and evaluation studies.

Based on this analysis, I will identify the features of the US SBIR that relate to its efficacy and I will conclude whether these strengths are reflected into the PCP. Moreover, based on the economic prerequisites identified in Chapter 2, I will conclude whether the main differences between PCP and the US SBIR weaken the potential of the PCP to achieve its objectives.

Chapter 4 (Implementation of PCP or PCP-like schemes in the EU – the current *'state of play'*)

I will address Q4 by analysing in Chapter 4 the performed evaluations regarding the state of implementation of PCP within the EU. I will also analyse and discuss the recent EU support to the broad application of cross-border collaborative PCPs. I will highlight in this context the reasons for the limited appeal of the PCP or PCP/SBIR-'like' procedures to individual contracting authorities.

I will subsequently analyse three of the most advanced national PCP/SBIR-like initiatives against the economic prerequisites identified in Chapter 2. To this end, I will conduct a documentary analysis of the guidelines and conditions for implementation of the PCP-/SBIR-like initiatives in the Netherlands, UK and Belgium. The calls for proposals published within the framework of these initiatives will also be studied. Interviews with functionaries involved in deploying these initiatives will also be conducted.

Based on this analysis, I will comment on the success of the current implementation of the PCP policy.

Chapter 5 (Legal barriers to the implementation of the PCP procedure)

In order to answer Q5, I will investigate in Chapter 5 how the EU and the WTO legal contexts shaped the choices around PCP. I will particularly focus on those choice that were identified in the previous chapters as being the most important barriers to the wide and effective implementation of PCP.

On the one hand, I will address questions of EU competence to adopt legislation in the area of innovation, the constrains posed by the EU State aid rules as well as the role of the general EU procurement rules in imposing re-opening of competition when purchasing the PCP results.

The analysis is conducted both from the perspective of the current legal framework and from the perspective of the newly adopted Procurement Directives.[20]

On the other hand, I will investigate how the choices made by the EU in the framework of the WTO's GPA constrained the design of the PCP.

Chapter 6 (Conclusions and Recommendations)

In Chapter 6, I will answer the main research question. I will propose improvements by way of legal interpretation as well as legislative amendments. I will also present legal and policy recommendations for necessary action to support the effective functioning of the PCP in line with the current policy goals.

What does this legal research not aim to achieve?

This research does not aim to evaluate the quantitative impacts of the PCP instrument on leveraging private R&D investments, on increasing the commercialization rate of R&D projects or on improving public service efficiency. Such measurements belong to the field of economics and are outside the scope of this legal research.

This research will neither strive to find alternatives to the use of PCP or to indicate a combination of innovation policy instruments which can best enhance the innovative capability and capacity of private actors. This research focuses on one instrument from the innovation policy repository, namely pre-commercial procurement. The research acknowledges though that the proper functioning of pre-commercial procurement cannot be seen in isolation from other systemic conditions (such as availability of qualified researchers, availability of technological opportunities, entrepreneurial culture etc.).

Moreover, this research focuses on the efficacy of legal instruments, not on the quality or the correctness of the economic theories that they implement. Consequently, this research is based on the conclusions of existing economic theories that have provided justification for EU intervention through PCP. By analyzing the current economic paradigm embraced by the EU-institutions, the research identifies under which economic conditions PCP can be effective and in which cases PCP might do more harm than good.

A short outline of the public procurement rules

The public procurement rules contained in Directives 2004/18/EC and 2004/17/EC (Procurement Directives) are procedural rules applicable whenever a contracting authority/entity awards a contract for the delivery of supplies or for the execution of services

[20] The new Public Sector Directive restricts this provision to supply contract (thus prototypes). See art 30(3)(a) Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.

or works with a value above certain thresholds.[21] The provisions of the Procurement Directives represent an interpretation of the principles of the Treaty for the Functioning of the European Union (TFEU): equal treatment, non-discrimination and transparency.

Their purpose is to ensure fair and objective assessment of bids, free of any kind of favouritism.[22] This should lead to a highly competitive European market for public contracts, which would result in important benefits for the EU citizens, such as efficient spending of public funds and qualitative public services.[23] Despite these noble goals, direct cross-border procurement (public contracts awarded to suppliers that are located in a different country than the procurer) remains limited. In 2008, it accounted for only 1.5% of the number of published contracts above the EU thresholds, and for about 3.7% of their combined value.[24]

Concretely the Procurement Directives regulate such aspects as: types of procedure which may be followed; the exceptional conditions under which competition may be limited or disregarded; the obligation to make available relevant information at different moments during a procurement procedure; time-limits; permitted criteria to evaluate the bidders or the bids; and exclusions from the scope of application of these directives etc.

The Procurement Directives do not regulate what a contracting authority/entity may or must buy. Other EU or national legislation may contain such substantive obligations. They may regulate the characteristics of products or tasks of the contracting authority. One example of the first type of legislation is the Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles, which requires procuring authorities/entities to take energy and environmental impacts linked to the operation of vehicles over their whole lifetime into account in purchase decisions. An example of the second type of legislation is the Council Directive 75/442/EEC of 15 July1975 on waste, which requires Member States to draw up plans for waste management and to adopt measures to encourage rationalisation of the collection, sorting and treatment of waste. One concrete measure, pursuant to Directive 91/156/EEC of 18 March 1991, amending Directive 75/442 is to ensure that waste be treated

[21] The thresholds are currently stipulated in Commission Regulation (EU) No 1336/2013/EC of 13 December 2013 amending Directives 2004/17/EC, 2004/18/EC and 2009/81/EC of the European Parliament and of the Council in respect of their application thresholds for the procedures for the award of contract. For procurements covered by the Utilities Directive and the Defence Directive the thresholds, exclusive of VAT, are: EUR 414.000 for supply and services contracts and EUR 5.186.000 for works contracts. For procurements covered by the Public Sector Directive the thresholds, exclusive of VAT, are: EUR 134.000 and EUR 5.186.000 for supply and services contracts respectively, for works contracts purchased by central government authorities mentioned in Annex IV of the Public Sector Directive and EUR 207.000 and EUR 5.186.000 for supply and services contracts respectively, for works contracts purchased other public authorities than mentioned in Annex IV.

[22] Case C-19/00 *SIAC Construction v Mayo CC* [2001] ECR I-7725, para 32.

[23] Elisabeta Manunza, 'De markt voor overheidsopdrachten na Lissabon' (14 October 2010) <http://weblectures.leidenuniv.nl/mediasite/Viewer/?peid=3d0f8edaf287475db286d723252dd2df> accessed 12 November 2012.

[24] DG Enterprise and Industry, 'Evaluation of SMEs access to public procurement markets in the EU' (September 2010) 3 <http://ec.europa.eu/enterprise/policies/sme/business-environment/files/smes_access_to_public_procurement_final_report_2010_en.pdf> accessed 12 November 2012.

in the nearest possible installation. However, there is no European legislation requiring the purchase of innovative products.

Scope of application

The scope of application of the procurement directives is determined by the qualification of an entity as a '**contracting authority' or a 'contracting entity'**, who awards **a supply, service or work contract** whose value is above the already mentioned thresholds.

A **contracting authority** according to article 1 (9) of Directive 2004/18/EC means the State, regional or local authorities, bodies governed by public law, associations formed by one or several of such authorities or one or several of such bodies governed by public law.

A 'body governed by public law' means any body: (a) established for the specific purpose of meeting needs in the general interest, not having an industrial or commercial character; (b) having legal personality; and (c) financed, for the most part, by the State, regional or local authorities, or other bodies governed by public law; or subject to management supervision by those bodies; or having an administrative, managerial or supervisory board, more than half of whose members are appointed by the State, regional or local authorities, or by other bodies governed by public law.

A **contracting entity** according to article 2 (2) of Directive 2004/17/EC is either a contracting authority in the sense of article 1(9) of Directive 2004/18/EC or a public undertaking (this is any undertaking over which the contracting authorities may exercise directly or indirectly a dominant influence by virtue of their ownership of it, their financial participation therein, or the rules which govern it) which pursues certain activities in the following sectors: gas, heat and electricity, water, transport services, postal services or exploration for, or extraction of, oil, gas, coal or other solid fuels, as well as ports and airports.[25] Any other entity active in the above mentioned sectors, which operates on the basis of special or exclusive rights granted by a competent authority of a Member State will also fall under the scope of application of Directive 2004/17/EC.

The procurement legislation will only be applicable if the procuring authority/entity awards a **supply, works or service contract**. These are defined as contracts for pecuniary interest concluded in writing with one or more contractors, suppliers, or service providers. There won't be the case of a contract in the sense of the procurement rules if the conditions mentioned above are not present (for example if the contracting authority does not have any pecuniary interest in the transaction). There will also not be a contract in the sense of the procurement

[25] Public Sector Directive, arts 3-7.

directives when a contracting authority/entity may perform the public interest tasks or its other obligations or needs by using its own resources/departments or in cooperation with other public authorities.[26] The Court of Justice of the European Union (hereafter: CJEU) developed in jurisprudence the 'quasi in-house' exception. A contracting authority/entity will not be mandated to apply the public procurement legislation if the contract is awarded to an entity on which it exercises a similar control as on its own departments and if the entity carries out the essential part of its activities with the controlling authority.[27] However, even a minority of private capital in the entity means that the contracting authority does not control this entity as it does its own departments.[28]

A public contract is subject to the public procurement directives when the contracting authority calls on outside entities, not forming part of its own departments, to fulfill the above mentioned tasks, obligations or needs. The contracting authority will also need to apply the public procurement rules, when it assigns the performance of economic activities to third parties, such as mixed capital entities, also called public-private partnership (PPP). The public procurement rules will only be applicable in this case, if the set up of the PPP involves the award of a public contract.[29]

The awarded contracts may be meant to fulfill a public task of general interest which has been attributed to the contracting authority by legislation, or may be meant to fulfill other obligations (such as the obligation in its role of employer towards its employees)[30] or logistic needs (such as the purchase of cleaning services or office haberdashery). Public procurement may follow in addition secondary objectives such as stimulating innovation and sustainability, which arise from national or EU policy and from the public expectations that a contracting authority should act as a responsible and accountable buyer. The new Procurement Directives mention expressly innovation and sustainability as objectives of the public procurement rules, besides the goal to ensure value-for-money.[31]

Terminology

In this section I will give definitions of some of the concepts that recur throughout this research. Most of the definitions are adopted from official OECD and/or EU documents.

[26] Case C-480/06, *Commission v Germany* [2009] ECR I-04747, para 45.
[27] Case C-107/98, *Teckal SRL v Comune di Viano and Azienda Gas-Acqua Consorziale (AGAC) di Reggio Emilia*, [1999] ECR I-08121, para 50.
[28] Case C-573/07 *Sea SRL v Comune di Ponte Nossa,* [2009] ECR I-8127, para46; and Case C-196/08 *Acoset SpA v Conferenza Sincaci and others* [2009] ECR I-9913, para 53.
[29] Commission, 'Interpretative Communication on the application of Community law on Public Procurement and Concessions to Institutionalised Public-Private Partnerships (IPPP)' C (2007)6661.
[30] Case C-215/09, *Mehiläinen Oy, Terveystalo Healthcare Oy v Oulun kaupunki* [2010] ECR I-13749, para 30.
[31] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC.

Innovation is defined in this research as a process *'connecting knowledge and technology with the exploitation of market opportunities for new or improved products, services and business processes compared to those already available on the common market, and encompassing a certain degree of risk'*.[32] In other words, innovation means valorisation of R&D results into marketable new or improved products, services and business processes.[33]

Depending on their capabilities to bring substantial economic change, innovations may be qualified as *incremental (small improvements of an existent product), revolutionary (new products with major economic impact)*, or *radical (a completely new product that creates whole new industries, such as the semiconductors, lasers, atom bombs or genetic engineering)*.[34]

When qualifying the use of novel products as innovation, many economists consider that the novelty need not be absolute to the market, but to the economic actor itself.[35] Unless stated expressly otherwise, the term 'innovation' throughout this research is meant to cover absolute novelty (when the novel product has not been used by any other public or private actor previously).

Innovation in this research covers both technological innovation and services innovation.

Innovation in services covers two types of innovation: process innovation and organizational innovation. Process innovation is defined as *'the use of new or significantly improved methods for the production or supply of services'* (such as greater flexibility, better quality and/or enhanced safety, reduced costs). Organizational innovation means *'new organizing principles for using the existing knowledge-base to carry out combinations that are new to the firm and the industry'*[36], aimed at *'step changes in internal efficiency or in approaching markets and customers'*[37].

From a conceptual point of view, an important difference is made in this research between invention and innovation and between innovative activities (such as R&D) and innovation results. Invention entails the first occurrence of an idea for a new product or process, while

[32] Commission, 'Community Framework for State aid for Research and Development and Innovation' (30 December 2006) OJ C 323/1, para1.2.
[33] Lieve Bos and Stephan Corvers, 'Pre-commercial Public Procurement A missing link in the European Innovation Cycle', (2006) 6 *Tijdschrift Aanbestedingsrecht* 2.
[34] Paul A. Tawiah and Alan D. Russell, 'Assessing Infrastructure Project Innovation Potential as a Function of Procurement Mode' (2008) 24 Journal of Management in Engineering 173.
[35] Chris Freeman, *The economics of industrial innovation* (MIT Press 1989); Andreas Pyka, Benjamin Schon, Paul Windrum, Lars Fuglsang and Koen Frenken, 'Cooperation for Innovation in Services: An Economic Approach to the Theory of Innovation Networks in the Service Industries', (ServPPIN 2009) 36.
[36] Examples of managerial and organization innovations are the direct delivery and self-assembly of Ikea, the approach of Honda (discouraging hierarchy, giving responsibility to young employees and supporting confrontation).
[37] Maria Abreua, Vadim Grinevich, Michael Kitson and Maria Savona, 'Policies to enhance the 'hidden innovation' in services: evidence and lessons from the UK', (2010) 30 The Service Industries Journal 99–118.

innovation means an attempt to turn the creative idea into a commercial product and diffuse it into the marketplace.[38]

Innovation is meant in this research as a process of creating *and* implementing a novel product. Innovative products are the results of the innovation process. During the innovation process R&D activities[39] as well as non-R&D activities are equally important.

R&D activities are defined as '*creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications'*.[40]

Non-R&D activities are mainly targeted at creating a stimulating environment or at achieving a commercial outcome (such as interaction with other firms and public research institutions, production, engineering, marketing of the novel product etc.). [41]

Other terminology used in this research:

'Public procurement of innovation' is the adoption of innovation by public authorities through the purchase of existent innovative products (goods or services) which are new to the public sector (although they might be already commercialized on the private market).

'Public procurement for innovation' refers to the use of public procurement in order to stimulate the creation of innovative products. One suitable procurement instrument to achieve this, is considered to be the PCP procedure.

The knowledge-based economy is '*an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors'*.[42]

The concept of product used throughout this thesis entails goods, services and works in a generic manner.

The concept of contracting authority is understood as implied in the Directives 2004/18/EC. Its use throughout the research also encompasses the concept of contracting entity as defined in Directive 2004/17/EC.

[38] Ibid; OECD, 'Proposed Standard Practice for Surveys on Research and Experimental Development (Frascati Manual (2002)),' (OECD Publications Service 2002) 18.
[39] OECD, 'Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data' (OECD Publications Services, 3rd Edition 2005) (Oslo Manual (2005)) para 40.
[40] Frascati Manual (2002) 30.
[41] DTI, 'Environmental innovation, Bridging the gap between environmental necessity and economic opportunity', (November 2006) 10 <http://webarchive.nationalarchives.gov.uk/+/http://www.bis.gov.uk/files/file34987.pdf> accessed 12 June 2012; Oslo Manual (2005) para 71.
[42] Oslo Manual (2005) para 71.

When reference is made to the Procurement Directives, Directives 2004/17/EC and 2004/18/EC are meant. Directive 2004/17/EC is also referred to as the Utilities Directive while Directive 2004/18/EC is also referred to as the Public Sector Directive.

Chapter 1. Pre-commercial procurement

1.1. Introduction

The procurement of R&D services where risks and benefits are shared between the contracting authority and the supplier is exempted from the scope of application of the EU Procurement Directives.[43] This would allow contracting authorities enhanced procedural flexibility in purchasing innovative solutions, as compared to the rules laid down by the Procurement Directives. Despite the fact that R&D services have been exempted since the adoption of the first public procurement directives in 1989, by 2005 the national procurement of R&D had barely started to show on the national and EU agendas.[44]

The European Commission attributed this to the legal uncertainty around the applicable rules of the Treaty on the Functioning of the European Union ('TFEU') to contracts exempted from the scope of the Procurement Directives.[45] The Court of Justice of the European Union ('CJEU') had by that time pronounced the most important decisions on the applicability of the fundamental principles of the TFEU to contracts which were (partially) left outside the scope of application of the Procurement Directive (services concessions, IIB services and contracts under threshold for the application of the Procurement Directives).[46] Procurement of R&D services outside the scope of the Procurement Directives had not been the subject of a case before the CJEU.

The European Commission decided in 2007 to encourage contracting authorities to engage more often in procurements of R&D services wherein risks and benefits are shared, by drafting a procedure which complied with the fundamental principles of the TFEU and the EU State aid rules, on the one hand, and which was suitable to exploit the potential economic benefits of public procurement of R&D, on the other hand.[47] The procedure was called pre-commercial procurement ('PCP').

This chapter describes the objectives and features of the PCP procedure, as drafted by the European Commission in its 2007 PCP Communication, as well as the particularities of PCP compared to other policy instruments that have been employed to stimulate innovation. This chapter distinguishes between the PCP features which have the status of recommendation from which a contracting authority may deviate and the legal obligations which constitute

[43] See article 16(f) Directive 2004/18/EC; article 24(e) Directive 2004/17/EC.
[44] Wilkinson et al, 'Public procurement for Research and Innovation', Expert Group Report – Developing procurement practices favourable to R&D and innovation (Wilkinson Report)', (September 2005)10 http://ec.europa.eu/invest-in-research/pdf/download_en/edited_report_18112005_on_public_procurement_for_research_and_innovation.pdf accessed 26 January 2013.
[45] Consolidated version of the Treaty on the Functioning of the European Union 9.5.2008 OJEU C 115/47.
[46] This case-law is discussed in section 1.5.
[47] Commission, 'Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe' (PCP Communication) COM (2007) 799 final.

minimum requirements and must be complied with. Based on this analysis, this chapter identifies the ambiguities and the gaps in the EU's guidance regarding the implementation of the PCP.

The policy process which led to the adoption of the PCP and the economic assumptions which lie at its basis are described in the next chapter.

1.2 Objectives

The adoption of the 2007 PCP Communication was preceded by enhanced awareness among the EU policy-makers that the common and complex European problems (also called Grand Challenges), such as ageing, security threats, shortage of resources, climate change, increased global competition etc., required substantially improved solutions compared to those available on the market. Insufficient R&D investment in the economy was identified as one of the major reasons for EU's incapacity to bring on the market the desired solutions and to gain global economic lead. The policy–makers realized that supply-side measures, which had been the focus of the EU innovation policy until 2000, were not sufficient to trigger the change Europe needed. As a consequence, demand-side measures, such as public procurement received since 2000 increased political support.[48]

Against this background, the European Commission requested in 2006 a group of experts ('PCP Expert Group') to explore whether public procurement in support of R&D and innovation in the ICT sector was a desirable instrument in the EU innovation policy arena.[49] The PCP Expert Group identified pre-commercial procurement as a suitable instrument to increase public demand of innovative solutions and to leverage private R&D investments in the ICT sector as well as elsewhere.[50] This motivated the Commission to draft the PCP Communication and an accompanying PCP Staff Working Document[51] in order to support the implementation of PCP as innovation policy instrument.

PCP was defined in the PCP Communication as one approach to procuring R&D services, in compliance with the EU public procurement and State aid rules.[52]

According to the PCP Communication, the objectives of the PCP were threefold: [53]

- reinforce the innovation capabilities of EU businesses, which will eventually lead to an

[48] For a description of the policy process which preceded the adoption of the PCP procedure, see Chapter 2.
[49] National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation, Pre-commercial Procurement of Innovation: A Missing Link in the European Innovation Cycle (PCP Expert Group) (March 2006). For a detailed outline of the policy process that preceded the adoption of the PCP procedure, see Chapter 2, section 2.2.
[50] PCP Communication 4-5.
[51] Commission, 'Example of a possible approach for procuring R&D services applying risk-benefit sharing at market conditions, i.e. pre-commercial procurement'(PCP Staff Working Document) SEC(2007) 1668.
[52] PCP Communication 2.
[53] PCP Communication 1, 4.

improved competitive position in the global economy;
- develop innovative solutions to the above mentioned Grand Challenges;
- improve the quality and efficiency of public services.

The European Commission intended to *'explor[e] the extent to which pre-commercial procurement could indeed contribute to more R&D and innovation in the EU and, hence, bring tangible benefits to society and economy'*.[54]

The European Commission did not question the need for government intervention in support of innovation. It embraced the view that public procurement of R&D incentivized innovation in competing economies such as the US and Japan and that it may yield similar results in the EU.[55] The Commission did not pay any further attention to the conditions for successful deployment of the R&D procurement in the model economies or in the EU. It simply decided to experiment with this instrument within the EU framework. [56] As a consequence, neither the PCP Communication, nor the accompanying PCP Staff Working Document define concrete targets regarding the deployment of PCP or pre-conditions for its effective implementation in the EU.

1.3 Form and conditions

1.3.1 Non-mandatory implementation

PCP is not a mandatory procedure, but a recommendation introduced through a soft-law instrument, the so-called Interpretative Communication. The role of an Interpretative Communication is not to create legal obligations, but to interpret and provide legal clarity on existent legal obligations.

The European Commission did not propose legislation to mandate the specific procedural steps of the PCP or to mandate minimum budgets being dedicated to R&D procurement. This is due to the fact that EU lacks competence to harmonize Member States' laws in the innovation policy area,[57] or to regulate Member States' financial obligations in the public procurement area.[58]

Arguably, the European Commission also believed that R&D procurement requires sufficient

[54] PCP Communication 3.
[55] The Commission observed that US and Japan successfully used public procurement of R&D to support the emergence of life-changing innovative solutions that can solve important environmental problems, can improve the quality of the public service and can create new global markets for national companies. Moreover, the Commission observed that the US is spending 20 times more than the EU on public procurement of R&D. Although the difference in R&D expenditure is mainly due to the substantial US defence/space budget, US still invests 4 times more than the EU in public procurement of R&D in non-defence/space sectors. See PCP Communication 5
[56] Conditions for the successful deployment of PCP are further discussed in Chapter 2.
[57] Art 173 TFEU.
[58] The EU's competence in financial matters is limited to the EU's competence is limited to taxing approximately 2-3 % of national and local government spending (1,3 percent of the GDP) which funds may only be disbursed towards a few specific policy areas, conditioned by the unanimous consent of the Member States. See A. Moravcsik, 'In Defence of the "Democratic Deficit": Reassessing Legitimacy in the European Union'(2002) 40 Journal of Common Market Studies 603.

flexibility to adapt the procedure to each specific situation. Contracting authorities who decide to procure R&D and to share the entailing risks and benefits are free to follow a different procedure, as long as they comply with the applicable EU public procurement and State aid rules. The analysis in sections 1.4 and 1.5 below will show however, that the legal obligations deriving from the procurement principles and from the EU State aid rules, allow contracting authorities limited procedural flexibility.

The Commission expected that enhancing legal certainty through the PCP Communication would suffice to boost the wide deployment of PCP. Later, it became obvious that a *'recommendation'* status did not adequately enhance contracting authorities' trust in the legality or necessity of the PCP procedure and consequently did not lead to its wide implementation.[59]

According to the recommendations of the PCP Expert Group, PCP was tailored by the European Commission to the situation wherein a group of European procurers concludes to have a shared need for solutions which are not yet commercially available. In order to learn about the existent solutions and about ongoing research projects, contracting authorities may organize an open dialogue with suppliers. Subsequently, they collaborate in the definition of a set of shared requirements.[60]

The PCP Expert Group underlined that the pre-condition for the successful application of PCP, is that contracting authorities themselves identify and formulate their future development needs.[61] This could be interpreted as a recommendation to implement PCP only in areas where the contracting authority is the main or even the only end-user, although the innovation may have beneficial spill-overs for the private market. Nevertheless, PCP was drafted by the Commission to cover problems of public interest, irrespective of whether the contracting authority is (one of the) end-user(s) or not.[62]

PCP may thus be used in three distinct situations. The innovative solution may be desired to fulfill a need the government has as exclusive end-user (direct procurement), or it can be intended to develop a solution that contributes to the achievement of a public goal the contracting authority strives for (catalytic procurement). In the second case, the public authority/entity helps an innovative technology/service to reach the market, by organizing the private procurement, but the solution is exclusively intended for private end-users. In between, there is cooperative procurement, which is intended to provide an innovative

[59] For an overview of the state of implementation of PCP, see Chapter 4.
[60] PCP Staff Working Document 3, 5.
[61] PCP Expert Group 27.
[62] PCP Staff Working Document 5: 'A key characteristic of the approach presented is to solicit multiple companies in competition to come up with alternative solution proposals to address a *particular problem of public interest*' (emphasis added by the author).

solution of interest to both the procuring authority/entity and the private consumers as end-users.[63]

In section 1.7.3 below, as well as in Chapters 4 and 5 further on, I will show that this broad definition leads to confusion on the distinction between PCP as demand-side instrument and subsidies as supply-side instruments. Moreover, it allows innovation agencies in EU Member States to provide financial support to national companies in breach of the EU State aid rules. This raises questions of efficacy in achieving EU's innovation policy goals. A potential solution will be outlined in Chapter 5.

1.3.2 Phases

PCP as formulated in the 2007 PCP Communication and accompanying PCP Staff Working Document, provides in one tender the conditions for competitive R&D during three phases, with evaluation moments after phase 1 and phase 2 (see Fig.1 below).[64]

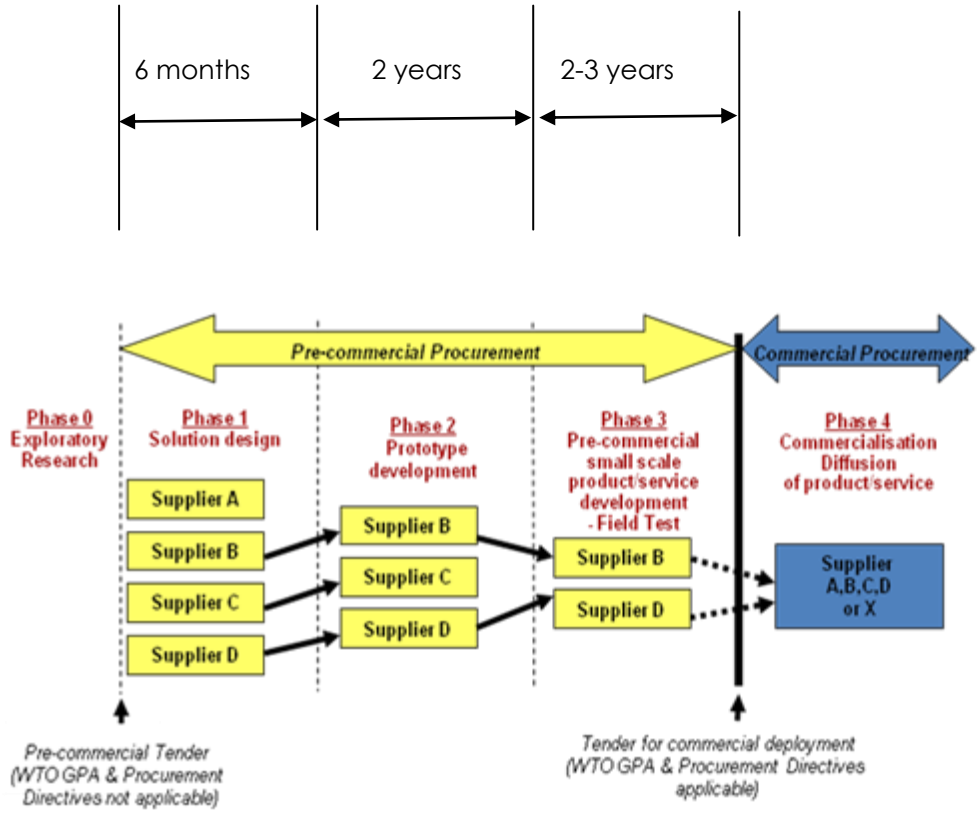

Fig.1 COM/2007/799 & SEC/2007/1668

[63] The theoretical foundation of these concepts was for the first time laid down in Charles Edquist and Leif Hommen 'Public technology procurement and innovation theory' in Edquist et al (eds), *Public Technology Procurement and Innovation* (Kluwer 2000) 22-23.
[64] PCP Communication 8.

Phase 1 involves solution exploration. The scope of the solution exploration phase – which takes about 6 month - is to *'verify the technical, economic and organisational feasibility of the proposal against the pros and cons of potential alternative solutions, as well as its ability to solve the problem of public interest'*. The output of this phase should be a technology evaluation, a plan of how R&D will subsequently be conducted and an evaluation of the economic value of the technology.

After selecting the best suppliers based on the R&D results achieved during phase 1, a prototyping phase follows (phase 2). This phase lasts around 2 years, and covers R&D activities performed up to a prototype. The outputs should be product specifications, a tested prototype, a production plan and a business plan.

Finally, phase 3 covers test series conducted by the best two suppliers, selected at the end of phase 2. Phase 3 lasts 2-3 years and covers the production of a first batch of pre-products/services, their testing in relevant environments and the incorporation of the results of the field testing in a limited series of products, meant to demonstrate the suitability for full-scale quantity production. The outputs are refined production and business plans.[65]

The final solution should thus be ready for commercialisation within 4,5 - 5,5 years from the start of the PCP.[66]

The PCP Communication clarifies that PCP is not meant for fundamental research (or *'curiosity driven research'*), but for R&D with certain applications in sight. In Chapters 2 and 3 I will check whether the timeline of 4,5-5,5 years is in line with the US approach to R&D procurement or with the economic theories regarding the pre-requisites for effective public R&D investments.

PCP does not include commercial development activities such as *'quantity production, or supply to establish commercial viability or to recover R&D costs, integration, customisation, incremental adaptations and improvements to existing products or processes'*.[67] The field test phase where a first batch of products/services is produced and tested is the last PCP phase. The subsequent commercialization of the innovation developed through PCP remains the responsibility of the supplier. If the contracting authority desires to purchase the innovation, it needs to open the award to competition according to the Procurement Directives.[68] The PCP Staff Working Document clarifies that this approach was determined by previous choices made by the EU within the framework of the World Trade Organisation ('WTO') Government

[65] PCP Expert Group 23
[66] PCP Expert Group 21.
[67] PCP Communication 2.
[68] PCP Communication 4.

Procurement Agreement ('GPA'). Separating the R&D procurement from the procurement of the developed innovation will allow the contracting authority to restrict participation in the PCP to EU businesses only. The commercial procurement will however need to grant access to suppliers from the GPA partners.[69]

The PCP Staff Working Document further praises this approach for its potential to identify superior innovations developed outside the framework of the PCP as well as to put competitive pressure on the offered prices. [70]

The PCP guidance is brief on the description of the R&D activities which qualify for funding under a PCP contract. This is further discussed in section 1.6 below.

The PCP Communication does not recommend specific amounts of funding for the different phases. Member States wishing to implement national PCP programmes, or contracting authorities desiring to conduct specific PCP procedures are free to decide the amounts of funding.

The first phase of the PCP commences with multiple different solutions, which are successively eliminated to yield at least 2 suppliers after the final PCP phase. Maintaining competition up to the final phase is meant to avoid the creation of monopolists. The precise number of R&D projects to be funded in parallel should be decided based on a comparison between the economic value of the desired solution for the contracting authority and the R&D risks involved.[71]

1.3.3 Eligibility and award criteria

PCP was formulated as a transparent and competitive procedure, which allows participation of all interested EU businesses as well as businesses from signatory countries of the GPA. The R&D and operational activities required by the PCP call need though to be performed within the EU.[72] However, the PCP Communication recognizes that a case-by-case analysis regarding the presence of sensitive issues (such as aspects related to national security) may justify restricting participation to EU businesses.[73]

The PCP Expert Group proposed two similar eligibility criteria to the US SBIR:[74]

- only for-profit organizations can participate,

[69] PCP Staff Working Document 10.
[70] PCP Staff Working Document 9.
[71] PCP Staff Working Document 5.
[72] PCP Staff Working Document 10.
[73] PCP Communication 6.
[74] PCP Expert Group 22.

- main researcher is employed by the proposing firm for at least 50% of his time.

Three diverging criteria from the US SBIR were also proposed:

- companies which locate their R&D and operational activities related to the PCP call within the EU, without being European or European-owned, are admissible;[75]
- no double funding of the same R&D activities is allowed;[76]
- open to both large, medium and small companies.[77]

These criteria were not explicitly adopted by the official Commission's guidance, but may serve as inspiration for the set-up of concrete PCPs.

The Commission recommended in the PCP Communication and the PCP Staff Working Document the use of specific award criteria:[78]

- ability to address the problem posed in the tender;
- technological quality & innovativeness of the proposal;
- added value for society/economy of the proposal.

The official Commission's guidance on the set-up of PCP procedures does not recommend any selection criteria.

1.3.4 Summarizing remarks

I have analysed in this section the approach proposed by the European Commission to the procurement of R&D services. I showed that due to limited competences in the area of R&D and innovation, the European Commission defined PCP as a voluntary recommendation. This entails that contracting authorities are not mandated to set-aside budgets for conducting PCPs and are neither bound by the procedural steps recommended by the Commission.

More concretely, the Commission recommends:

- to conduct PCPs in collaboration by contracting authorities (from different Member States);

- to set the PCP up as a three-staged competition, gradually selecting the suppliers who deliver the best R&D results after each R&D stage;

- to focus on innovations that find themselves within 4,5-5,5 years from commercialisation;

[75] Companies do not need to have their head offices located in Europe or to have European shareholders.
[76] In the US a firm may receive funding via SBIR, as well as other funding programs.
[77] Nevertheless, subcontracting to SMEs should be required and encouraged.
[78] PCP Staff Working Document 10.

- to allow suppliers from GPA countries to participate as long as they perform their R&D within the EU;

- to apply award criteria that focus on quality and degree of innovativeness.

A contracting authority may deviate from all these recommendations. The Commission did not recommend any amount of funding per R&D phase, leaving this to the discretion of implementing contracting authorities.

In the following section I will focus on the minimum legal conditions for the applicability of a PCP, as interpreted by the European Commission in the PCP Communication. I will clarify in how far contracting authorities retain the choice to deviate from the Commission's interpretation of these legal requirements.

1.4 Legal limits to PCP

As already mentioned, the PCP procedure was drafted by the European Commission in compliance with the relevant EU rules: the Procurement Directives, the TFEU principles (non-discrimination, equal treatment and transparency) and the State aid rules. In this section, I will highlight the PCP features which stem out of these legal rules. I will point out in how far contracting authorities can deviate from these obligations. I will also identify the gaps in the provided guidance on some of these legal conditions.

1.4.1 Compliance with the Procurement Directives

1.4.1.1 Minimum applicability conditions

The European Commission designed the PCP procedure to fall within the exemption from the procurement rules, as provided by articles 16(f) of Directive 2004/18 and 24(e) of Directive 2004/17.[79]

These articles exempt from the application of the strict rules of the Procurement Directives the purchase of R&D services whose risks and/or benefits are shared between the contracting authority and the service provider.[80] A PCP procedure may thus be applied when the following three minimum requirements are fulfilled.

Firstly, the procured contract covers in majority R&D activities. Which activities qualify as R&D is not defined in the Procurement Directives or in the PCP Communication or accompanying

[79] Article 16(f) Directive 2004/18 provides*: The Directive shall not apply to public service contracts for: (f) research and development services other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority.'*
[80] Article 16(f) Directive 2004/18/EC.

PCP Staff Working Document, although this is a crucial pre-condition for reliance on the PCP exemption. Whether the development of a solution entails R&D activities can be a complex and often uncertain undertaking. A contracting authority may refer for guidance to the OECD publication, the Frascati Manual,[81] whose analysis of the meaning of R&D has been embraced by the EU. A detailed discussion on the concept of R&D as provided in the Frascati Manual can be found in section 1.6 below.

Secondly, the procured contract should be an R&D service contract and not an R&D supplies or an R&D works contract. The latter two types of contract are not exempted from the application of the Procurement Directives.[82] A public contract is qualified as an R&D service contract if the total value of the services over all the R&D phases exceeds the value of R&D products (such as prototypes) or R&D works covered by the contract. Where for example the value of the R&D products or R&D works covered by the contract is higher than that of the R&D services, the respective contract would constitute an R&D supply or an R&D works contract which needs to be procured according to the Procurement Directives.[83]

The PCP guidance does not provide a description of R&D service activities as compared to R&D works or R&D supplies. Based on an analysis of the definition of 'public supply contracts' in article 1(1)(c) of the Public Sector Directive, I can conclude that R&D supplies cover a physical product, which corresponds within the R&D cycle to a prototype. Based on an analysis of the definition of 'public works contracts' in article 1(1)(b) of the Public Sector Directive, I can conclude that R&D works entail the delivery of the physical outcome of building or civil engineering activities. This could for example entail building a prototype installation. The analysis of the definition of 'public service contract' in article 1(1)(d) reveals that R&D services cover other activities than the delivery of works or supplies. The list of services in Annex II to the Public Sector Directive shows that service contracts cover the delivery of intangible results, such as knowledge. By targeting R&D service contracts, PCP focuses thus on R&D projects which entail a large share of knowledge creation and are not very close to commercialisation. When the value of the prototype or of the building/installation of the test object (prototype) is larger than the value of the R&D services, the contract will not qualify for a PCP procedure.

Thirdly, the contracting authority should share either the risks or the benefits of the R&D services with the participating business or both. If the contracting authority retains all the benefits (such as intellectual property rights (IPR)) and pays the exclusive costs of development, the procurement of R&D services will fall within the scope of the Procurement

[81] OECD, 'Proposed Standard Practice for Surveys on Research and Experimental Development,' (OECD Publications Service 2002) (Frascati Manual (2002)).
[82] See article 30(1)(d) and 31(2)(a) Directive 2004/18/EC and 40(3)(b) of Directive 2004/17/EC.
[83] See footnotes 5 and 6 of the PCP Communication.

Directives and one of the therein described procurement procedures will need to be followed.[84] It is interesting to notice that the PCP Communication narrows these applicability conditions for PCP by requiring that both risks *and* benefits be shared.[85]

1.4.1.2 Sharing risks and benefits

The sharing of risks and benefits is a crucial element of PCP. Apportioning risks and benefits between the contracting authority and the private company provides incentives to both the contracting authorities to engage in PCPs and to the private company to partly invest itself in R&D and commercialise the resulting solutions. On the one side, sharing risks between collaborating contracting authorities and between the contracting authorities and the private company, provides incentives for each individual contracting authority to assume the inherent risks of R&D and enhances the chances of wide commercialization of the new solutions. On the other side, sharing benefits with the wider public through publication of the results and participation of the PCP participant in standardization activities ensures spill-over of knowledge.[86]

The PCP Communication and the attached PCP Staff Working Document clarify that compliance with the public procurement principles of transparency and equal treatment entail prior agreement on the concrete sharing of risks and benefits with the supplier, publication of these terms in the PCP call and absence of any subsequent negotiations.[87]

Sharing risks

The Commission enumerates in the PCP Communication and accompanying PCP Staff Working Document, by way of example, several risks which could be assumed by the supplier: the risk that additional funding beyond the PCP budget will be needed for the development, the litigation/filing costs for IPR emerging during the PCP procedure and the exploitation risks.[88] The main risk which could be assumed by the contracting authority(ies) is that the developed technology/service will not be developed in conformity with the expected quality levels and the investment through PCP would be lost.[89]

A later study supported by the Commission concludes that risk aversion is for contracting authorities a serious barrier to engaging in PCPs and provides additional guidance on the types of risks which may arise in the procurement of innovation (technological risks, organisational and societal risks, market risks, financial risks and turbulence risks) and the risk

[84] Article 16(f) Directive 2004/18/EC.
[85] PCP Staff Working Document 8.
[86] PCP Communication 6-7; PCP Staff Working Document 6-7.
[87] PCP Staff Working Document 9.
[88] PCP Staff Working Document 7.
[89] PCP Staff Working Document.

management actions which may be suitable depending on the nature or type of risk, the likelihood to occur, the extent of the consequences if it occurs, the potential benefits if it does not occur and the different stakeholders it might affect and their degree of tolerance to risk.[90]

Risk is defined therein, as *'measureable uncertainty (likelihood) for something to occur that lets projects fail, decreases their utility or increases their costs and duration'*.[91]

Sharing benefits

The guidance offered by the Commission in the PCP Communication and accompanying Staff Working Document on the sharing of benefits is not detailed. Moreover, it is restricted to situations when patentable inventions emerge from the PCP procedure.

The Commission recommends to assign to the supplier the IPR generated by himself during the PCP procedure, with due protection of each contracting authority's rights as an end-user in the form of (either royalty-bearing or) royalty-free licenses and the right to require suppliers to license IPRs to third parties under fair and reasonable (FRAND)[92] conditions.[93]

This IPR sharing strategy is based on the assumption that the contracting authority is not well-suited to pursue commercialization of the solutions developed within an R&D contract. By retaining (royalty-free) usage-rights, the contracting authority will be able to obtain direct benefits in terms of improved quality and lower costs of its public tasks/services. This approach can, according to the Commission, also enable the contracting authority to obtain access to existing technologies which are protected by IPR but were developed prior to the PCP procedure (also called 'background' IPR).[94]

By granting the IPR to the participating business in the PCP and retaining a call-back option, the contracting authority will ensure that the developed innovation is widely used on the market and that it will form the basis of follow-on innovation activities.[95] The main benefit retained by the supplier under these conditions, regards the possibility to commercialise the results of PCP and to obtain the resulting profits. Moreover, the contracting authority can expect that the supplier bares a share of the funding, which *'can (be) consider(ed) … to be*

[90] Expert Group Report, 'Risk management in the procurement of innovation, Concepts and empirical evidence in the European Union' (2010) <http://ec.europa.eu/invest-in-research/pdf/download_en/risk_management.pdf> accessed 20 August 2012.
[91] Ibid 24.
[92] FRAND means 'Fair, Reasonable and Non Discriminatory' licensing terms. The concept has been developed in the context of IPR in the standard-setting context. See OJ 2011/C11/01, Draft Communication from the Commission, Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements, recital 289.
[93] PCP Communication 7.
[94] PCP Staff Working Document 8.
[95] PCP Staff Working Document 8.

an investment in intellectual property, which could be re-applied later as a building block for other projects'.[96]

Although the PCP Communication recommends the above mentioned distribution of IP rights, a contracting authority is free to choose for a different IP strategy,[97] to the extent to which there is no national legislation regarding the division of IPR in government-funded projects. If no mandatory regulations restrict its discretion, the contracting authority may choose to contractually gain the ownership of the IP or leave it to the supplier. Licenses may be free, for a symbolic, modest or a larger fee, depending on the market value of the IPRs and the strategy of the procurer and may be exclusive,[98] partially exclusive or nonexclusive.

However, the contracting authority should keep in mind that when the innovation has potential applications on the private market, the private actor is in a better position than the government to commercialise the novel product, to decide in which jurisdictions patents should be applied for, or to enforce the patents in case on infringement. Moreover, the supplier should be incentivized to invest in the commercialization of the novel product without concerns that licenses are also made available to its competitors. As a consequence, the supplier should at a minimum obtain an exclusive license (when ownership is retained by the procurer). When IP ownership is granted to the supplier, the procurer should at a minimum have the right to use the IP (on exclusive or non-exclusive terms) in order to ensure continuity of its internal operations as well as the possibility to grant a license to another firm when practical application of the invention is not fulfilled or not done to the agreed extent (either through commercialization, internal implementation or licensing).[99]

The Commission does not provide detailed guidance on the specific contractual clauses which could be applied in PCP contracts but leaves this to the discretion of the implementing contracting authorities. The Commission's guidance does not go into detail on the choice between royalty-bearing or royalty-free licenses, impossibility of a supplier to grant a license to the contracting authority on the 'background' IPR resting on the underlying existing technology,[100] the need to request the PCP participant to disclose all background IPR he may

[96] Ibid; Wilkinson Report 39.
[97] Ecorys, 'Study on pre-commercial procurement in the field of security' (November 2011) 64 http://ec.europa.eu/enterprise/policies/security/files/doc/pcp_sec_finalreport_en.pdf accessed 29 January 2013.
[98] An exclusive license to use the IP means that the licensee is the sole beneficiary of the licensed rights to exploit and commercialise the IP.
[99] Rambøll Management A/S, 'Opportunities for Public Technology Procurement in the ICT-related sectors in Europe' (Rambøll Report) (June 2008) ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/pcp-final-ramboll-report-js2_en.pdf accessed 29 January 2013.
[100] It could be envisaged that the PCP participant is prevented by pre-PCP agreements to transfer or grant a license on the background IPR. In such case, the contracting authority may need to include obligations for eventual sub-contracting.

be aware of[101] or to require licensing of background IPR to third parties when the invention cannot be practiced without such license etc.

Moreover, the Commission does not seem to have had in mind the division of other IP rights than patent rights when it drafted the PCP Communication and accompanying Staff Working Document. When copyrighted products (such as a book, software etc.) are the result of the PCP, the following sharing of risks and benefits could be envisaged: the PCP-participant may retain the moral right to be indicated as the author of the expression of his/her ideas, while the contracting authority obtains permission (equivalent to a royalty-free license) to reproduce and re-distribute the copyrighted expression of ideas (it could be a book, a study or software etc.) within and/or outside its organisation.

Scenario's for sharing benefits through license-contract design will directly affect the incentives perceived by both contracting authorities and R&D providers involved. Current IP laws support the design of almost any benefit-sharing scenario imaginable. Yet experience has learned that this freedom does not always induce the emergence of efficient solutions. Research into mechanism design for IP licensing must remain outside the scope of this research.

Inspiration on public quidance for dealing contractually with benefit sharing through IPR could be found in the Bayh-Dole Act, however. The Bayh-Dole Act was adopted in 1980 in the US, at a time when the US government owned 28.000 patents, but licensed less than 5% to businesses, due to their reluctance to invest in the production of innovations which could also be licensed to competitors. The government became aware that public spending on R&D would be far more effective if small businesses would retain ownership on the inventions funded with public money.[102]

The Bayh-Dole Act, which governs since 1980 the division of rights to inventions made by small businesses under government grants, contracts and cooperative agreements, brought about the needed change. It imposes the following standard division of IPR: supplier obtains the ownership and the government a 'nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world'. A government agency may deviate from this standard clause (such as national security reasons or due to the location of the business outside the US) upon motivation and subject to appeal possibilities.

[101] Rebeca Lucas, Antonella Vulcano and Borinka Jacobsen, 'Draft PCP Manual – A practical guide to PCP Implementation for PROGR-EAST WP4 Pilots' (13 May 2012) 45-6 (PROGR-EAST Draft PCP Manual)
<http://www.progreast.eu/files/Deliverable%202.1.%20Draft%20PCP%20Manual.pdf> accessed 29 January 2013.
[102] Diane M. Sidebottom, 'Updating the Bayh-Dole Act: Keeping the Federal Government on the Cutting Edge' 30 Pub. Cont. L.J. 225 (2001).

The Bayh-Dole Act provides detailed contractual clauses for different IPR strategies as well as detailed guidance on contractual enforcement clauses. For example, the supplier needs to disclose the invention to the government agency in order to obtain ownership and is therefore mandated to keep records of the background IPR in order to be able to retain IPR outside the SBIR clauses.[103]

The Commission's guidance neither clarifies whether other benefits than IPR (such as for example profits gained with commercialization of the innovative solution developed during the PCP procedure) may be shared in order to be able to rely on the exception provided by articles 16(f) of Directive 2004/18 and 24(e) of Directive 2004/17. The only benefits beyond IPR mentioned by the PCP Communication regard the input obtained by the supplier from potential public buyers on the desired functionalities and disadvantages of the envisaged solution, and the potential savings achieved through early tailoring of the solution to the customer's needs.[104] In Chapter 3 I will investigate how national PCP-like initiatives have picked up the challenge of dealing with IPR sharing and I will conclude whether there is a need for the European Commission to provide additional guidance.

1.4.2 Compliance with the TFEU fundamental principles

The PCP Communication was based on the premise that although PCP falls outside the scope of application of the Procurement Directives, the TFEU principles of equal treatment, non-discrimination, transparency remain applicable. The PCP Communication interpreted the TFEU principles as implying an obligation to organize a fully-fledged competitive award.

Compliance with the transparency and equal treatment principles entails according to the European Commission that a PCP call is published EU-wide and that sufficient information is provided in the PCP call (on design of the competition, eligibility, sharing of risks and benefits etc.) to allow the objective comparison of the received proposals. All the requirements/criteria applied throughout the PCP procedure need to be '*understandable, quantifiable and verifiable*'.[105]

The initial functional and performance requirements, as well as the award criteria and risk-benefit sharing arrangements are not subject to change or negotiation during the PCP procedure.[106] However, the Commission considers that there is some flexibility to progressively

[103] W. Jay DeVecchio, 'Patent Rights Under Government Contracts', 07-7 Briefing Papers 1 (2007).
[104] PCP Communication 8.
[105] PCP Communication 10-1.
[106] PCP Staff Working Document 3-4, 10.

specify the tender specifications (technical/scientific minimum requirements) with each PCP phase.[107]

Section 1.5 investigates whether the approach embraced by the European Commission in the PCP Communication is in line with the currently available EU case-law on the applicability of the TFEU to contracts falling outside the scope of application of the Procurement Directives. It concludes on the degree of procedural flexibility in conducting a PCP, compared to a procurement procedure governed by the Procurement Directives.

1.4.3 Compliance with the EU State aid rules (the market price criterion)

PCP is designed to avoid a State aid element in the sense of the EU State aid rules. According to the PCP Communication, this entails that the contracting authority needs to pay a market price, which ought to reflect the pre-defined division of risks and benefits. The market price and the risk-benefit sharing conditions lead automatically to the requirement for the contracting authority(ies) to pay less than the full costs of the R&D.

Normally, a tender procedure conducted in accordance with the Procurement Directives is an indication that the purchase was done at market conditions,[108] but other aspects particular to the case (use of environmental or social criteria, intellectual property rights, negotiations etc.) could weaken the conclusion that the least cost for the community was achieved.[109]

Despite the fact that PCP was designed as a competitive procedure in compliance with the fundamental principles of public procurement, the Commission didn't consider it a sufficient guarantee that PCP would not be used as a screen for illegal State aid. The PCP Communication included therefore an explicit requirement that a market price be paid for the purchased R&D services. This was arguably a reaction to the national initiatives in the Netherlands and the UK, where programs similar to the US SBIR were employed by innovation agencies, as a means to bypass the EU State aid rules, and to provide 100% funding of R&D project costs. For a more detailed discussion on this topic see Chapter 5.

A market price in the context of PCP means that less than the total cost of the R&D should be paid by the contracting authority, reflecting the market value of the risks assumed by the participating company (such as costs for maintaining the IPR and commercializing the developed products/services) and benefits received by the participating company (such as

[107] PCP Staff Working Document 9.
[108] Commission, 'Community Framework for State aid for Research and Development and Innovation' (Framework for State aid for R&D&I) 2006/C 323/01, para.2.1.
[109] Commission, 'Application of the European Union State aid rules to compensation granted for the provision of services of general economic interest' paras 65-6 (2012/C 8/02).

the IPRs and the corresponding commercialization opportunities).[110] According to the European Commission, the contracting authority needs to determine in advance how risks and benefits (such as IPR) related to the R&D activities are shared with the R&D service provider and what maximum price it is disposed to pay in a PCP. The maximum price should be calculated by deducting from the total cost of R&D[111] plus a reasonable profit margin, the market 'present' value of the commercialization opportunities left to the participating company (this value will need to reflect also the risks assumed by the participating company, such as the cost carried by the company for maintaining the IPRs and commercializing the products).[112] Bidding companies are invited to compete by offering an equal or lower price.

It is, of course, extremely difficult to value to the commercialization opportunities of products which are not yet developed and the European Commission does not recommend a specific methodology which could be used to this end.

A workable alternative accepted by the Commission, is to ask bidding companies (1) to supply the calculation of the price reduction they can offer in return for the IPR benefits (this calculation should be related to their business cases analysis in their PCP offer) and (2) to include a financial expert in the PCP tender evaluation committee who is charged with assessing whether the business-case and associated price reductions for the IPRs offered by different companies are indeed in line with normal market conditions in that sector.[113]

In Chapter 5 I will provide a critical analysis of the market price criterion, and I will define alternative approaches to ensure a clear distinction between PCP and subsidies, which takes into account the need to comply with the EU State aid rules.

1.4.4 Compliance with the GPA

As already mentioned in section 1.3.2, the purchase of the innovation developed during the PCP should be re-opened to competition in compliance with to the Procurement

[110] The risk-benefit sharing should try to balance two aspects: on the one hand, the procurement must be interesting enough for relevant suppliers from a financial point of view; on the other hand, the procurer should not carry all financial, technical or operational risks. See Rambøll Report.

[111] This is made of all the costs incurred by the company - for example the market value of the salaries of researchers/developers in a certain sector and the costs of R&D material required to perform the work. Commission, 'Policy related Frequently Asked Questions on Pre-Commercial Procurement (PCP) and the link with Public Procurement of Innovative Solutions (PPI)' (FAQ PCP) question nr 8 <http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf> accessed 30 January 2013.

112 PCP Staff Working Document 9.

113 FAQ PCP question nr 8: 'one way used by patent traders to calculate the price reduction for IPR ownership rights uses the so-called *present value method*. It is normal practice that companies make a business case, and thus estimate the potential market over the years to come, when deciding to start investing in a new development or not. The price reduction on the PCP bid towards the procurer can be calculated as a portion of the 'present' value of projected profits for the company (the 'present' value is the value discounted back in time to the day of the bid), that is proportional to the investment/risks taken by the government (PCP price paid to the company) compared to the total investments required to turn the R&D efforts into a commercially viable product (this includes the projected investment/risks that will be carried by the company e.g. costs of maintaining IPR projection, further production, marketing and commercialisation investments). Companies can extract these values from the business case they prepare at the moment they make their PCP offer'.

Directives.[114] According to the PCP Staff Working Document, this approach was determined by previous choices made by the EU within the framework of the World Trade Organisation ('WTO') Government Procurement Agreement ('GPA'). Separating the R&D procurement from the procurement of the developed innovation will allow the contracting authority to restrict participation in the PCP to EU businesses only. The commercial procurement will however need to grant access to suppliers from the GPA partners.[115]

1.4.5 Summarizing remarks

I have analysed in this section the minimum legal requirements for the application of a PCP, as interpreted by the European Commission in the PCP Communication. I provided an overview of the obligations deriving from the applicable public procurement rules and principles (sharing risks and IPR, opening the PCP award to competition, no possibility to modify the award criteria and the risk-benefit sharing arrangements or the tender specifications) and the EU State aid rules (the market price criterion), and the GPA (the obligation to reopen the tender to competition when purchasing the innovation resulting from a PCP).

A contracting authority may deviate from the market price criterion and conduct a procurement of R&D services which entails granting State aid, provided that the applicable EU State aid rules are followed. A contracting authority may also deviate from the recommended sharing of risks and benefits, as long as there is an element of 'sharing' present.

However, a contracting authority may not deviate from the following obligations:

- the prohibition to change during the PCP phases the pre-established sharing of risks and benefits, the award criteria or the tender specifications;

- the obligation to open the PCP award to competition from the EU companies and optionally from GPA companies who are willing to perform the respective R&D services within the EU.

- the prohibition of a direct award to a PCP finalist for the purchase of the developed innovation.

I can conclude that the PCP Communication and the accompanying PCP Staff Working Document define an obligation to conduct a fully-fledged competitive procedure for the

[114] PCP Communication 4.
[115] PCP Staff Working Document 10.

award of the PCP contracts, with limited procedural flexibility following the award. In the following section I will test the Commission's interpretation of the obligations deriving from the fundamental public procurement principles (non-discrimination, equal treatment and transparency) against the available jurisprudence from the EU courts. Later in this research I will analyse the origin of the prohibition to directly purchase the developed innovation from (one of) the PCP participants (see Chapter 5).

I can also conclude that the European Commission missed the opportunity to establish a clear distinction between State aid (or subsidies) as supply-side instrument and PCP as demand-side instrument. In Chapter 4 I will provide proof of the problematic implementation of this criterion in practice and in Chapter 5 I will comment on more suitable alternatives.

The European Commission also missed the opportunity to clarify the concept of R&D and to define clear mechanisms to deal with the exploitation of the emerging IPR. In this section I indicated the IPR aspects which could benefit from additional guidance. In section 1.6 below, I will search for additional guidance on the R&D concept.

1.5 Procedural flexibility through PCP

As already mentioned in section 1.4.2, the PCP Communication holds that PCPs conducted in collaboration between contracting authorities from different Member States need to comply with the TFEU fundamental principles of equal treatment, non-discrimination and transparency. The Commission derives from these principle extensive procedural obligations.

When the PCP Communication was published, the Court of Justice of the European Union (CJEU) had decided in a series of cases on the applicability of the TFEU and had explained the extent of the applicable TFEU obligations for contracts which are (partially) excluded from the scope of the Procurement Directives (such as services concessions, IIB services and contracts under the threshold of the Procurement Directives). The CJEU has, however, not yet judged in matters of PCP contracts.

Despite inconsistencies and controversies in the interpretation provided by the European judges (as I will illustrate below), the case-law suggests that the CJEU adopts the same approach to the whole range of contracts that (partially) fall outside the application of the Procurement Directives, irrespective of contract type (whether concession, II B service or contracts whose value is under the thresholds) and of contract value.[116] This allows me to assume that the CJEU will adopt the very same line of reasoning when considering PCP contracts.

[116] Case T-258/06 *Germany v Commission* [2010] ECR II-2027 para.83-84.

This section analyses the case-law of the CJEU and concludes on the circumstances that determine the applicability of the TFEU to PCPs. It also deals with the extent of the obligations flowing from the applicability of the TFEU principles as compared with procedures falling within the Procurement Directives. Based on this analyses, this section will clarify the degree of procedural flexibility a PCP offers as compared to procedures regulated by the Procurement Directives.

To achieve this, subsection 1.5.1 outlines the Court's different interpretations of the Treaty's applicability outside the scope of the Procurement Directives (depending on the existence of cross-border interest or irrespective thereof) and describes the dispute regarding the applicability of the principle of equal treatment. Section 1.5.2 outlines the dispute regarding the concrete obligations flowing from the transparency principle. The discussion in subsections 1.5.1 and 1.5.2 covers case-law up to 2010. Based on case-law from 2010 onwards, subsection 1.5.3 presents the resolution of the dispute on the concrete obligations flowing from the applicable Treaty provisions and principles.

1.5.1 Rebuttable presumption of cross-border interest and applicability of Treaty principles

The CJEU has pronounced several decisions on the applicability of the TFEU principles to contracts (partially) falling outside the Procurement Directives. I consider these decisions to show inconsistencies. Firstly, the decisions are inconsistent regarding the question whether the TFEU is automatically applicable to contracts excluded from the Procurement Directives or whether it is only applicable when a contract presents cross-border interest (when companies from other Member States are/may be interested in obtaining the contract). Secondly, the decisions are inconsistent regarding the question whether the principle of equal treatment of tenderers applies only when it was established that the award discriminates against tenderers from other Member States or whether it is an independent principle that applies even in purely internal situations (when all the facts of the case are linked to one Member State). Thirdly, the decisions are inconsistent regarding the obligation to organize a competitive award in all cases, or only when the contract is relevant for the Internal Market.

RISAN case

In the RISAN case of 1999,[117] regarding a service concession awarded on a non-competitive basis, the Court hastily dismissed the question of the referring Italian judge regarding the applicability of the free movement rights established by the Treaty. The European judge underlined that the complainant was an Italian company and that the whole situation in

[117] Case C-108/98, *RI.SAN. Srl v Commune di Ischia and Others* [1999] ECR I-5238 (RISAN case).

question was purely internal to one Member State. This did not justify the application of the TFEU provisions on the freedom of movement for persons or on the freedom to provide services.[118]

Unitron Scandinavia case

In the Unitron Scandinavia case[119] of the same year, the Court was equally expeditious when asked by the Danish judge to interpret the obligations for a contracting authority flowing from the now obsolete article 2(2) in the old Directive 93/36 coordinating procedures for the award of public supply contracts. The Court ruled that a contracting authority who grants a body special or exclusive rights to engage in a public service activity, is mandated to oblige that body to comply with the non-discrimination principle on the ground of nationality when awarding public supply contracts. However, the non-discrimination article does not require compliance with the tendering procedures laid down by Directive 93/36.[120] The Court did not mention the refer though to the question whether the Treaty would be applicable.

Telaustria case

In the Telaustria case of 2000,[121] the European judge changed course. It decided that, despite the explicit exemption of service concessions from the Procurement Directives, the TFEU remains directly applicable to such contracts.[122] The Court adopted this approach despite the fact that all the parties involved in the case belonged to the same Member State (Italy).[123] The Court seemed to establish a non-rebuttable presumption that *any* service concession contract is potentially of interest to companies from other Member States.

The Court singled out the non-discrimination principle on the ground of nationality as the key principle that needs to be complied with outside the scope of application of the Procurement Directives.[124] The Court considered that the principle of non-discrimination *'implies, in particular, an obligation of transparency in order to enable the contracting authority to satisfy itself that the principle has been complied with'*.[125] In other words, only by advertising the contract, the contracting authority could prove that the non-discrimination

[118] RISAN case para 21-3.
[119] Case C-275/98, *Unitron Scandinavia A/S and 3-S A/S, Danske Svineproducenters Serviceselskab v Ministeriet for Fodevarer, Landbrug og Fiskeri* I-8305 (Unitron Scandinavia case).
[120] Unitron Scandinavia case para 29-32.
[121] Case C-324/98, *Telaustria* [2000] ECR I-10745 (Telaustria case). In this case, Telekom Austria, a contracting authority endowed by the Austrian legislation with operating a telecommunication service had awarded a contract for the production and publication of lists of telephone subscribers to a private undertaking, without competition.
[122] Telaustria case para 60.
[123] In the area of the four fundamental freedoms, EU case-law states that the EU law (including the Treaty) is not applicable if the elements of a case are confined to the borders of one Member State and there is no factor connecting the case to any of the situations envisaged by [EU] law. In other words, a cross-border element is the necessary condition to justify the application of EU law. See for example, Case C-98/86 *Mathot* [1987] ECR 809; and Case C-286/81 *Oosthoek* [1982] ECR 4575; Case C-204/87 *Bekaert* [1988] ECR 2029.
[124] Telaustria case para 60.
[125] Telaustria case para 61.

principle was not breached.[126] The approach of the Court to import the transparency obligation into the TFEU, after it had been considered as a necessary consequence of the non-discrimination principle within the scope of the Procurement Directives, was criticized in the literature. Arrowsmith and Kunzlik concluded that the Court derived positive obligations from the non-discrimination principle, although this principle had been defined within the context of the Treaty as implying only negative obligations.[127]

The Court was also criticized for giving the same interpretation to the obligation of transparency as within the scope of the Procurement Directives and for suggesting an obligation to organize a competitive award procedure.[128] According to the Court the contracting authority should ensure *'for the benefit of any potential tenderer, a degree of advertising sufficient to enable the services market to be opened up to competition and the impartiality of procurement procedures to be reviewed'*.[129]

Coname case

In the Coname case,[130] the second case concerning a strictly national situation in the context of a non-competitive award of a service concession,[131] the Court nuanced the position taken in Telaustria towards the applicability of the TFEU and towards the interpretation of the transparency obligations.

The Court introduced the possibility to rebut the presumption that a contract excluded from the scope of application of the Procurement Directives automatically falls under the scope of the TFEU. In this case, the Court decided that the TFEU will not be applicable, when it can be proven that undertakings from other Member States would not be interested in the contract. In such cases, the impact on the fundamental freedoms of the TFEU would be too uncertain and indirect to justify the applicability of the TFEU.[132]

However, the presumption of applicability can only be rebutted when special circumstances such as the *'very limited economic value'* of the contract can be brought as proof.[133] The Court did not explain when a contract has very limited economic value (for example, whether only the monetary value of the contract should be considered or whether additional

[126] Telaustria case para 61-2.
[127] The free movement provisions of the TFEU prohibit unjustified discrimination. Sue Arrowsmith and Peter Kunzlik, *'Social and Environmental Policies in EC Procurement Law – New Directives and New Directions'* (CUP 2009)
[128] E.P. Hordijk, G.W van der Bend, J.F. van Nouhuys, *'Aanbestedingsrecht – Handboek van het Europese en het Nederlandse aanbestedingsrecht'* (4th edition Sdu Uitgevers 2011) 151; Arrowsmith & Kunzlik (2009) 82-83.
[129] Telaustria case para 62.
[130] Case C-231/03 *Coname* [2005] ECR I-7287. In this case, the company Coname has been entrusted for one year the maintenance, operation and monitoring of the methane gas network by the municipality Cingia de' Botti. When the municipality subsequently directly awarded the same contract to Padania, Coname complained that the contract had to be tendered in compliance with the Treaty.
[131] All parties to the case were Italian.
[132] Coname case para 20.
[133] Coname case para 17-20.

circumstances may also be relevant). However, the position adopted by the Court seems to imply that there are only restrictive possibilities to rebut the presumption that companies from other Member States may be interested in the contract.[134] Moreover, the Court did not spell out whether lack of interest means that the Treaty provisions are not applicable, but (considering transaction-cost related arguments) this would be the logical conclusion.

Regarding which TFEU obligations specifically apply in case a certain cross-border interest could not on forehand be excluded, the Court referred again to the same non-discrimination principle, that would be breached in the absence of transparency.[135] The Court took a step back compared to the Telaustria case and stated that the transparency principle does *not* entail an obligation to organize a procurement procedure, but only obliges contracting authorities to allow access to appropriate information regarding the contract before it is awarded, '*so that, if an undertaking from another Member State had so wished, it would have been able to express its interest in obtaining the contract*'. This suggests that the contracting authority gets a second chance to conclude that the contract is not of interest to the Internal Market and can be awarded without consideration of the Treaty principles. It could be concluded that when no foreign company expresses interest following the advertisement, the contracting authority would be allowed to disregard the Treaty obligations.[136]

On the other hand, the Court did not clarify which concrete obligations rest on a contracting authority if an undertaking from another Member State would express its interest in the contract, following the publication of the information regarding the respective contract. If no procurement procedure needs to be organized, it could be concluded that the contracting authority should be able to award the contract by inviting the undertaking of its choice as well as the interested foreign undertakings to submit an offer.[137] This conclusion has however categorically been rejected by the Court in the subsequent case-law.

Parking Brixen case

The Parking Brixen case[138] came next, the third case in a row concerning service concessions. It confirmed the inconsistent approach of the European judges to the possibility to rebut the presumption that a contract (partially) excluded from the Procurement Directives is of interest to companies from other Member States. In this case, the Court ignored the Coname judgment and suggested that service concession contracts should always be awarded in

[134] Hordijk (2011) 154.
[135] Coname case para 19.
[136] Conclusie Advocaat-Generaal Keus, HR 18 januari 2013, LJN: BY0543
[137] Hordijk (2011) 155.
[138] Case C-458/03 *Parking Brixen* [2005] ECR I-8612.

compliance with the TFEU. The Court explicitly stated: *'Notwithstanding the fact that public service concession contracts are, as Community law stands at present, excluded from the scope of Directive 92/50 [former public procurement directive, added by the author], the public authorities concluding them are, none the less, bound to comply with the fundamental rules of the EC Treaty (…).'*[139]

When confronted by the defendant party with the argument that a cross-border element was missing, as all the parties involved in the main proceedings resided in one Member State (Italy again), the Court stated that in the absence of advertising and opening to competition, it is not possible to prove that undertakings of other Member States would not be interested to provide the same services.[140]

Regarding the applicable Treaty obligations, the Court went even a step further than in the Telaustria case. It stated that the equal treatment principle applies as an independent principle, even in the absence of discrimination on grounds of nationality. [141] The Court used the following reasoning: equal treatment is a general principle of EU law and articles 43 and 49 of the old Treaty as well as the non-discrimination principle on the basis of nationality set out in article 12 TEC are expressions of the equal treatment principle.

This marks a change compared to the previous Coname case, where the Court left the door open to the interpretation that after publicizing the contract, a contracting authority may conclude that the contract had not attracted the attention of foreign companies and consequently the non-competitive award would not amount to discrimination on the basis of nationality. The conclusion in Parking Brixen - that the equal treatment principle applies irrespective of discrimination on the basis of nationality - provided the Court with a solid basis to scrutinize procurement decisions taken in 'purely internal' situations, when all the parties belonged to the same awarding Member State, and potentially no undertakings from other Member States were interested in the contract. In other words, even when after advertising the contract no foreign companies show interest to participate, the contracting authority would still be mandated to give equal access to all interested national companies to the contract, which amounts to an obligation to organize a competitive award procedure. The Court clearly stated that *'a complete lack of any call for competition in the case of the award of a public service concession such as that at issue in the main proceedings does not comply with the requirements of articles 43 EC and 49 EC any more than with the principles of equal treatment, non-discrimination and transparency'*.[142]

[139] Parking Brixen case paras 46-9.
[140] Parking Brixen case paras 54-5.
[141] Parking Brixen case para 48.
[142] Parking Brixen case paras 49-50.

The interpretation of the Court was disputed in the literature.[143] Some authors criticized the tendency of the Court to import obligations into the Treaty which had previously been created within the context of the secondary procurement legislation.[144] Arrowsmith[145] has pointed out that the application of the equal treatment principle[146] would open the door to judicial scrutiny of non-discriminatory procurement decisions under the Treaty, which would conflict with the interpretation of the Court in Keck[147] as well as with the principles of legal certainty, subsidiarity and proportionality.

ANAV case

The Parking Brixen approach to public services concessions was confirmed in the ANAV case.[148] It looked like the Court had made up its mind on the fact that public service concessions imply a non-rebuttable presumption of potential cross-border interest, that the equal treatment principle is an independent principle applicable irrespective of the existence of discrimination on the ground of nationality and that a contracting authority should always organize a competitive award procedure.[149]

An Post case

And yet, in the An Post case,[150] which concerned the non-transparent award of a IIB service, the Court returned to the Coname interpretation regarding the applicability of the TFEU and made no reference to the Parking Brixen case. The Court considered that the TFEU is not applicable unless a '*certain cross-border interest*' in the contract is present.[151] The Court underlined that there was a legislative assumption that IIB service contracts are not, in light of their specific nature, of cross-border interest.[152] The Court decided that the Commission could not just rely on an assumption that a IIB service contract necessarily is of certain cross-border

[143] E.R. Manunza, 'Alle aanbestedingen zijn interstatelijk' in Elizabetta Manunza en Linda Senden (red) 'De EU: de interstatelijkheid voorbij ?' (Blaeu, Willem Jansz, Amsterdam 2006); Hordijk (2011)158; M. Krugner, 'The Principles of Equal Treatment and Transparency and the Commission Interpretative Communication on Concessions' (2003) 12 PPLR 181; the contrary view is argued by T. Tridimas, *'The General Principles of EU Law'*, (2nd edn Oxford University Press, 2006).
[144] Arrowsmith & Kunzlik (2009) 85.
[145] Arrowsmith & Kunzlik (2009) 87.
[146] The equal treatment principle has been defined in the *Fabricom* case as requiring that comparable situations must not be treated differently and that different situations must not be treated in the same way unless such treatment is objectively justified'. See Case C-21/03 *Fabricom v Etat belge* [2005] E.C.R. I-1559 para 27.
[147] In the Keck case, the Court decided that under article 28 TEC, only measures relating to the characteristics of the products in question would be covered when non-discriminatory, while 'selling arrangements' such as rules on opening hours of retail outlets will only become subject of scrutiny if discriminatory. Joined cases C-267/91 and C-268/91 ECR I-06097.
[148] Case C-410/04 *ANAV* [2006] ECR I-3303 paras 18-23.
[149] ANAV case paras 18-20.
[150] Case C-507/03 *Commission v Ireland* [2007] ECR I-9777 (An Post case).
[151] An Post case para 29.
[152] An Post case para 25.

interest.[153] A mere statement by the Commission that a complaint was made to it in relation to the contract in question was not considered by the Court to be sufficient proof.[154]

The Court did not go into the question whether the equal treatment principle is a general principle independent of discrimination on the ground of nationality. It only decided that, when cross-border interest exists, lack of transparency would amount to a difference in treatment in the disadvantage of interested undertakings from other Member States.[155]

APERMC case

In the subsequent APERMC case the Court bounced back to the Parking Brixen approach, this time in the context of a public service contract with a value below the threshold. The case did not make any reference to the An Post case.[156] The Court concluded that the Treaty is automatically applicable and that *'the principle of equal treatment of tenderers is also to be applied […] even in the absence of discrimination on grounds of nationality'*.[157]

Commission v Italy case

In the Commission v Italy case,[158] the following case regarding a non-competitive award of a contract with a value below the threshold, the Court chose the An Post line of argumentation again and dismissed the APERMC approach. The Court decided that a Member State is not mandated to adopt legislation regarding compliance with the TFEU for the award of contracts under the threshold, but a case-by-case evaluation of the relevance of the contract for the Internal Market should be made, in order to conclude whether the TFEU fundamental principles are applicable.[159] The Court reiterated that when a cross-border interest is present, the absence of transparency will lead to *'a difference in treatment to the detriment of undertakings which might be interested in the contract but which are located in other Member States'*.[160]

Moreover, the Court expressly stated that articles 43 and 49 TEC '*do not lay down a general obligation of equal treatment but contain (…) a prohibition on discrimination on the basis of*

[153] An Post case para 33.
[154] The Commission brought as an argument the fact that it had received a complaint from an undertaking from another Member State. See An Post case paras 29, 32-4.
[155] An Post case para 30.
[156] Case C-220/06 *Asociation Profesional de Empresas de Reparto y Manipulado de Correspondencia* [2007] ECR I-12175 (APERMC case), para 70-75.
[157] APERMC case paras 71-4.
[158] Case C-412/04 *Commission v Italy* [2008] ECR I-619.
[159] Commission v Italy case paras 65-8.
[160] Commission v Italy case para 66.

nationality'.[161] The Commission had failed to demonstrate the existence of such discrimination.

SECAP cases

The subsequent SECAP cases[162] dealt with the discriminatory nature of a national legislation imposing the automatic exclusion of abnormally low tenders in contracts with a value below the threshold, without granting the opportunity to tenderers to prove that their offer is genuine and viable. Tenders were qualified as abnormally low according to a pre-set mathematical formula.[163] The Court underlined that the fundamental rules and general principles of the Treaty apply only when the contracts in question are potentially of certain cross-border interest.[164] The Court stated that the application of the formula to contracts excluded from the scope of the Procurement Directives, but nevertheless presenting a cross-border interest, amounted to indirect discrimination, since it created disadvantages for undertakings from other Member State that may be able to offer a genuine and viable solution at a much lower prices as a result of concrete competitive advantages.[165]

In the SECAP cases, the Court also provided examples of circumstances which should be taken into account when deciding whether cross-border interest is present or not: the monetary value of the contract in question, in conjunction with its place of execution and its technical complexity.[166] The Court made clear that a cross-border interest is absent when the economic interest at stake in the contract in question is very modest. However, even low-value contracts may be of certain cross-border interest when the execution of the contract is situated in a place that is likely to attract foreign companies (for example in the vicinity of borders with other Member States).[167] The Court clarified that it is the duty of the contracting authority to assess whether a contract whose value is below the threshold is of cross-border interest.[168]

Regarding the applicability of the equal treatment principle, the Court followed the same approach as in the An Post and Commission v Italy cases. It decided that not allowing the tenderers to prove that their bids are genuine and viable breaches the non-discrimination principle when cross-border interest is present.[169]

[161] Commission v Italy case para106.
[162] Joined Cases C-147/06 and C-148/06 *SECAP SpA and Santorso Soc. Coop. Arl . Comune di Torino* [2008] ECR I-3565 (SECAP cases).
[163] SECAP cases para 23-4.
[164] SECAP cases para 21.
[165] SECAP cases para 26.
[166] SECAP cases para 24
[167] SECAP cases paras 29-31.
[168] SECAP cases para 30.
[169] SECAP cases para 25-6.

Wall case

In the following Wall case,[170] the question arose whether change of a subcontractor in a service concession contract requires reopening the contract to competition. In this case, the existence of a cross-border interest was not disputed and the contract had been awarded in competition. The Court embraced the view that the principle of equal treatment applies[171] and interpreted it by reference to case-law regarding contracts falling within the scope of application of the Procurement Directives. The Court stated that substantial amendments of a service concession contract falling within the scope of application of the Treaty, amounts to a breach of equal treatment when they demonstrate the intention of the parties to renegotiate the essential terms of the contract.[172]

Conclusions

I conclude from the above case-law that there are two diverging approaches regarding the applicability of the TFEU principles to contracts (partially) excluded from the Procurement Directives. It is unclear whether the reasons for these inconsistencies lie in the principled opinions of the different European judges or other circumstances peculiar to the facts of the case.

According to the approach established in the Parking Brixen case, the potential interest of companies from other Member States in contracts falling outside the Procurement Directives cannot on forehand be excluded. Moreover, the equal treatment principle is a general principle that applies independent from the determination of a link to the Internal market and entails an obligation to advertise and to organize a competitive award procedure.

According to the approach established in the Coname and An Post cases, a case-by-case evaluation should be made whether companies from other Member States may be interested in the respective contract. The potential interest of companies from other Member States in the contract depends not only on its monetary value, but also on its technical complexity and/or on the place of execution of the contract. When no cross-border interest is present, the respective contract may be awarded without consideration of the TFEU. When potential cross-border is present, an award in the absence of transparency breaches the non-discrimination principle. Transparency entails an obligation to advertise the contract. When following advertisement no foreign company expresses interest in obtaining the contract, the contracting authority may still conclude that no competitive award procedure in line with the Treaty principles needs to be set in motion.

[170] Case C-91/08 *Wall AG v Stadt Frankfurt am Main* [2010] ECR I-0000 (Wall case) para 37.
[171] Wall case para 37.
[172] Wall case.

1.5.2 The 2010 case-law - resolution of the disputes ?

In 2006, the European Commission decided to intervene in the dispute by codifying the EU case law in its *Interpretative Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives*.[173] The Communication does not mention R&D service contracts excluded from the scope of the Procurement Directives. This is arguably due to the fact that the Commission wanted to restrict its Communication to the existing case-law. It follows the case-law up to just before the An Post case[174] on important points discussed in the previous sections of this chapter:

- Firstly, it embraces a rebuttable assumption that a contract falling outside the Procurement Directives presents cross-border interest and lays the burden of proof regarding the irrelevance of the contract for the Internal market on the contracting authority.
- Secondly, it adopts the view that when a cross-border interest cannot be excluded, a contracting authority needs to organize a competitive award procedure. The Communication outlines the obligation to publish a call for competition, which should contain the essential information related to the contract as well as the award procedure.

The Communication does not follow the Coname approach regarding the second possibility to rebut the TFEU applicability if foreign companies do not express interest following the advertisement of the contract. It seems to have chosen a middle way between the Coname and the Parking Brixen approaches.

The Commission also goes further than the case-law in detailing the procedural steps that would comply with the TFEU principle. Summarized, the following obligations flow from the TFEU principles, according to the Commission:

1. Prior assessment of the cross-border interest in the respective public contract; And in case of positive conclusion regarding the existence of cross-border interest:
2. Prior publication of an advertisement of the public contract through a sufficiently wide coverage medium, including a description of the award procedure;[175]
3. Non-discriminatory description of the subject-matter of the contract.[176] Concretely this obligation entails that '*the description of the characteristics required of a product or service should not refer to a specific make or source, or a particular process, or to*

[173] Commission, 'Interpretative Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives' 2006/C 179/02.
[174] The Communication dates from before the An Post case.
[175] Germany v Commission case para 79.
[176] Germany v Commission case paras 113-5.

trade marks, patents, types or a specific origin or production unless such reference is justified by the subject-matter of the contract and accompanied by the words 'or equivalent'.[177]

4. Use of non-discriminatory selection criteria.[178]
5. Recognition of equivalent diplomas, certificates and other evidence of formal qualifications from other member States – flows out of the principle of mutual recognition.[179]
6. Time-limits for expressions of interest and submission of offers should allow sufficient time to undertakings from other Member States to formulate meaningful offers.[180]
7. The award needs to take place according to the prior laid down rules and avoid de facto unjustified advantages to a specific tenderer (for example by providing the same amount of information). This is particularly important in negotiated procedures.
8. The negotiated procedure without prior announcement of the contract, is allowed under the same conditions as provided within the Procurement Directives for the same procedure, but not limited to these situations.[181] This ensures that the prior publication obligations is not imposed where the Procurement Directives expressly allow for a derogation.[182] Additional grounds for the application of direct negotiations may be based on exemptions from the applicability of the TFEU, such as 106(2) TFEU or one of the justificatory grounds expressly provided for in the Treaty applies (for example, public policy or public health, under Articles 46 EC and 55 EC, or official authority, under articles 45 EC and 55 EC), or on overriding reason relating to the general interest,[183] or on an 'in-house' exception.[184]

Germany disputed the Communication before the Court of First Instance ('CFI'), for allegedly creating new obligations for the procurement of contracts expressly excluded by the legislator from the scope of application of the Procurement Directives. The case concerns in particular the extent of the obligations the Commission interprets from the applicable Treaty principles.

In May 2010, the CFI considered the case and concluded that the 2006 Communication limits itself to explaining the obligations arising from the fundamental principles of the Treaty and does not create new obligations for contracting authorities/entities.[185] It could be that a

[177] Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives 7; Germany v Commission case.
[178] Germany v Commission case para 128.
[179] Germany v Commission case para 119-120.
[180] Germany v Commission case paras 122-3.
[181] Germany v Commission case paras 138-143.
[182] Germany v Commission case para 141.
[183] Case T-158/03 *R Industrias Químicas del Vallés v Commission* [2003] ECR II-3041para 35.
[184] Coname case paras 23-6.
[185] Germany v Commission case.

steady course is adopted in the case-law on these issues, according to which a contract falling (partially) outside the scope of the Procurement Directives needs to be awarded in competition whenever the assumption that foreign companies are not interested in the contract cannot be rebutted.

A few months later, in the most recent case-law regarding a contract falling partially outside the scope of application of the Procurement Directives, the CJEU followed the tendency to interpret the Treaty principle in line with case-law relating to contracts fully covered by the Procurement Directives. The case regarded a complaint of the European Commission against Ireland concerning the procurement of II B services. Ireland had allocated the award criteria weights after the deadline for the submission of bids and amended these weights after a first investigation of the submitted bids.[186] In this case, the existence of a cross-border interest was not disputed, as Ireland had voluntarily advertised the contract and the conditions for a competitive award procedure.

The Court decided, that the obligation to publicize the weights of the award criteria before the deadline for the submission of bids does not follow from the principle of equal treatment or from the transparency principle. The Advocate-General had noticed in this context that the same outcome had been reached by the Court in the context of a procurement falling under the scope of the Procurement Directives. The Court had judged that assigning scores to the award sub-criteria after the deadline for submission of bids but before the opening of the bids was allowed.[187]

Of importance to the decision in the discussed case was that the award criteria did not lend themselves to multiple interpretations and could thus not be used to disadvantage bidders from other Member States.[188] Moreover, the award criteria had not been published in the order of relevance and knowledge of the scores before the deadline for submission would not have substantially influenced the formulation of the bids.[189]

Changing the scores of the award criteria after the opening of the bids, on the other side, breaches the equal treatment and transparency principles.[190] It is not necessary to demonstrate the discriminatory effect of the change or show that damages derived thereof.[191]

[186] Case C-226/09 *Commission v Ireland* [2010] ECR I-11807 (Commission v Ireland case).
[187] Case C-331/04 *ATI EAC* [2005] ECR I-10109 (ATI EAC case).
[188] Commission v Ireland case para 45.
[189] Case C-226/09 *Commission v Ireland* [2010] ECR I-11807, Opinion of AG Mengozzi.
[190] Commission v Ireland case para 62.
[191] Commission v Ireland case paras 63-4.

1.5.3 Conclusions

In this section I analyzed the case-law of the CJEU on the applicability of the TFEU obligations to contracts (partially) excluded from the scope of the Procurement Directives. I also analyzed the extent of the concrete obligations deriving from the TFEU. This analysis was meant to check the Commission's interpretation of the obligations deriving from the TFEU fundamental principles in the context of a PCP procedure. It was also meant to conclude on the degree of procedural flexibility a contracting authority has when awarding an R&D service contract that falls outside the scope of the Procurement Directive. Although CJEU has not decided on matters related to PCP yet, I considered that its interpretation in other cases excluded from the scope of application of the Procurement Directives is relevant for PCP.

CJEU's case-law before 2010 shows inconsistencies in interpreting the applicability of the TFEU to contracts (partially) excluded from the scope of the Procurement Directives. The Court is also inconsistent in interpreting which concrete obligations derive from the fundamental principles of the Treaty.

Regarding the applicability of the TFEU, it can be concluded from the case-law, that the award of a contract (partially) falling outside the scope of the Procurement Directives may disregard the fundamental principles of TFEU only if special circumstances are present. Such special circumstances may regard the lack of economic interest of the contract for companies from other Member States (for example due to the low monetary value, distance from the border etc.).

This implies that the procurement of R&D services when risks and benefits are shared may present a certain cross-border interest or not, depending on the circumstances of the case. However, the PCP as defined in the PCP Communication is meant to address problems that are common to more than one Member State and would in most cases be of interest to companies from different Member States.

Regarding the concrete obligations flowing from the TFEU, the same case-law before 2010 is inconsistent regarding the obligation to publicize the contract details and to organize a competitive award procedure. The case-law after 2010 confirms the approach adopted by the Commission: whenever a cross-border interest cannot be excluded, a competitive award procedure should be conducted following advertisement through sufficiently wide-coverage means.

In addition, the Court has confirmed that extensive obligations flow from the general Treaty principles. The consequence of this approach is that the flexibility left to the contracting authority when awarding contracts falling outside the Procurement Directives is limited. In

practice, it amounts to a minimum obligation to conduct a negotiated procedure with prior notice, with the following additional flexibility as compared to the provisions of the Procurement Directives:

1. It is not necessary to prove the applicability grounds imposed by the Public Procurement Directive for the applicability of the negotiated procedure with prior notice.
2. Different time-limits for expressions of interest or submission of bids than prescribed by the Procurement Directives could be applied.
3. Scores could be assigned to the award criteria after the deadline for the submission of bids, but should be assigned before the opening of the bids.
4. The exclusion and selection criteria may entail other requirements than those enumerated within the Directive.

If the Court adopts the same approach to R&D services contracts, there is arguably little incentive for contracting authorities to choose for the PCP procedure as opposed to an open procedure, for example. Due to the applicability of the equal treatment principle to contracts outside the scope of application of the Procurement Directives, there is limited room for changing the technical specifications during the subsequent PCP Phases. Moreover, conducting a PCP procedure would not legitimately cover the purchase of the resulting innovative products.

1.6 Concept of R&D

PCP may only be applied for the funding of R&D services, so it is important to know what 'R&D' means. The R&D activities that constitute the focus of the three PCP phases are barely outlined in the PCP Communication and the accompanying PCP Staff Working Document. The European Commission thus did not clarify a crucial concept for the applicability of PCP. When the concept of 'R&D' is not interpreted properly,the pre-commercial procurement may breach the Procurement Directives and, consequently, may lead to a waste of public funds.

A more comprehensive analysis of the meaning of R&D, concrete examples and guidance on the borderline between R&D and other innovative non-R&D activities can be found in the Frascati Manual. Although the Frascati Manual was developed for the purpose of measuring R&D investments in national contexts, its interpretation of the R&D concept is to a large extent relevant to PCP. Yet, the PCP Communication does not recommend the use of the Frascati Manual as leading authority in deciding what is R&D and what not.

However, the Frascati Manual has officially been endorsed by the European Commission and it is expressly mentioned as a source of inspiration for the definition of different categories of R&D activities in the area of State aid for R&D and innovation.[192] Moreover, definitions of R&D in line with the Frascati Manual can be found in the recent Defence Directive.[193]

The available definitions often use different terms and different degrees of detail. They mirror the legislator's effort to provide guidance to the interpretation of a complex concept. They also reflect the different purposes of the respective legislative or policy instruments.

In this section I outline the coverage of the R&D concept as defined in the Frascati Manual and in other EU legislative or policy documents. I subsequently point out the relevance of this guidance for the PCP procedure and I underline the remaining conceptual difficulties and the remaining gaps in the PCP policy guidance on the R&D concept. To this end, subsection 1.6.1 focuses on the R&D concept in technological innovation. Subsection 1.6.2 describes the concept of R&D in the area of software development. Finally, subsection 1.6.3 describes the concept of R&D in services innovations.

1.6.1 R&D that leads to technological innovation

1.6.1.1 Frascati Manual guidance on the concept of R&D

Definitions

According to the latest version of the Frascati Manual, R&D can be defined as *'creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications'*.[194]

Three categories of R&D can be distinguished: basic research, applied research and experimental development. The Frascati Manual provides the following definitions for each of these categories.[195]

Basic research is *'experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view'*.

Applied research is *'also original investigation undertaken in order to acquire new*

[192] Framework for State aid for R&D&I art 2.2 (e-g).
[193] Recital (13) of Directive 2009/81/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of procedures for the award of certain works contracts, supply contracts and service contracts by contracting authorities or entities in the fields of defence and security, and amending Directives 2004/17/EC and 2004/18/EC [2009] OJ L216/76.
[194] Frascati Manual 30.
[195] Frascati Manual 64.

knowledge. It is, however, directed primarily towards a specific practical aim or objective'.

Experimental development is *'systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed'*.

Borderline between R&D and other innovative non-R&D activities

Besides R&D, the innovation process requires the performance of innovative activities, which are linked to R&D activities but are not themselves R&D. These innovative activities relate to the implementation of technologically new or improved products and processes (for example, production/construction, distribution, marketing etc.).

The Frascati Manual recognizes the difficulties in locating the cut-off point between R&D and the innovative non-R&D activities particularly when the innovative non-R&D activities have a scientific and technological basis and are *'very closely linked to R&D both through flows of information and in terms of operations, institutions and personnel'*.[196] The difficulty is also increased when the costs of preparing for production are higher than the costs of the R&D itself.[197] R&D is often carried out at different phases of the innovation process up to the implementation stage. R&D is often not only *'the original source of inventive ideas but also as a means of problem solving which can be called upon at any point up to implementation'*.[198]

The Frascati Manual distinguishes between innovative activities that can never be qualified as R&D, but may occasionally entangle 'feedback' R&D, and innovative activities that may be qualified as R&D or non-R&D depending on whether they are *'carried out solely or primarily for the purpose of an R&D project'*.[199]

Innovative activities which can never qualify as R&D are, for example: *'acquisition of technology (embodied and disembodied), tooling up and industrial engineering,(...) other capital acquisition (...) and marketing for new or improved products'*,[200] pre-production, production and distribution, business services, market research.[201]

Innovative activities which may qualify as R&D or non-R&D are, for example: scientific and technical information services (such as the provision of library or computer services),[202]

[196] Frascati Manual para 65.
[197] Frascati Manual para 24.
[198] Frascati Manual para 21.
[199] Frascati Manual para 69.
[200] Frascati Manual paras 21-2, 79.
[201] Frascati Manual paras 82-3.
[202] Namely collecting, coding, recording, classifying, disseminating, translating analyzing, evaluating when performed by scientific and

management, administration and clerical activities,[203] general purpose data collection, testing and standardization, feasibility studies, specialized health care, personal education of academic staff, patent and license work, policy-related studies, industrial design.[204]

Within this context, particular difficulties are identified by the Frascati Manual in finding the cut-off line between experimental development which is R&D and pre-production development which is not R&D. According to the Manual, technical demonstrations, which are intended *'to make further technical improvements on the product or process'* constitute R&D activities.[205] The successful testing of the original prototype marks the end of the experimental development stage. Only when the testing does not yield the expected results and changes to the prototype are brought, the repeated test will continue to constitute R&D.[206]

A user demonstration which involves that the innovation is *'operated at or near full scale in a realistic environment'* for purposes of supporting policy or promoting the innovation does not constitute R&D. The pre-production planning or getting a production or control system working well, after the product, process or approach has been set, does not constitute R&D either.[207]

The initial manufacturing stage may, according to the Frascati Manual, constitute R&D if it *'implies further design and engineering'*.[208]

Generic criteria to identify R&D

For situations of uncertainty on whether an activity is R&D or not, the Manual defines generic criteria. These criteria may be applied whenever it is not clear whether an activity is R&D or not. The most important criterion is the *'presence of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty, e.g. when the solution to a problem is not readily apparent to someone familiar with the basic stock of common knowledge and techniques for the area concerned'*.[209]

Other supplementary criteria which are listed by the Frascati Manual as indicators of R&D

technical personnel or by bibliographic services, patent services, scientific conference and scientific and technical information, extension and advisory service. See Frascati Manual para 70.

[203] Frascati Manual para 132.

[204] Frascati Manual paras 71-7,110.

[205] Frascati Manual Annex 10 and paras 8-9.

[206] Frascati Manual para 115.

[207] Frascati Manual para 111.

[208] Frascati Manual para 120.

[209] Frascati Manual para 2.3.1. The components of this definition of R&D match to a large extent with those of patentability according to the European Patent Convention, Arts 52-56. However, purely 'scientific' advances would rarely meet the patentability test, whereas according to the Frascati Manual, they fall within the concept of R&D. See R. Apostol & C. Mair, 'The Pre-commercial procurement of FLOSS: quirks, conflicts and legal complexities', paper presented at the UNDERPINN Conference, Manchester, (22-23 March 2012).

include: the scope of the project to seek previously undiscovered phenomena, structures or relationships, the application of knowledge or techniques in a new way within the project, the significant chance that the project will result in new (extended or deeper) understanding of phenomena, relationships or manipulative principles of interest to more than one organization, the potential patentability of the results, the involvement of academic staff in the project.[210] These criteria are more useful when attempting to retrospectively identify R&D activities and are not relevant in the context of a PCP.

The Frascati Manual makes clear that in some blurry situations, the distinction between experimental development and pre-production development *'requires engineering judgement as to when the element of novelty ceases and the work changes to routine development'*.[211]

PCP does not use the terms of applied research or experimental development, but simply refers to feasibility studies, prototyping and test series. It is though clear that PCP covers the stages of applied research and experimental development.

The PCP guidance misses detailed guidance and examples on the activities that qualify as R&D under the 3 phases, particularly in situations of uncertainty. Although the Frascati Manual has not officially been acknowledged as the authoritative guidance on the interpretation of the R&D concept in the context of a PCP, it provides useful complementary guidance.

However, the Frascati Manual also lacks clarity on the concept of R&D as part of the innovation process in services (see section 1.6.3 below).

1.6.1.2 EU guidance on the concept of R&D

Some additional guidance on the interpretation of the R&D concept can be found in other areas of EU law. I hereunder provide an overview of the most useful guidance.

Area of defence procurement

The Defence Directive[212] adopts almost literally the R&D definitions provided by the Frascati Manual. This confirms that the guidance provided by the Organisation for Economic Co-operation and Development (OECD) on the R&D concept constitutes the leading authority on the interpretation of this concept in the area of public procurement.

[210] Frascati Manual para.2.3.2.
[211] Frascati Manual Annex 10 and para 39.
[212] Directive 2009/81/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of procedures for the award of certain works contracts, supply contracts and service contracts by contracting authorities or entities in the fields of defence and security, and amending Directives 2004/17/EC and 2004/18/EC [2009] OJ L216/76.

The Defence Directive also attempts to clarify the borderline between R&D and non-R&D activities. In line with the Frascati Manual, it clarifies that technological demonstrators (i.e. devices demonstrating the performance of a new concept or a new technology in a relevant or representative environment) fall within the concept of experimental development. A less clear overview is given of activities that fall outside the R&D concept: *'the making and qualification of pre-production prototypes, tools and industrial engineering, industrial design or manufacture'*.[213]

Area of state aid

The Framework for State aid for R&D&I, European Commission's guidance on the conditions for exempting R&D national subsidies from a detailed scrutiny of their negative impact on EU-wide competition, expressly mentions the Frascati Manual as one source of inspiration for the classification of various R&D activities.[214]

The Framework defines three categories of R&D activities: fundamental research, applied research and experimental development which largely correspond to the Manual's definitions of basic research, industrial research and experimental development.[215] The Framework pays more attention than the Frascati Manual to drawing a clear line between different categories of R&D activities. The Frascati Manual is less preoccupied with defining the cut-off line between the different R&D categories and is more interested in distinguishing between R&D and non-R&D activities.

Distinguishing between different categories of R&D activities is important in the area of State aid, due to the fact that maximum percentages of the R&D costs per R&D category may be subsidized by a public authority. The closer the R&D activity finds itself to commercialization, the more distortive the subsidy is considered for the good functioning of the private market and as a consequence, the less substantial the subsidy may be.[216]

The Framework clarifies thus that the aim of industrial research is to acquire new knowledge and skills needed to develop new, or significantly improved products, processes or services. The creation of components may also fall under industrial research, but fully-fledged prototypes are included into the category of experimental development.[217] Experimental

[213] Recital (13) Directive 2009/81.
[214] Framework for State aid for R&D&I para 5.1.1.
[215] Framework for State aid for R&D&I art 2.2 (e-g). The third R&D category, 'experimental development', was included into the Framework for State aid for R&D&I in 2006.
[216] 100% of the costs for fundamental research may be funded by Member States, 75% of the industrial research activities and 50% of the experimental development activities. For a more detailed overview of the EU State aid rules for R&D subsidies, see Chapter 5.
[217] Framework for State aid and R&D&I 'Industrial research' means the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components of complex systems, which is necessary for the industrial research, notably for generic technology validation, to the exclusion of prototypes as covered by point(g);

development, on the other side, covers the creation of new or improved products, processes or services, based on knowledge previously acquired during industrial research.[218] The aim of the R&D activities at the experimental development stage should not be to produce something for commercial use, whether it is drafts, drawings, plans or other documentation. However, commercially usable prototypes and pilot projects are considered experimental development activities, '*where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes*'.

Besides drawing a strict line between the different categories of R&D activities, the Framework restrictively defines the R&D costs which qualify for a subsidy at the later stage of experimental development. This is arguably due to the objective of the Framework to minimize distortions to competition at the end of the R&D trajectory.

According to the Framework, subsequent revenues gained by the private recipient of the subsidy through commercial use of the prototype must be deducted from the eligible costs for the R&D subsidy.[219] For example, if a new or significantly improved water purifying installation is built to demonstrate its viability in a real environment, not only the costs of the demonstration activities, but also the cost of building the installation will be eligible for an R&D subsidy under the EU rules (namely reimbursement of 25% of the eligible costs). However, if the pilot water purifying installation is subsequently used in the operational activities of the private water company (that is the recipient of the R&D subsidy) and revenues are obtained from consumers for the purified water, these revenues should be deducted from the R&D costs which qualify for the subsidy.

Furthermore, the Framework stresses that experimental production and testing of products, processes and services do not qualify for reimbursement of R&D costs, if the resulting products, processes and services can be used or can be transformed to be used in industrial applications or commercially. In other words, if a company can subsequently sell the tested

[218] Framework for State aid for R&D&I para.2.2(g): 'Experimental development means the acquiring, combining, shaping and using of existing scientific, technological, business and other relevant knowledge and skills for the purpose of producing plans and arrangements or designs for new, altered or improved products, processes or services. These may also include, for example, other activities aiming at the conceptual definition, planning and documentation of new products, processes and services. The activities may comprise producing drafts, drawings, plans and other documentation, provided that they are not intended for commercial use.
The development of commercially usable prototypes and pilot projects is also included where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes. In case of a subsequent commercial use of demonstration or pilot projects, any revenue generated from such use must be deducted from the eligible costs.
The experimental production and testing of products, processes and services are also eligible, provided that these cannot be used or transformed to be used in industrial applications or commercially.
Experimental development does not include the routine or periodic changes made to products, production lines, manufacturing processes, existing services and other operations in progress, even if such changes may represent improvements'.
[219] Framework for State aid for R&D&I para.2.2(g).

products, processes or services, it cannot obtain an R&D subsidy for the costs of the experimental production or of the testing.

The question arises whether the same restrictive approach to the interpretation of eligible R&D costs should be applied in the area of PCP.

The PCP guidance does not detail the meaning of eligible R&D costs under a PCP contract and does not mention a similar restriction to the Framework regarding the subsequent commercial use of the resulting products by the supplier.

However, the PCP guidance refers to the market price criterion, which may constitute an indirect limitation on the eligible R&D costs under a PCP. When the maximum price to be paid by a contracting authority for a PCP project is decided by taking into account the commercialization potential of the resulting solution, the estimated (share of the) revenues from subsequent commercial use should be detracted from the price to be paid for a PCP contract. However, as already mentioned in section 1.4.3, such a fictive calculation is very difficult to apply in practice. More suitable alternative to the market price criterion are discussed in Chapter 5, section 5.5.4.

Important to mention is that there is no limitation on the subsequent commercial use of the prototype/tested product by the funding contracting authority, besides the fact that PCP may only cover R&D service contracts. If the cost of the resulting tested product for use in its operational activities outweighs the cost of the R&D services, the contract cannot be qualified as a PCP.

1.6.2 R&D in software development

The Frascati Manual contains specific guidance on identifying R&D in software development. Because PCP was initially envisaged as a suitable instrument to leverage private R&D efforts in the ICT sector, and because innovative ICT solutions are still promoted by EU policy-makers as crucial for the global competitiveness of the European economy, it is important to be able to identify when software development can be qualified as R&D.

The Frascati Manual is concise on this matter. The main conditions to qualify software development as R&D are the following:

- the completion of the development must be dependent on a scientific and/or technological advance (advance in the area of computer software); AND
- the aim of the project must be the systematic resolution of a scientific and/or technological uncertainty.

These conditions practically reiterate the generic criteria for identification of R&D. The Manual further specifies that an upgrade, addition or change to an existing program or system will, according to the Frascati Manual qualify as R&D when *'it embodies scientific and/or technological advances that result in an increase in the stock of knowledge'*.[220]

1.6.3 R&D which leads to services innovation

The 2007 PCP Communication and the accompanying PCP Staff Working Document are not clear on whether PCP is a suitable instrument for the development of innovative services which are not built around an innovative technology. On the one hand, the policy documents talk about the role of PCP to assure the development of technological solutions to meet challenging societal needs.[221] On the other hand, the same policy documents indicate that the result of a PCP can be either an innovative product or service.[222]

The same lack of clarity is evident in the Frascati Manual. Initially, the basic definitions in the Frascati Manual were developed for the manufacturing industry and research in the natural sciences and engineering. Subsequently, these were extended to service activities.

The Frascati Manual acknowledges the remaining difficulties in identifying R&D in services. According to the Manual, these difficulties are mainly due to the fact that R&D in services is not specialised, but covers several areas: *'technology-related R&D, R&D in the social sciences and humanities, including R&D relating to the knowledge of behaviour and organisations'*.[223] When software-related, R&D in services will be present even when the software is not by itself innovative, *'but innovates by virtue of the functions that it performs'*.[224]

The Frascati Manual proposes the use of the same above mentioned generic criteria to identify R&D in services.[225]

Policy-makers' difficulty to clarify the relevancy of PCP to be applied in the services area is also due to the incipient stage of economic theories on the importance of traditional R&D activities in services innovation. Some economists consider that the reality of service development activities is not fully reflected into the current R&D definition of the Frascati Manual. However, very few practical solutions have so far been brought up.[226]

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[220] Frascati Manual paras 135-8.
[221] PCP Communication 4, 9, 10; PCP Staff Working Document 2-3, 10-1.
[222] PCP Communication 2-3, 8; PCP Staff Working Document 3-4, 8.
[223] Frascati Manual para 147.
[224] Frascati Manual para 147.
[225] Frascati Manual para 149.
[226] CREST R&D in Services Working Group, 'R&D in Services – review and case studies' (1 February 2008) 31 (CREST Working Group) <http://ec.europa.eu/invest-in-research/pdf/download_en/service_rd080129.pdf> accessed 2 February 2013. For a discussion on the economic theories on how innovative services emerge, see Chapter 2 below, section 2.3.6.

According to the economic literature, examples of R&D activities in the services sector include: socio-economic research, insurance and financial mathematics (in the banking and insurance industry), IT systems development for the back office and delivery, service scripts development for the front desk personnel, ICT research and development, logistics simulation, management research, marketing research, environmental research, consumer behaviour, nutritional research, demographics research, religion-oriented research, medical research, law etc.[227]

An interesting solution for the difficulty to identify R&D in services has been advanced in the EU State aid area. The Framework for State aid for R&D&I expressly enumerates several cumulative conditions for exempting national funding of organisational and process innovative activities from the obligation to pre-notify the aid (R&D subsidy) to the European Commission:[228]

- the organisational innovation in services needs to be related to the use and exploitation of ICT (this limitation does not hold for process innovations);
- both organisational and process innovations need to be conducted within a proper R&D project with an identified and qualified project manager and with identified project costs;
- the project needs to entail a clear degree of risk;
- the result of the innovation projects needs to be new or substantially improved compared to the state of the art in its industry; and
- the result of the innovation project has to be in the form of *'a standard, a business model, methodology or concept which can be systematically reproduced, possibly certified and possibly patented'*.[229]

Interesting to notice is that the maximum aid intensities are lower than for traditional R&D technology projects[230] (15% of the cost of the project for large enterprises, 25% for medium enterprises and 35 % for small enterprises).

Organisational and process innovation activities are treated within the Framework for State aid for R&D&I differently from the rest of the R&D activities. The European Commission finds the justification for this different treatment in the fact that innovation in services does not always conform to the definition of R&D, but is *'typically less systematic and stems frequently*

[227] CREST Working Group 12.
[228] Framework for State aid for R&D&I.
[229] Framework for State aid for R&D&I para 5.5.
[230] The Framework had also extended the definition of R&D to experimental development, which corresponds to the testing phase of the PCP.

from customer interaction, market demand, adoption of businesses and organisational models and practices from more innovative sectors or from other sources'.[231]

In the case of organizational innovations, the Framework for State aid for R&D&I limits the scope of the exemption to those innovations related to the use and implementation of ICT. This is in line with the approach to patentability of business methods within the European patent law, which requires, inter alia, computer-implementation for patentability and which does not consider pure or "naked" business methods patentable.[232] Pure business method patents (non-technical/non-computer implemented) are not recognized, due to a history of limiting patentability to *technical* inventions.[233] In distinguishing between patentable, innovative computer-implemented inventions and unpatentable software and business methods, the Board of Appeal applies the *technical character* test. The test requires the examiner to determine whether the claim's contribution to prior art lies in a technical area.[234]

The Frascati Manual does not bring a similar restriction to ICT-related R&D activities within organizational innovations. Advancing knowledge in scientific areas may also qualify as R&D in services.

1.6.4 Conclusions

By limiting PCP to R&D services contracts, the EU legislator and the EU policy-maker sought to provide public funding to those cutting-edge, knowledge-creating activities, which promise significant benefits, but do not easily attract the necessary private investments. The EU sought to ensure that public funding is not wasted on funding trivial innovative activities performed by national champions. A correct interpretation of the concept of R&D services is thus important in order to ensure that PCP achieves its objectives as innovation policy instrument. However, the PCP Communication does not provide a clear definition of R&D services or clear guidelines on the types of activities that qualify as R&D services.

Although the Frascati Manual has not officially been acknowledged as the authoritative guidance on the interpretation of the R&D concept in the context of a PCP, it provides useful complementary guidance. The Frascati Manual has already been embraced by the European Commission in the area of defence procurement and State aid.

In this section I outlined the most important guidance that may be relevant for the interpretation of the R&D concept in the context of a PCP procedure. I distinguished

[231] Framework for State aid for R&D&I para 5.5.
[232] Commission, 'Proposal for a Directive on the patentability of computer-implemented inventions' 5 COM(2002) 92 final.
[233] Ibid.
[234] Ibid 6-7.

between R&D in technological innovation (including software development) and R&D in service innovation.

Regarding R&D in technological innovation, the Frascati Manual provides generic criteria for identifying R&D in situations of uncertainty, particularly at the border between experimental development and pre-production development (before the commercial roll-out of the innovation). According to the Frascati Manual, *successful testing of a prototype marks the end of the last phase in the R&D trajectory, namely experimental development*. *When the borderline is not clear*, the key characteristics of R&D activities in software and technological fields are:

- '*presence of an appreciable element of novelty*'; and

- '*the resolution of scientific and/or technological uncertainty*'.

In other words, the solution to a problem should not be readily apparent to '*someone familiar with the basic stock of common knowledge and techniques for the area concerned*'. The Manual admits though the sometimes distinction between R&D and non-R&D activities requires '*engineering judgment as to when the element of novelty ceases and the work changes to routine development*'.

Useful additional guidance is also provided by the Framework for State aid for R&D&I. Particularly relevant for the question whether an innovation developed during a PCP may be subsequently used by the funding contracting authority is the approach in the State aid area to commercially usable prototypes and pilot projects. These are considered experimental development activities, '*where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes*'. The Framework underlines that subsequent revenues gained by the private recipient of the subsidy through commercial use of the prototype must be deducted from the eligible costs for the R&D subsidy. There is however no restriction for the contracting authority who grants the subsidy to subsequently use the commercial prototype for its own benefit, besides the condition that the value of the R&D services covered by the PCP contract must outweigh the value of making the prototype.

Clarity on the concept of R&D as part of the innovation process in services sectors is more difficult to find.

The Frascati Manual acknowledges the difficulties in defining R&D in services. These difficulties are due to the unspecialized nature of the R&D activities in services. The Manual makes though clear that, when software related, R&D in services will be present even when the

software is not by itself innovative, but innovative by the functions it performs. The Frascati Manual proposes the use of the same above mentioned generic criteria to identify R&D in services.

In the EU State aid area, subsidies for organisational and process innovative activities (or in other words R&D activities in services) benefit of a light supervision regime when the following cumulative conditions are present:

- they are related to the use and exploitation of ICT (this limitation only applies to organisational innovations),

- are organised in a systematic manner (with an identified and qualified project manager and with identified project costs),

- entail a clear degree of risk and

- yield new or substantially improved results compared to the state of the art, which can be systematically reproduced, possibly certified and possibly patented.

Concerning the clarity of the 'R&D' concept I conclude three things:

- first, that it is essential to distinctinguish between legitimate and illegal application of PCP exceptions;
- second, that clear interpretation is available when considering R&D for innovation of products (yet is not always understood in that way by contracting authorities);
- third, that clear interpretation is not available when considering R&D for innovation of services (resulting in uncertainty about legitimate application of PCP for innovative services).

1.7 Distinction from other available instruments to stimulate innovation

Other (procurement) tools for stimulating increased private R&D investments have been developed in public policy. Some of these tools have a design that comes close to the mechanisms of PCP. Questions may arise whether these tools are able to perform the same functions and reach the same results as PCP.

This section outlines the main differences between the PCP instrument and the instruments which may come close to the working and effects of the PCP procedure. These instruments are: (1) functional/performance specifications; (2) competitive dialogue; (3) R&D subsidies; and (4) Forward Commitment Procurement (FCP).

1.7.1 PCP and Functional and/or performance specifications

Directives 2004/18/EC and 2004/17/EC allow contracting authorities/entities to formulate their technical specifications in terms of performance levels and/or functions.[235]

The formulation of ambitious functions and/or performance levels in procurement procedures governed by the Procurement Directives is thus allowed and even recommended. However, they are not always an interchangeable instrument with PCP in terms of outcome. For example, if commercially available products cannot comply with the required functions and/or performance levels and the timeline for the purchase is too short to allow the further improvement of the existent products, the procurement will fail. In such a case, the contracting authority will either need to start a new procurement procedure with less ambitious requirements in terms of functions and/or performance, or procure a public R&D contract for the development of a solution with the desired functionalities and performance levels.

If the development of the desired solution requires R&D services, the contracting authority will be able to choose to organize the procurement outside the Procurement Directives and in line with the Commission's guidance, provided that the minimum legal conditions discussed in section 1.5.1 are fulfilled. As shown in the section 1.6, this choice does not provide significantly increased procedural flexibility as compared to a procedure falling within the scope of the Procurement Directives, while preventing the contracting authority from purchasing and using the end-result. Alternatively, the contracting authority may purchase both the R&D services and the end-result thereof in one procedure in compliance with the Procurement Directives.

When innovative products are available, but are not yet commercialized (for example products which have just completed phase 3 of the PCP), ambitious performance and functional specifications combined with qualitative award criteria may lead to their purchase. Through such a use of performance and functional specifications, contracting authorities act as leading customers and stimulate, according to some economists, private actors to invest in future innovation efforts.[236] However, this is a different role compared to PCP. PCP is intended to steer private R&D efforts and investments at a much earlier stage in the innovation process, towards socially beneficial solutions which would otherwise not be developed or would be developed at a much slower pace.

[235] See articles 23(3)(b) of Directive 2004/18/EC and 34(3)(b) of Directive 2004/17/EC.
[236] Luke Georgiou, 'Demanding Innovation Lead markets, public procurement and innovation' (London NESTA 2007).

From an efficiency point of view, it is recommendable that a contracting authority learns about the available solutions in the market and about the stage of development of innovative products before deciding on the level of required performance and/or functions.

Of course, performance and functional specifications may also be used in award procedures that fall outside the Procurement Directives. The use of functional and performance specifications is even recommendable in the context of a PCP, in order to avoid restricting the choice of a specific solution by the suppliers.[237] This entails that functional and/or performance specifications reinforce the functioning of the PCP instrument.

In conclusion, formulating functional and/or performance specifications is not in conflict with PCP, it will often be a part of it.

1.7.2 Competitive dialogue

The competitive dialogue is a flexible procedure introduced in 2004 into the Directive 2004/18/EC, in order to allow increased flexibility in the communication between the procuring authority and a private participant. The competitive dialogue may only be used in complex projects, such as infrastructure/IT projects wherein legal and financial make-up are uncertain.[238] This can also apply to R&D projects falling within the Procurement Directives, but the procedure has not been developed specifically for this type of project.

Thus, the competitive dialog is not designed to tackle technological uncertainties in the framework of R&D projects. It is designed to limit the contractual and financial uncertainties in complex projects.[239] In addition, the competitive dialog contains a potential disincentives for the bidders to propose highly innovative solutions (when such a procedure invites them to inform competitors of new approaches to innovative solutions).

The contracting authority, in the quest for the best solution for its own need, may communicate during the dialogue about the proposed solutions and other confidential information to the other bidders without the agreement of the bidder.[240] Moreover, at the end of the dialogue, the unique features of the best solution will be inevitably communicated to the other candidates, when they are invited to submit their final tenders on the basis of this solution. In this case, the participant who proposed that solution is not even sure that he will be the winning bidder.[241]

[237] PCP Staff Working Document 10.
[238] See articles 1(11)(c) and 29 of Directive 2004/18/EC.
[239] PCP Working Group 14-5.
[240] Article 29(3) of Directive 2004/18/EC.
[241] Commission, 'Green Paper on the modernisation of EU public procurement policy - Towards a more efficient European Procurement Market' COM (2011) 15 final 46.

Compared with the competitive dialogue, PCP has been developed specifically for R&D contracts. PCP expressly recognizes the need to protect the confidentiality of the developed solutions and allows parallel development trajectories.

1.7.3 PCP and R&D subsidies

Edquist and Zabala have recently expressed doubts regarding the nature of PCP as demand-side innovation policy instrument. They have signaled the need to rethink the rationale behind PCP.[242] Based on a study of 3 PCP cases deployed in the Netherlands, UK and Australia, they argue that PCP should not be qualified as procurement of innovation at all, as it does not involve any real purchase of the envisaged innovative product. Neither is any commitment or guarantee to such a purchase given.[243] According to the authors, PCP *'is a supply-side policy instrument in relation to innovation'* and *'a demand-side policy instrument in relation to R&D, as it only intends to influence the production of R&D outputs'*.[244] They conclude that PCP is a pre-competitive R&D programme that stimulates innovation from the supply-side.

The unclear conceptualization surrounding the PCP has not only puzzled policy researchers, but has also discouraged risk-averse contracting authorities from engaging in PCPs that may result in illegal subsidies.[245] In this section I clarify the distinction made in the policy research field between demand-side and supply-side instruments. I also clarify the criteria use in EU public procurement and State aid legal fields to distinguish between 'public contracts', which are subject to the *mandatory* application of the EU public procurement rules and subsidies, which are subject to the *voluntary* application of the public procurement rules, but are subject to the *mandatory* application of the EU State aid rules.

I agree with the above mentioned authors on the point that PCP was not drafted as a demand-side innovation policy instrument. As already mentioned in section 1.3.1 above, PCP was intended to incentivize the creation of solutions to problems of public interest, irrespective of whether the contracting authority is (one of the) end-customer(s) of the future innovation, or not. The contracting authority may be, next to the supplier, the end-user of the outcome of the R&D service contract (e.g. the emerging IPRs). This does not make PCP an policy instrument that stimulates *innovation* from the demand-side. It may be considered a demand-side instrument in respect of the R&D/knowledge outputs, but it remains a supply-side instrument in respect of the intended innovation.

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[242] Charles Edquist, Jon Mikel Zabala-Iturriagagoitia, 'Pre-Commercial Procurement: a demand or supply policy instrument in relation to innovation ?', CIRCLE Paper Series, Paper no. 2012/11 (October 2013).
[243] Edquist & Zabala (2013) 13.
[244] Edquist & Zabala (2013) 18.
[245] Legal uncertainty regarding compliance with EU State aid rules has been invoked by contracting authorities for not engaging in PCPs. See Commission, 'Compilation of Results of the EC Survey on the Status of Implementation of Pre-Commercial procurement Across Europe' 5 (April 2011) (PCP Survey (2011)) < http://cordis.europa.eu/fp7/ict/pcp/pcp-survey.pdf> accessed 12 November 2012.

PCP may not incorporate the purchase of the resulting innovations due to legal constraints deriving from previously made choices within the context of the WTO Government Procurement Agreement. This is outlined in detail in Chapter 5 below. However, the legal rules do not prevent a contracting authority who conducts a PCP to commit or guarantee that a subsequent procurement procedure in compliance with the Procurement Directives will be organised for the purchase of the developed innovation. This approach is not recommended by the PCP Communication or the accompanying Staff Woking Document and it is neither adopted in practice. As a consequence, according to the 'end-customer' criterion used by Edquist and fellow policy researchers,[246] PCP does not qualify as a demand-side innovation policy instrument. However, the qualification of PCP as demand-side policy instrument in respect of R&D rather than in respect of the resulting innovation, does not necessarily diminish its importance as part of a comprehensive EU innovation policy.

More worrying is that the unclear conceptualisation of the PCP may either lead to its implementation as illegal subsidy or to a scarcee implementation due to concerns of compliance with the EU State aid rules.

Compliance with the EU State aid rules is translated into the PCP Communication as the obligation for the contracting authority to pay a market price for the benefits gained from the awarded contract. Provided this condition is complied with, no subsidy is granted.

The market price criterion is a variant of the market economy investor principle, that has long been used in the EU State aid area to identify subsidies that need to be scrutinised by the EU.[247]

The PCP Communication uses the market price criterion as a substitute for the public procurement procedures as prescribed by the Procurement Directives. The application of the latter procedures in the EU state aid area normally creates a presumption that the award of the contract was made in accordance with the market conditions and no subsidy has been granted.[248] However, R&D services with shared risks and benefits, which form the subject-matter of the PCP are exempted from the mandatory application of the Procurement Directives. Moreover, the Court of Justice of the EU has clarified that following the respective procurement procedures would not prevent the qualification as a subsidy if the contractual conditions were not the market conditions or if the quantities purchased would not

[246] See also Jakob Edler, Ia (2013) 18.Innovation Policy - Concept, Application, Critiquetiqu[th] European Innovation Summit (2013), http://joint-institute.eu/files/2013/10/Edler-JIIP-Sep30-final2.pdf> accessed 4 March 2014.
[247] Ben Slocock, March 2014.u/files/2013/10/Edler-JIIP-S 2 *Competition Policy Newsletter* (2002).
[248] Framework for State aid for R&D&I para 2.1.

correspond to the real needs felt by the private end-users.[249] For these reasons, the European Commission chose to formulate the market price criterion.

A few years after the PCP Communication was released, the EU judge introduced the more useful and simple criterion of 'direct economic interest' to qualify a contract as a *public* contract, subject to the mandatory application of the EU public procurement rules. Although the Court did not seek to distinguish between public contracts and subsidies, this criterion is obviously useful to this end.[250]

In 2010, the Court of Justice of the EU clarified in the Helmut Muller case,[251] that the key criterion to define a public contract is the afferent pecuniary interest. According to the Court, a pecuniary interest entails that the contracting authority obtains a 'direct economic interest' in return for the consideration paid. This would be the case when the contracting authority gained the ownership on the contract results or retained a legal right on the use of the results of the activities deployed as part of the contract.[252]

As a matter of contract law, a subsidy may also qualify as a contract and may have strings attached (e.g. for the grantee to deliver concrete results). It may, however, not yield a direct economic interest for the contracting authority. For example, when a private customer received funds to purchase an innovative solution, the funding agreement may qualify as a contract, but not as a public contract according to the 'direct economic interest' criterion. The contracting authority will have an economic interest in the diffusion of the innovation onto the market. The diffusion may for example lead to decreased environmental costs or increased tax revenues for the state. But such an economic interest is for the contracting authority, indirect.

In the current context, PCP can be applied even when the contracting authority is not the end-user of the final innovative solution. For reasons of clarity, this conceptual distinction should be made by the EU policy-maker. It should be stated that PCP is an instrument that can be employed to award public contracts as well as subsidies. A public contract will be awarded when the contracting authority is the end-user, a subsidy when the private consumer is the end-user. In the second case, the subsidy should be subject to mandatory compliance with the EU State aid rules. What the current State aid rules for R&D and innovation encompass is further discussed in Chapter 5 below.

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[249] Case C-342/96, *Tubacex* [1999] ECR I-02459; Joined cases T-116/01 and T-118/01, *P&O European Ferries (Vizcaya) SA and Diputaci D Foral di Vizcaya v Commission* [2003] ECR II-2956.

[250] K.P.E. Lasok QC, 'Contracts and Grants in Public Procurement Law', file:///C:/Users/Ramona/Downloads/Paul%20Lasok%20QC,%20Monckton%20Chambers%20(1).pdf> accessed 4 March 2014.

[251] Case C-451/08, *Helmut Muller GmbH v Bundesanstalt fur Immobilienaufgaben* [2010] ECR I-02673.

[252] Helmut Muller case paras 50-1.

Whether the PCP leads to the award of a public contract or to granting a subsidy, in both cases, PCP could be employed as a demand-side innovation policy instrument. According to the end-customer criterion used in the policy research field, this would require that the contracting authority should commit or should guarantee to organize a subsequent procurement procedure in accordance with the EU Procurement Directives to purchase the resulting solution. In the case of a subsidy, the contracting authority should commit or guarantee to coordinate the private end-users and to conduct the procurement in their name.

The dividing line between public contract and subsidies on the one side, and demand-side and supply side innovation policy instruments on the other side, can be visualized as follows:

<table>
<tr><td colspan="4">R&D service contract between contracting authority and supplier</td></tr>
<tr><td>PUBLIC CONTRACT</td><td colspan="3">SUBSIDY</td></tr>
<tr><td>Direct economic interest (public end-user)</td><td colspan="3">Indirect economic interest (societal goals + private end-user)</td></tr>
<tr><td>Purchase of resulting innovation by contracting authority (according to the EU procurement rules)</td><td colspan="2">Purchase of resulting innovation by contracting authority (according to the EU procurement rules)</td><td>Purchase of resulting innovation by private customers/consumers</td></tr>
<tr><td>According to the market conditions/needs</td><td>No market conditions</td><td>Larger quantities than needs</td><td rowspan="2">SUPPLY-SIDE INNOVATION POLICY INSTRUMENT</td></tr>
<tr><td colspan="3">DEMAND-SIDE INNOVATION POLICY INSTRUMENT</td></tr>
</table>

For reasons of comprehensiveness, I can add that R&D subsidies and PCP public contracts may also be used as complementary instruments, at different stages in the innovation process: an R&D subsidy may be used to push exploratory research, while PCP public contracts may be used to pull applied research into commercialisation.

1.7.4 Forward Commitment Procurement

Another instrument which is sometimes advertised as an efficient and suitable instrument to leverage private R&D investments is Forward Commitment Procurement (FCP).

FCP is a procurement approach used in the UK, which involves alerting the private market to the future procurement needs of a contracting authority and allowing the private market a certain period of time to develop a solution at an agreed price and at an agreed level of performance. FCP was inspired from the automotive industry, where companies actively engage with their supply chains to provide information on future requirements and procurements in order to stimulate investment in innovation.[253]

FCP can be defined as '*a commitment to purchase at a point in the future, a product that may not yet exist commercially, against a specification that current products do not meet, on a scale sufficient to make it worthwhile for suppliers to tool up and manufacture*'.

FCP was initially meant to stimulate the leap to commercialization of environmental innovations, as it was observed that an unaided market rarely provides the incentives needed for environmental innovation. Environmental products are only being developed due to the value society puts on the environment and due to the public policies which create a value which justifies investing in environmental innovations. As environmental innovation becomes a necessity, the economic opportunities for businesses become increasingly visible. FCP was proposed, based on the analysis of how over 100 companies in the environmental sector innovate and of which difficulties they encounter.

FCP is thus considered suitable for environmental innovations which find themselves at the demonstration and scaling-up stage.[254] FCP is now used in other sectors (such as sustainability and health care) to provide a first market to innovative products. FCP is considered an effective public instrument for situation in which the private actor does not have sufficient certainty on the size and nature of the future markets, in order to invest in the innovation process. [255]

Through the FCP approach, contracting authorities can articulate credible demand and provide important information about the nature and scale of the demand. This may provide

[253] Environmental innovations Advisory Group, 'Environmental Innovation: Bridging the gap between environmental necessity and economic opportunity' (November 2006) (EIAG Report) <http://www.berr.gov.uk/files/file34987.pdf> accessed 24 December 2013.
[254] EIAG Report 4.
[255] Department for Business Innovation and Skills, 'Forward Commitment Procurement Know How Programme' slide 17 <http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=6&ved=0CGQQFjAF&url=http%3A%2F%2Fbis.gov.uk%2Fassets%2Fbiscore%2Finnovation%2Fdocs%2Ff%2Ffcp-introduction-concepts-background.ppt&ei=UcYLUdrdJcSk4AS8xIHIAQ&usg=AFQjCNHfxMdZGSl3GL1UU0SPQf6_rhIkdg&sig2=sQHlqhb8SilETMpo9pa3KQ> accessed 2 February 2013.

the necessary incentive to unlock private investment in such innovations.[256] Moreover, FCP is profiled as a low risk enterprise from the part of the contracting authorities, which are risk averse when it comes to new products with no track record. FCP addresses thus the investment risks, not the investment costs.[257] In other words, through FCP, a contracting authority does not invest in R&D, but leaves it to the private supplier.

FCP is thus suitable individually or in combination with PCP or other fiscal incentives, depending on whether the private market fails to invest sufficiently in desirable R&D projects due to lack of information regarding the nature and extent of demand or depending on whether the private innovator has difficulties in accessing private funding for the respective R&D projects. FCP is most suitable to situations when the desired solution involves incremental improvements and when it will suffice to signal the intention to buy the developed solution to determine the private supplier to invest in the development of the respective product. PCP is meant to be applied in situations when the private actor is not ready to invest or does not have the potential to invest in the solution without the direct financial incentive of the public procurer.

1.8 Conclusions

In 2005, the Commission set-up an expert group to investigate the need to support in the EU the procurement of R&D, in order to emulate the greater success of competitors such as the US in bringing valuable innovation onto the market and gain global competitive positions for their national businesses. Based on the positive conclusions of the experts, the European Commission embraced PCP as an important instrument capable to bring about the following benefits for Europe:

1. improvements of public services;

2. solutions to important societal problems (such as global warming, shortage of resources, ageing etc.);

3. enhanced innovation and commercialisation capabilities of EU businesses, which would lead to improved competitive positions in global markets and would indirectly bring long-term benefits to the economy.

Based on these convictions, the European Commission decided to further incentivize contracting authorities in Europe to engage in PCPs and turn themselves into technology

[256] Environmental Innovations Advisory Group, 'Forward Commitment Procurement and the HMPS Demonstration project' (2006) <http://www.bis.gov.uk/files/file35312.pdf> accessed 1 February 2013.
[257] See <http://www.bis.gov.uk/policies/innovation/procurement/forward-commitment> accessed 11 March 2011.

demanding first buyers, when these technological solutions have important social benefits, have the potential to improve public service and to support EU innovative companies in developing new capabilities and new market opportunities. The Commission attempted to achieve this by providing guidance on the legally compliant ways to apply PCPs. The European Commission drafted its guidance on PCP from an EU-perspective and focused on the improved efficiency of PCP if EU-wide competition is ensured and common European problems are addressed.

This chapter outlined the features of the PCP procedure as drafted by the Commission in its 2007 Communication. It concluded that important guidance on IPR sharing, on defining a market price or on the interpretation of the concept of R&D is missing. Based on an analysis of the current case-law regarding contracts (partially) exempted from the scope of the Procurement Directives, this chapter concluded that PCP offers a limited degree of procedural flexibility as compared to the provisions of the Procurement Directives.

This chapter also outlined the conceptual differences between PCP and other innovation procurement instruments, such as technical specifications, competitive dialogue, R&D subsidies and Forward Commitment Procurement. It concluded that no guidance was provided on certain conditions which should be present for PCPs to be more effective than other instruments or on objective grounds for choosing for a PCP instead of other innovation policy instruments. I particularly underlined the current confusion between PCP as demand-side innovation policy instrument and R&D subsidies as supply-side innovation policy instrument. I concluded that the EU policy-maker missed the opportunity to clarify that PCP may be used as a means to award a public contract as well as to grant a subsidy. Whenever the contracting authority commits or guarantees to purchase the innovative end-solution for itself as end-user or for private end-users, PCP will function as a demand-side innovation policy instrument.

Finally, this chapter underlined that the Commission did not performed an extended economic analysis of whether government intervention through PCP - as drafted in the 2007 Communication - is suitable to achieve the expected results within the EU. In the next chapter, I will outline the policy process which led to the current support for PCP as innovation policy instrument and I will investigate whether the policy expectations find support in the economic theories and empirical studies which are embraced by the EU or in alternative economic approaches. Moreover, I will identify the conditions under which public intervention to stimulate innovation through PCP can be most effective, as well as the circumstances under which PCP would not be effective as public policy instrument to stimulate innovation.

CHAPTER 2. Institutional and economic backgrounds to the European PCP policies in the 21st century – revival of the demand-side policy in support of innovation

2.1 Introduction

By 2000, political consensus held that innovation is the key to Europe's advancement in the face of competitive pressure from emerging economies and in the face of global threats of a different kind (climate change, shortage of natural resources, ageing etc.). This was acknowledged in 2000 by the European Council during its meeting in Lisbon. Since 2000, EU and national policy-makers have considered (combinations of) policy instruments that would incentivize private actors to bring those types of innovations to the market that are capable to adequately face the above mentioned challenges.

In this context, demand-side policy instruments were rediscovered by the policy-makers as important tools to achieve more, faster and socially desirable innovation. Particularly public procurement was brought to the fore. In 2005, the Commission decided to exploit the potential of public procurement as source for investment in additional R&D efforts in order to contribute to the political goals outlined in Lisbon.[258] This eventually led to the adoption of the PCP Communication in 2007.

As already mentioned in Chapter 1, the PCP Communication focuses on legal compliance with the state aid rules and legal compliance with the fundamental principles of the Treaty regarding the Functioning of the European Union (TFEU). No guidance is provided on the economic pre-conditions that justify the use of PCP or plead against its application, and neither are practices explained that would increase PCP's effectiveness. Nevertheless, the policy decision to include PCP within the EU innovation policy toolbox is based on a number of economic assumptions regarding the role of government intervention in support of innovation and the role of public R&D funding from the demand-side to incentivize private companies to increase their investments in desirable R&D projects.

This chapter describes first the policy processes that preceded the adoption of the PCP. It outlines the political support and the relevant public policy actions adopted in this context by the different EU institutions which have a say in the innovation policy arena: the European Council (which gives the political impetus and support for certain action to stimulate innovation), the European Commission (which translates the European Council´s guidance into concrete activities) and the European Parliament (which has a say as co-legislator, in case legislation needs to be adopted).

[258] Commission, 'Implementing the Community Lisbon Programme: More Research and Innovation - Investing for Growth and Employment: A Common Approach' 8, COM(2005) 488 final.

In the second part of this chapter, the economic assumptions that lie at the basis of the PCP policy are listed. Subsequently, this chapter analyses whether the economic assumptions and the policy expectations resonate with the economic theories and studies on public economic-policy intervention(s) in the form envisaged by PCP (namely public funding of R&D with involvement and purchasing prospects from the side of the end-customer/user).

The economic theories and studies used in this chapter are those employed by EU institutions when deciding on their policies. This chapter also identifies, by looking at these theories and studies, under which economic conditions PCP can be expected to be effective and in which situations PCP can be expected to be counterproductive and should better not be employed.

2.2 Policy background to PCP, an institutional approach

2.2.1 Introduction

This section discusses both the policy steps that precede the adoption of PCP and the policy actions that have been subsequently adopted in order to boost the implementation of PCPs in practice.

It describes the European Council political support for the development of public policy in support of increased investments in R&D (section 2.2.2). It subsequently describes the actions undertaken by the European Commission to design and subsequently encourage the deployment of pre-commercial procurement (section 2.2.3). The description of the policy background continues with an outline of the European Parliament's endorsement of PCP (section 2.2.4) and ends with concluding remarks (section 2.2.5).

2.2.2 European Council's guidance

In 2000, the European Council[259] laid the basis for the current policy expectations related to PCP. The European Council gave in the 'Lisbon Strategy' the political impetus to renew EU's objectives in the face of the challenges brought by economic globalization (such as increased competition from developing countries, climate change, ageing, scarcity of natural resources etc.). The European Council set the ambitious goal for Europe to become the most competitive and dynamic economy in the world within a decade. To reach this goal, increased research and technology intensive production of goods and services and improved innovative capabilities for European businesses were considered necessary requirements.

[259] The European Council is the organ which gives the political impetus to the Union's economic, social and environmental action. It is formed of the heads of the Member States.

In the Lisbon Strategy, the European Council expressed its view that both (i) coordinating research efforts at EU level and (ii) ensuring a substantial demand for the resulting innovations would diminish inefficiencies in the European innovation policy.[260] Moreover, the European Council stressed the importance of redirecting public expenditure towards research and development, innovation and towards information technologies.

In Lisbon 2000, the European Council concurrently decided to introduce the concept of 'open method of coordination' (OMC). OMC is a decentralized approach which entails that the European Council provides annual political guidance on the policy measures which are necessary to achieve the Lisbon agenda in employment, innovation, economic reform and social cohesion. Based on the conclusions of the European Council, the European Commission drafts European guidelines on the needed actions, with specific timetables. The implementation of the actions identified by the European Commission is left to the Member States.

Yet the European Commission monitors the implementation by each Member State against quantitative and qualitative indicators and benchmarks. It draws up annual reports on the progress made in each area. For the comparative assessment of the research and innovation performance of the 27 Member States and the relative strengths and weaknesses of their research and innovation systems, the Commission uses the innovation indicators of the Innovation Union Scoreboard. These Scoreboards are used as justification for policy choices.

This method leaves the European Commission with no direct enforcement mechanisms, yet it allows for evidence-based arguments to persuade and leverage peer pressure.

Since 2000, the European Council re-endorsed and fine-tuned the Lisbon Strategy on innovation each and every year. Different measures meant to create favourable conditions for businesses to invest in R&D and innovation were proposed. Hereafter, I will highlight European Council's most important decisions related to increasing the amount of public investments in R&D and to increasing the efficiency of public policy in incentivizing increased private R&D investments.

In 2001 in Göteborg, the European Council added an environmental dimension to the Lisbon Strategy and underlined the importance of triggering increased private investments in the

[260] Expert Group on 'Knowledge for Growth', 'Globalisation of R&D: linking better the European economy to 'foreign' sources of knowledge and making EU a more attractive place for R&D investment (2006) <http://ec.europa.eu/invest-in-research/pdf/download_en/foray_report.pdf> accessed 12 December 2012.

development of technological innovation.[261] It also identified priority areas for policy action: climate change, transport, public health and natural resources.[262]

Another important step was taken in 2002 during the Barcelona European Council, when it was agreed that investment in R&D and innovation in the Union should be increased to 3% of the GDP by 2010, of which two-thirds should come from the private sector.[263] The Barcelona European Council laid a particular emphasis on priority areas in frontier technologies such as life sciences and biotechnology, considered instrumental for closing the gap between the EU and its major competitors. It also added the energy sector to the priority list.[264]

In 2003, the Spring European Council[265] reiterated that innovation is an insufficiently tapped source of growth for the EU. Increased public and private investments in R&D and innovation are the key to increasing the competitiveness of EU businesses and enhance growth. The 2003 Council mentioned improved access to finance among the various policy actions needed to incentivize businesses to increase their R&D investments and recognized the important role defence R&D procurement has in promoting leading-edge technologies.[266] The 2003 European Council also indicated that environmental innovations must be treated as a priority in EU's public research and innovation strategy.[267] In 2004, the European Council remarked that the EU had not booked sufficient progress towards reaching the 3% investment target, but reiterated its political commitment therefore. It also called upon Member States to use among a variety of measures, targeted public R&D investments in order to enhance greater private investments in R&D.[268]

In 2005, the European Council explicitly added public procurement to the array of innovation policy instruments needed to deploy innovative products and services and particularly eco-technologies.[269] This happened against the background of a negative mid-term evaluation of the achievement of the Lisbon Strategy targets for 2010.[270] This addition was triggered by the request of the French, German and UK governments to surge the use of public procurement

[261] Presidency Conclusions, 'Goteborg European Council, 15 and 16 June 2001', paras19-21 <http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/00200-r1.en1.pdf> accessed 26 March 2013.
[262] Presidency Conclusions June 2001 para 27.
[263] Presidency Conclusions, 'Barcelona European Council 15-16 March 2002' paras 47-8 <http://ue.eu.int/ueDocs/cms_Data/docs/pressData/en/ec/71025.pdf> accessed 26 March 2013.
[264] Presidency Conclusions March 2002 para 12.
[265] Presidency Conclusions, 'Brussels European Council of 20 and 21 March 2003' 14-526 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/75136.pdf> accessed at 27 July 2011.
[266] Ibid 4.
[267] Ibid 25.
[268] Presidency Conclusions, Brussels European Council 25-26 March 2004' 2 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/79696.pdf> accessed 11 April 2013.
[269] Presidency conclusions, 'Brussels European Council, 22 and 23 March 2005' paras 13, 19 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/84335.pdf> accessed 27 June 2011.
[270] Spring European Council, ´Working together for growth and jobs, A new start for the Lisbon Strategy´ COM(2005) 24 final.

in support of innovation.[271] Investments in eco-technologies in the energy and transport sectors were considered particularly suitable to be stimulated through public procurement.[272]

The European Council renewed each year its support for the commitments made in Lisbon towards investment in innovation and R&D in areas of European strategic interest, such as the energy sector (energy efficiency, sustainable energies and low emission technologies),[273] waste management and climate (technologies for environmentally safe carbon capture and sequestration and for new fossil-fuel power plant),[274] construction, food and drink, energy-efficient water-technologies, transport, recycling and waste water.[275]

In 2007, at the dawn of the economic crisis, the European Council signaled the need to make public spending on R&D and innovation effective and to increase the rate of R&D transformation into innovative products and services.[276] In 2008, after the economic crisis had hit Europe, the Spring European Council made clear that the long-term global challenges got bigger and that innovation was more than ever needed to deal with these challenges, especially in the context of restricted financial resources. Based on the 2007 Innovation Union Scoreboard, which concluded that EU's performance is significantly weaker than competing economies in areas such as availability of early stage venture capital and public R&D expenditure,[277] the *European* Council reinforced the commitment to invest more, but also more effectively, in research, creativity, innovation and to achieve the 3% R&D investment target. Public procurement was again mentioned as one of the instruments capable to contribute to deployment of desired innovations.[278]

The European Council of 2009 called on the Commission to consider in its proposal for a post-2010 Lisbon Strategy, among others, the need to step up and improve the quality of investment in research.[279]

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[271] French, German, UK Governments (2004)'Towards and Innovative Europe. A paper by the French, German and UK Governments' (2004) <http://www.hm-treasury.gov.uk/media/C0B/BF/towards_innov_europe_200204.pdf> accessed 26 March 2013.
[272] Ibid (n12) 6..
[273] Presidency Conclusions, 'Brussels European Council, 23/24 March 2006' para 22, 34 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/89013.pdf> accessed 28 July 2011.
[274] Presidency conclusions, 'Brussels European Council, 8/9 March 2007' 11-2 <http://register.consilium.europa.eu/pdf/en/07/st07/st07224-re01.en07.pdf> accessed 28 July 2011.
[275] Presidency conclusions, 'Brussels European Council, 13/14 March 2008' <http://register.consilium.europa.eu/pdf/en/08/st07/st07652-re01.en08.pdf> accessed 28 July 2011.
[276] Presidency Conclusions March 2007 3, 6.
[277] The EU-US gap in public R&D expenditure was reportedly increasing and the GDP share of early-stage venture capital in the US was still more than 50% higher in the US as compared to the EU. See 'European Innovation Scoreboard 2007 – Comparative Analysis of Innovation Performance' (2008) 16-7, Pro Inno Europe Paper N.6 http://ec.europa.eu/enterprise/policies/innovation/files/proinno/eis-2007_en.pdf> accessed 11 April 2013.
[278] Presidency Conclusions 2008.
[279] Presidency Conclusions, 'Brussels European Council 19/20 March 2009' paras 15-6 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/106809.pdf> accessed 11 April 2013.

In 2010, the European Council endorsed the new Europe 2020 Strategy and reconfirmed its political commitment to the same R&D investment target of 3% of GDP, which had been set within the framework of the Lisbon Strategy.[280]

The European Council of February 2011[281] underlined the importance of creating synergies and coherence between actions undertaken by the EU and the Member States in fostering private R&D investments and commercialization of innovations with societal benefits. Concurrently, the Council acknowledged the importance to lift remaining obstacles to the cross-border operation of venture capital and to this end, it invited the Commission to explore the feasibility of a Small Business Innovation Research Scheme.[282]

The European Council of March 2012 praised the Commission for being on time with its measures to improve the conditions for innovation in the EU. This reflected the fact that all six legislative proposals announced in the new innovation strategy[283] were adopted by the Commission in 2011.[284] Concurrently, the European Council acknowledged for the first time the need to put demand-led innovation at the core of Europe's research and development policy and expressly mentioned the need to make more efficient use of pre-commercial procurement.[285]

In conclusion, the European Council provided since 2000 broad guidance on the policy action needed to improve EU's innovative capabilities and transform Europe into the most competitive and dynamic economy in the world. It underlined the need for an integrated and coordinated approach between EU's and Member States' actions in support of research and innovation. Among the various conditions needed to leverage private investments in research and innovation, the European Council mentioned the need to increase not only the amount but also the efficiency of public R&D investments. It also explicitly pointed at the need for public authorities to purchase those innovations which present social benefits.

Following the successful lead of competing economies such as the US, the European Council proposed to increase public R&D and innovation investments up to 1% of the GDP. The European Commission was asked to guide Member States and monitor the amount and impact of their investments. The aim was to deploy public R&D investments in such a way as to leverage increased private R&D and innovation investments up to an additional 2% of

[280] Presidency Conclusions, 'European Council 17 June 2010' 11 <http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/115346.pdf> accessed 11 April 2013, N. CO EUR 9/CONCL 2.
[281] Presidency conclusions, 'Brussels European Council, 4 February 2011' 7-9 <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/119175.pdf> accessed 26 March 2013.
[282] Presidency Conclusions February 2011 8.
[283] Such as Horizon 2020, new Cohesion policy, reform of public procurement legislation, a new regime for venture capital, standardisation package and legislative proposals for unitary patent protection.
[284] Presidency, Brussels European Council 1-2 March 2012' <http://europa.eu/rapid/press-release_DOC-12-4_en.htm> accessed 26 March 2013.
[285] Presidency Conclusions March 2012 para 18.

GDP. The Innovation Union Scoreboards was designated to monitor the achievement of these targets.

Public procurement of R&D (or pre-commercial procurement) was not mentioned as a distinct policy instrument before 2012. However, the guidance offered before 2012 left sufficient leeway for the European Commission to promote and finance public procurement of R&D. The express reference to pre-commercial procurement in 2012 seems to indicate further increased political support for the deployment of pre-commercial procurement as distinct innovation policy instrument.

2.2.3 European Commission's actions

2.2.3.1 Actions to promote public procurement as innovation policy instrument

Since 2000, the European Commission gave concrete form to the political guidance offered by the European Council. In 2002, it started to pay attention to the potential of public procurement as an important instrument to stimulate private actors to invest in R&D and innovation. The Commission underlined in a number of communications the importance of public procurement as funding source particularly for some industries (such as transport, communications and defence) as well as the need to overcome fragmentation of EU procurement markets in areas where scale is necessary to incentivize innovators to take risks and invest in R&D.[286] In 2003, the Commission included public demand in its Research Investment Action Plan, as an instrument to raise R&D expenditure to the 3% Barcelona target.[287]

Besides explicitly identifying public procurement as a suitable policy instrument to leverage private R&D investments, the Commission introduced new possibilities to procure innovative products into the 2004 Procurement Directives, by creating an equal footing for formal standards and functional specifications, and by introducing the competitive dialogue.[288] Subsequently, the European Commission provided clarity regarding the possibilities to procure innovative solutions in compliance with the legal framework.[289]

The Commission concluded that public procurement may incentivize private investment in R&D, based on a number of funded studies (outlined below). The commissioned studies underlined the importance of customers' needs and risk-taking attitudes in influencing private

[286] Commission, 'More research for Europe, Towards 3% of GDP' 14 COM(2002) 499 final.
[287] Commission, 'Investing in research: an action plan for Europe' COM(2003) 226 final/2.
[288] Arts 23 and 29 Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, OJ L 134/114.
[289] Wilkinson R. et al, 'Public procurement for research and innovation' (2005) <http://ec.europa.eu/invest-in-research/pdf/download_en/edited_report_18112005_on_public_procurement_for_research_and_innovation.pdf> accessed 26 March 2013.

firms' decisions to invest in R&D and innovation, and warned that the lack of focus on public technology procurement constituted a missed opportunity towards achieving the 3% target. Experts advised the European Commission, among others, to set targets for Member States regarding public procurement of R&D and to stimulate the establishment of analogues to the US SBIR.[290] The same conclusions were validated by yearly EU surveys among private actors. These surveys repeatedly reported that businesses who had the opportunity to offer innovations in publicly tendered contracts, were the most likely to increase their innovation budgets. At the same time, public procurement tenders reportedly did not offer sufficient opportunities to bid innovative solutions, while in the few cases where they did, large companies had a higher chance to sell such innovative solutions.[291]

Some of the most representative studies contracted by the Commission on this topic were the Kok Report which pointed out the possibility to use public procurement to offer lead markets to innovative products[292] and the Wilkinson Report which re-confirmed the need for demand-side innovation policy.[293] But the Aho Group Report, which was commissioned by the EU leaders in the aftermath of their Spring Summit in 2006[294] provided the most important input for the EU broad-based innovation strategy formulated by the European Commission in the same year.[295] The Aho Group underlined that the demand-side was concomitantly the most promising and the most under-represented approach in the EU innovation policy. The Group argued for 4 priority actions: creating innovation friendly markets, strengthening R&D resources, increasing structural mobility and fostering a culture that celebrates innovation. The EU Council endorsed the conclusions of the Aho Group and the possibility of using public procurement to stimulate demand for innovation was reiterated at the Ministerial Meeting organized during the Finnish Presidency in 2006.[296]

The EU broad-based innovation strategy adopted by the European Commission In September 2006, proposed to improve access to finance in support of innovation, to create an innovation friendly regulatory environment and to create demand for innovation as well as to reinforce the activities of institutions relevant for innovation, including the links between

[290] Gheorghiou et al., 'Raising EU R&D Intensity: Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development: Direct Measures' (2003) < http://ec.europa.eu/invest-in-research/pdf/download_en/report_directmeasures.pdf> > accessed 26 March 2013; Business Decisions Limited, 'The Power of Customers to Drive Innovation' (2003) <ftp://ftp.cordis.europa.eu/pub/innovation-policy/studies/studies_the_power_of_customers_to_drive_innovation.pdf> accessed 26 March 2013.

[291] Gallup Organization, 'Innobarometer 2009 Analytical Report' (2009) 59 <http://www.proinno-europe.eu/sites/default/files/Innobarometer_2009.pdf> accessed 26 March 2013; Commission, 'Monitoring Industrial Research: the 2005 EU Survey on R&D Investment Trends in 10 Sectors' <http://iri.jrc.es/> accessed 26 March 2013;

[292] W. Kok et al., 'Facing the Challenge. The Lisbon Strategy for Growth and Employment'(2004) <http://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/evaluation_studies_and_reports/evaluation_studies_and_reports_2004/the_lisbon_strategy_for_growth_and_employment__report_from_the_high_level_group.pdf> accessed 26 March 2013.

293 Wilkinson Report.

[294] Aho, E., Cornu, J., Georghiou, L. and Subira, A. 'Creating an Innovative Europe' (2006) (Aho Report) <http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm> accessed 26 March 2013.

[295] The 2006 innovation strategy is the predecessor to the current EU innovation policy (Innovation Union Flagship).

[296] Jakob Edler, Luke Georghiou, 'Public Procurement and innovation – Resurrecting the demand side', *Research Policy* 36 (2007) 958.

research institutions and industry.[297] Amongst the instruments to achieve these goals, public procurement was singled out. By purchasing innovation, the public sector may stimulate the dissemination of innovations onto the private market through the power of example, while at the same time improving the quality and productivity of the public services. The Commission considered that, in order to achieve a significant impact, the focus should lie on the purchase of innovative products that have the potential to improve public service and for which the public sector is an important customer (such as ICT). Moreover, the need to stimulate all forms of innovation (technological, organizational and innovation in services) was underscored.[298]

The Commission contracted subsequently a broad study to review the focus on innovation in the public procurement practice in EU countries. On the basis of this study, the Commission drafted in the spring of 2007 the Handbook on Public Procurement for Innovation, to provide legal certainty on the possibilities offered by the procurement directives to procure innovative products.[299]

The Commission had thus by 2007 formulated guidance for Member States to uptake demand-side measures within their innovation policies, improved the legal framework for public procurement and increased legal certainty around the room for procurement of innovative products within the EU Procurement Directives. The guidance was by then focused on the procurement of commercially available innovative products, not on the procurement of R&D services.

In 2007, the Commission went a step further and decided to bring policy-makers from different Member States together to deploy in a coordinated manner demand-side policies and disseminate the resulting best practice. This was the aim of the Lead Market Initiative ('LMI'). The LMI identified and employed a set of demand-based measures such as public procurement networks, standardization and regulation, in support of particular technologies and sectors (eHealth, protective textiles, sustainable construction, recycling, bio-based products and renewable energies). These concrete demand-side instruments were meant to complement supply-side instruments already being employed in these areas. In addition, Member States involved in the LMI were supported in the development of public procurement policies favorable to innovation.[300]

Following the adoption of demand-side instruments by several Member States in their

[297] Council, 'Council Conclusions on a Broad-Based Innovation Strategy: Strategic Priorities for Innovation Action at the EU level' (2006) 2 <http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/intm/91989.pdf> accessed 26 March 2013.
[298] Commission, 'Putting knowledge into practice: A broad-based innovation strategy for the EU' 11 COM(2006) 502 final.
[299] J. Edler et al., 'Innovation and Public Procurement. Review of Issues at Stake' (2006) <ftp://ftp.cordis.lu/pub/innovation-policy/studies/full_study.pdf> accessed 26 March 2013.
[300] OMC-Net ERA-PRISM, <http://www.eraprism.eu/> accessed 26 March 2013.

innovation policies, the Commission contracted in 2011 a study to investigate the trends and challenges in demand-side innovation policies in Europe. The study concluded that there was a tendency in the EU Member State to focus on public procurement and pre-commercial procurement in their innovation policies, but that it was *'still too early to say whether demand-side type of activities meet the expectations'*.[301] The study signalled the importance of 'intelligent learning' as compared to 'policy copying' as well as the importance of experimentation with demand-side policies, before their positive effects are proven. Based on these results, the EU commissioned the first systematic conceptualisation of an evaluation of demand-side policy (described in section 2.3.2 below).[302]

Another recently commissioned report warns for the necessary improvement in the *quality* of the spending on R&D and innovation in order to close the innovation gap between Europe and its major competitors. According to this study, two issues that need further exploration are the demand-side policy and the innovation of services. The report also underlines that a successful innovation policy requires supranational coordination and governance.[303] Among other solutions, the Report pleads for *'the use of pre-commercial and early-commercialization procurement'* and for extended competences of the European Commission, beyond sharing practices and granting funds.[304]

2.2.3.2 Actions to promote PCP within the EU innovation policy

Until 2005, the European Commission had focused mainly on the use of commercial public procurement as a demand-side instrument to encourage private actors to invest more in R&D. The procurement of innovative products (whether new to the market or to the public purchaser) was expected to give private actors the trust that follow-up innovations would find a market in the public sector. This would potentially nudge them towards assuming more risks and investing more in R&D.

In 2005, the European Commission decided to add a new dimension to the use of public procurement as innovation policy instrument. In a Communication of 2005 the Commission announced its intention *'to raise awareness of the benefits of re-orienting public procurement towards stimulating research'*.[305] In 2006, the European Commission put together a group of

[301] Technopolis, 'Trends and Challenges in Demand-side Innovation Policies in Europe' (2011) <http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=7011> accessed 26 March 2013.
[302] J. Edler, L. Georghiou, K. Blind and E. Uyarra, 'Evaluating the demand side: New challenges for evaluation' *Research Evaluation* 21 (2012) 33–47.
[303] Ernst&Young and Centre for European Policy, 'Next generation innovation policy, The future of EU innovation policy to support market growth' (2011) 14 <http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=3&ved=0CEMQFjAC&url=http%3A%2F%2Fwww.siliconrepublic.com%2Fdownload%2Ffs%2Fdoc%2Freports%2Finnovation-20report-lr.pdf&ei=uj4NUb7ECcHs0gXftIDABw&usg=AFQjCNE20kBwzEgEf_ryTG90zL4vBk6ODA&sig2=j0Xz_TvF_v3KJFyUYCvWyw> accessed 2 February 2013.
[304] Ernst&Young study (2011) 17.
[305] COM (2005) 488 final 8.

experts who committed themselves to investigate whether there was a need in the EU to stimulate R&D activities in the ICT sector through demand-side policies.[306]

The ICT sector was singled out as a dynamic and innovative sector that is responsive to public demand, that is of common European interest and that can generate spill-over effects and enable innovative capabilities into other sectors of the economy.[307] It was also considered that the competitive advantages Europe held in certain ICT markets, could be leveraged, if private and public R&D investments were increased to levels comparable to those of competing economies such as the US.[308] Although the scope of PCP was later broadened beyond its initial focus, ICT remains an important target area for PCP as it is considered to hold the capacity to provide revolutionary solutions for the sustainable economy of the future,[309] but needs public steering towards environmentally friendly choices.[310] In the context of the economic slowdown since 2008, innovative ICT solutions were also seen as a source of potential efficiency gains and cost cuts related to energy and the environment in the public sector.[311]

The expert group reported that PCP is a suitable instrument to pull innovative solutions from the R&D phase into the commercialization phase in the ICT sector as well as elsewhere.[312] The conclusion reached by the experts motivated the Commission to support the implementation of PCP as innovation policy instrument.[313]

The PCP Expert Group mentioned several reasons why use of public procurement of R&D was considered necessary.

1. Firstly, Europe's major competitor, the United States (US) succeeded more often to pull technological R&D into the commercialisation phase.[314] The European experts attributed this success to (i) the strategic use of procurement procedures for R&D (design contests with considerable prizes, the SBIR competitions for high-tech solutions,

[306] National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation 'Pre-commercial Procurement of Innovation: A Missing Link in the European Innovation Cycle' (PCP Expert Group) (2006) <ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/precommercial-procurement-of-innovation_en.pdf>, accessed 12 November 2012.
[307] ISTAG, 'Shaping Europe's Future through ICT" (2006) <http://www.cordis.lu/ist/istag.htm> accessed 26 January 2012. Aho Report; 'The EU Economy Yearly Review' 70 <http://ec.europa.eu/economy_finance/publications/publ_page8701_en.htm> accessed 12 December 2012
[308] Commission, 'A Strategy for ICT R&D and Innovation in Europe: Raising the Game' 3 COM(2009) 116 final. The Commission underlines the world leadership Europe holds in ICT application markets such as telemedicine and medical equipment, in automotive and aerospace electronics, and in embedded ICT. See also Joint Research Centre, 'Mapping R&D Investment by the European ICT Business Sector' (2008) (JRC Report) <http://ftp.jrc.es/EURdoc/JRC45723_RR.pdf> accessed 26 March 2013.
[309] The ICT sector generates more than a fifth of all patents in Europe. See JRC Report.
[310] In 2009, the ICT sector and ICT products were considered responsible for about 2% of global GHG emissions and this harmful contribution was expected to grow quickly. See also OECD, 'Measuring the Relationship between ICT and the Environment' (2009) <http://www.oecd.org/sti/43539507.pdf> accessed 26 March 2013.
[311] For example, by making significant savings in energy possible, in sectors such as transport, buildings and in manufacturing, ICT technologies are expected to help reduce 20% of the CO2 emissions in Europe by 2020. See Commission, 'A European Economic Recovery Plan' COM (2008) 800 final. See also COM(2009)116.
[312] PCP Expert Group 4.
[313] These reasons could also be valid for the deployment of PCP in other sectors.
[314] PCP Expert Group 9.

value engineering, risk and IPR sharing in R&D procurement etc.) and to (ii) the restriction of procurement of R&D to domestic suppliers. The US deployed these instruments in well-defined areas in which they aspired to gain international competitiveness. Through these actions the US succeeded to offer a strong home market to their domestic suppliers. This strengthened their competitive capabilities on the global market.

2. Secondly, the EU spent 20 times less (2,5 Bn euro) compared to the US federal government agencies (49 Bn dollar)[315] on demand of R&D. This investment gap was most obvious in public procurement of R&D (and not in other financial instruments such as R&D subsidies, loans or fiscal measures).
3. Thirdly, due to the increasing opening of the Internal Market, the practice in the EU Member States to share the risks of R&D between state monopolies and private suppliers disappeared and left European companies without an important source of funding for risky R&D projects.[316]
4. Fourthly, the private market in the EU had not stepped in to fill the funding gap. In the case of projects focused on the public market, this was due to the limited upside commercialisation potential.[317] This situation was mainly observed in the case of products destined to meet intrinsic needs of the public organisation, but it was also present in cooperative procurement (when the innovative product addresses needs of both the public sector and the private customer) and in catalytic procurement (when the innovative product is destined to meet extrinsic needs to the procuring organization). Consequently, the experts concluded that the private market failed to fund risky R&D in general and R&D oriented towards solutions to public needs, in particular. Such market failures justified, according to the experts, the intervention of the government. [318]
5. Fifthly, the supply-side instruments such as subsidies, were considered insufficient to stimulate the creation of ICT solutions for the public sector. Unlike subsidies, procurement of R&D was not meant to co-finance firms to carry out R&D in line with company plans, but to steer R&D towards the needs of the public sector.[319]
6. Sixthly, the experts concluded that, in the context of increased global competition, the underutilization of pre-commercial public procurement as an instrument for boosting research and innovation in ICT, as well as the fragmented national public

[315] PCP Expert Group 10.
[316] PCP Expert Group 5.
[317] According to the PCP Expert Group 24, before deciding to invest in R&D projects, companies calculate the value of the different investment options as a function of time of the upside commercialisation potential and the downside risk that the project will not be well received in the market. Products destined to the public market have a limited upside commercialisation potential due to the smaller size of the public market and to the risk aversion of public procurers.
[318] PCP Expert Group 24.
[319] PCP Expert Group18.

policy objectives were Europe's most important weaknesses compared to its competitors.[320]

The PCP Expert Group recommended a concerted European approach to the procurement of R&D which involves pooling together resources, demand and competencies of contracting authorities and which allows competition from all GPA countries, provided that the research centre of the company is situated in the EU. According to the experts, this approach had the advantage to lower for each contracting authority the risks of participating in procurements of R&D and to ensure more efficient spending of public money. From an EU perspective, a transparent and competitive procedure would increase interoperability and coherence of solutions in different Member States and would strengthen the Internal market with all its related benefits for EU citizens.[321]

The experts' conclusion that procurement of R&D in the EU was desirable was based on a comparison with the set of instruments in the US innovation policy. The experts did not question the effectiveness of government intervention in support of innovation. Moreover, no evaluation methodology of the impact of PCP was suggested[322] and no need was signalled to check on a case-by-case basis whether PCP is a suitable instrument and is capable of bringing more benefits than harm in the context of competitive markets. The policy recommendation to implement PCPs was in concert with the desire of both the policy-makers and the expert group to explore whether PCP could reproduce the success of the US SBIR and '*bring tangible benefits to society and economy*'.[323]

The PCP Expert Group concluded that PCP could be a suitable instrument to develop ICT solutions for recognized European challenges and recommended priority areas for its deployment: healthcare, social inclusion, e-government, security and transportation. Within these areas, the PCP Expert Group provided examples of broad topics which contain suitable challenges for cross-border collaborative PCPs.[324] In the health area, the following specific topics are mentioned: electronic patient records supported by smart electronic health cards and e-prescriptions based on health information exchange networks. Within the area of social inclusion, the Study mentions the following topics: ambient assisted living for elderly, children, etc., design for all workplaces, total conversation communication technologies, multi-platform information society access for groups at risk of exclusion e.g. in remote or deprived areas. In the area of e-government the following topics are considered to present

[320] PCP Expert Group 11.
[321] PCP Expert Group 6.
[322] Only recently, there has been increased attention for more measurement methodologies of the impact of demand-side policies. These may provide solid proof on the impact of PCP in the EU and may offer suggestions for improvements in its implementation. See Edler et al (2012) 21.
[323] PCP Communication 3.
[324] PCP Expert Group.

suitable challenges for cross-border collaborative PCP procedures: digital identities, workflows for inter-administration business processes (distributed secure software tools) and interactive multi-channel multimedia government to consumer/business architectures. In the security and transportation areas, PCP could be used to solve challenges within the following topics: border security, risk management systems e.g. for large scale bioterrorism attacks, attacks on utility resources etc., automatic inspection in electronic customs/taxation systems, traffic control systems for freight (for secure cargo tracking and managing freight movements), integration of traffic control systems over different transport modes, communication between car and road infrastructure, advanced driver assistance systems ADAS, automatic emergency call from vehicles.

The European Commission embraced the policy recommendations of the PCP Expert Group in the PCP Communication and in the accompanying PCP Staff Working Document.[325]

Subsequently, the European Commission set in its 2009 ICT Strategy the target to triple the use of pre-commercial procurement in ICT by 2020 and announced upcoming actions to incentivize cross-border implementations of PCP.[326] At the same time, the Commission underlined that socially desirable technologies, such as environmental technologies, should be given priority.[327]

In order to achieve the above mentioned target, the Commission started in 2009 to fund under different funding programmes (in RFEC, FP7 and CIP programmes)[328] the establishment of networks of public authorities. The Commission made more than EUR 1,2 million available. These networks were intended to raise awareness on the PCP instrument, to facilitate exchanges of experiences and to eventually facilitate cross-border collaborations for implementation of pre-commercial procurement procedures.

In 2010 it became clear that the goals and targets formulated within the framework of the Lisbon Strategy had not been reached. The data published by the European Commission in the Innovation Union Scoreboards between 2001-2010 confirmed that the gap between Europe on the one side, and the United States and Japan on the other side, has consistently been widening along several dimensions of innovation. At the same time, the BRIC

[325] Commission, 'Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe' (PCP Communication) COM (2007) 799 final.
[326] Commission, 'Communication setting a Strategy for ICT R&D and Innovation' COM (2009) 116 final 6, 11.
[327] COM (2009) 116 final.
[328] RFEC is the Regions for Economic Change programme is a European Commission initiative for the 2007-2013 period aiming at funding good regional practices with a particular focus on innovation. See <http://ec.europa.eu/regional_policy/cooperate/regions_for_economic_change/index_en.cfm> accessed 15 April 2013. FP7 (Framework Programme 7) is EU's programme aimed at funding research and covering the period 2007 to 2013. See <http://europa.eu/legislation_summaries/energy/european_energy_policy/i23022_en.htm> accessed 15 April 2013. CIP (Competitiveness and Innovation Framework Programme) is EU's funding framework for innovation activities, with a focus on small and medium-sized enterprises (SMEs). CIP runs from 2007 to 2013 as well. See http://ec.europa.eu/cip/> accessed 15 April 2013.

economies (Brazil, Russia, India and China) were quickly catching up and may overtake the EU in the next few years in terms of key indicators of innovation performance, such as education, patents and investment in R&D. [329] Moreover, despite the fact that Europe features similar levels of public R&D spending on GDP to the US, Japan and China, the difference is substantial in private spending. The effect is less innovation brought to the market.[330]

In response to this negative evaluation, the Commission adopted the new innovation strategy as one of the seven flagships (Innovation Union Flagship)[331] which form the general strategy for the development of Europe up to 2020.[332] The Innovation Union Flagship considers demand-side instruments such as standardisation, public procurement and regulation crucial. The fact that the current low level of investment in R&D in Europe (below 2% of GDP) compared to the US (2.6% of the GDP) and Japan (3.4% of the GDP) is mainly due to lower levels of private investment, led the Commission to conclude that the public investment in R&D in Europe does not trigger the desired incentive effect. As a solution the Commission proposes to improve the impact and composition of public research spending. It also proposes to improve the conditions for private sector R&D in the EU.[333] The new Strategy maintains the focus on the great challenges Europe is facing in the fields of climate change, energy and resource efficiency, health and demographic change.

PCP is expressly up-taken in the new Strategy as innovation policy instrument. The Commission announces the initiative to support Member States to set aside dedicated budgets for PCPs. The use of PCP is considered to contribute to the creation of procurement markets for innovation of at least €10 billion a year across the EU.[334] The Strategy makes clear that PCPs are suitable when used for innovations which at the same time improve the efficiency and quality of public services, while addressing the major societal challenges. According to the 2020 Innovation Union Flagship Initiative, suitable areas where PCP can play a role are the six Lead market Initiative areas (e-Health, sustainable construction, protective textiles, bio-based products, recycling and renewable energies) or the areas identified for European Innovation Partnerships (energy security, transport, climate change and resource efficiency, health and ageing, environmentally-friendly production methods and land management).

It is interesting to notice that the Innovation Union Flagship specifically refers to direct PCPs (and not to catalytic PCPs). It is unclear whether this means that the European Commission

[329] UNU-MERIT, 'Innovation Union Scoreboard 2010 The Innovation Union's performance scoreboard for Research and Innovation' 20 (2011), <http://ec.europa.eu/research/innovation-union/pdf/iu-scoreboard-2010_en.pdf> accessed 26 March 2013.
[330] Ibid.
[331] Commission, 'Europe 2020 Flagship Initiative: Innovation Union' COM(2010) 546 final.
[332] Commission, 'Europe 2020, A strategy for smart, sustainable and inclusive growth' COM(2010) 2020 final.
[333] COM(2010) 2020 final 14.
[334] COM(2010) 546 final commitment no. 17.

considers PCP exclusively suitable when used for intrinsic/operational needs of contracting authorities.[335] The European Commission announces its intention to provide guidance and support mechanisms to contracting authorities and to stimulate joint procurements.[336]

The Innovation Union Flagship of 2010 also introduces the new concept of European Innovation Partnerships (not to be understood as synonimous with the 'Innovation Partnership' procedure introduced through the new draft Procurement Directives). European Innovation Partnerships are a complex combination of supply- and demand-side instruments which should mobilise key actors at both national and EU levels to develop and bring on the market innovations with potential social benefits. From the scant and vague description of the European Innovation Partnership, it could be concluded that its aim is to coordinate and integrate the existing instruments and existing initiatives beyond the existing Joint Technology Instruments (JTIs). The Partnerships would therefore act across the whole research and innovation chain (from R&D efforts to demonstration and pilots, all the way to the market). PCP is one of the available instruments to be used within the Partnerships. The Commission intends to launch innovation partnerships in key areas which represent major societal challenges: energy security, transport, climate change and resource efficiency, health and ageing, environmentally-friendly production methods and land management.[337]

Besides the "Innovation Union Flagship Initiative",[338] other flagships announce Commission's actions related to PCP, flagships such as "Industrial Policy",[339] and "Digital agenda"[340] as well as the communication "Regional Policy contributing to smart growth".[341] The PCP-related actions are: co-finance between 2011-2013 five PCP projects involving contracting authorities from different Member States, employ PCP to create a vibrant Single Market for innovative goods and services, encourage Member States (through guidance and improved legal framework for cross-border collaboration in procurements) to include pre-commercial type of procurement into their procurement budgets.

As already mentioned in the previous section, the European Council of February 2011[342] endorsed the innovation strategy proposed by the Commission and invited the Commission to explore the feasibility of a Small Business Innovation Research Scheme. A recent study on

[335] The question arises whether the 'public services' concept should be broadly interpreted to cover public policy objectives whose achievement does not involve any changes in the purchasing behaviour of the contracting authorities, but does require such changes in the behaviour of private end-customers/users.
[336] COM(2010) 546 final 17.
[337] COM(2010) 546 final 25.
[338] COM(2010) 546 final.
[339] Commission, 'An Integrated Industrial Policy for the Globalisation Era' COM(2010) 614 final.
[340] Commission, 'A Digital Agenda for Europe' COM(2010) 245 final.
[341] COM(2010) 245 final key action 9 states that the Commission will try to leverage more private investment through the strategic use of pre-commercial procurement.
[342] Presidency conclusions February 2011.

the feasibility of a Small Business Innovation Research Scheme has been finalised in 2012.[343] Based on interviews with contracting authorities and policy-makers accross Europe, the study argues that EU suport is key in coordination of cross-border procurement projects, in learning activities and in drafting procurement specifications, while defining the needs and assessing the bids should be left to the Member States. The topic of the procurement initiatives could both fall within the broad common-EU policy objectives, as well as be driven by the concrete needs of the contracting authorities.

The new Public Procurement Directives represent the most recent initiative of the Commission to modernize the public procurement rules.[344] The most important changes supposed to encourage the innovation supportive practices regard the simplification of the grounds for application of the competitive dialogue procedure and the competitive procedure with negotiation and the legal guidance on the applicable rules in case of cross-border procurements. The new proposed directives introduce also the procedure of Innovation Partnerships, which is meant to stimulate contracting authorities to engage in procurements of R&D. For a critical analysis of the legislative choices regarding this instrument and its relation to PCP, see Chapter 5.

Since 2011, the Commission has also made funding available for consortia of contracting authorities from different Member States which decide to conduct PCPs for the development of innovative solutions on topics of common European interest. The funding is available for up to 100% of the preparation, management and coordination costs of joint PCPs, plus 50% of the development cost of the new solutions within the PCP.[345] The targeted areas are health, ageing well, photonics. But funding has also been made available for PCP proposals addressing any area of public interest.[346] The Commission's support for PCP is further discussed in Chapter 4.

In conclusion, the Commission engaged since 2005 to stimulate public authorities to act as demanding customers of highly innovative solutions. In the Commission's view, demanding public authorities could steer private innovative efforts towards desirable innovations and could incentivize increased private R&D investments. To this end, the European Commission drafted the PCP Communication. Initially, it hoped that the case for PCP was so compelling that contracting authorities throughout the EU would recognize its importance and would

[343] John Rigby, Patries Boekholt, Abby Semple, Jasper Deuten, Ramona Apostol, Stephan Corvers, Jakob Edler, 'Feasibility study on future EU support to public procurement of innovative solutions: Obtaining Evidence for a Full Scheme' (2012) <http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/files/meeting-procurement-feb2012/study-eu-support-public-procurement-innovative-solutions_en.pdf> accessed 2 February 2013.
[344] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.
[345] See http://cordis.europa.eu/fp7/ict/pcp/calls_en.html
[346] See http://ec.europa.eu/research/participants/portal/page/cooperation;efp7_SESSION_ID=ljVtPHbpQQd9SsJ9YvDT86W8lCZy4LnVT7pppv1NkCDcT6nVRMBm!733177337?callIdentifier=FP7-ICT-2011-8

widely implement it. When this proved not to be the case, the European Commission first funded the set-up of networks and subsequently funded the organization of collaborative cross-border PCPs. Furthermore, PCP features strongly in the new innovation strategy for 2020. The Commission even investigates the possibilities to extend its competences for deploying PCP, beyond providing guidance and funding.

2.2.4 European Parliament's support

The European Parliament has also engaged in the debate around PCP. In a resolution of 2007, it identified pre-commercial procurement as an '*untapped opportunity in Europe to use public needs as a driver for innovation*' and encouraged Member States to use PCP to develop innovative solutions for specific problems of public interest.[347]

In a later report of 2009, the Parliament endorsed the adopted PCP Communication and the Commission's efforts to fund exchanges of good practices and training on pre-commercial procurement, but expressed concerns that pre-commercial procurement remained little understood by SMEs and largely underutilized by public authorities particularly at the regional and local levels.[348] It called on the European Commission to take further steps to encourage public authorities to deploy this instrument through financial incentives, improved guidance and the set-up of a European pilot project.[349] The report also underscored the role of the Commission and of the Member States in identifying and prioritizing medium and long-term public challenges that could be tackled through PCP.[350] It also stressed the importance of the EU Technology Platforms and of continuous knowledge transfer between technologically innovative universities, institutes and contracting authorities for the successful deployment of PCPs.[351]

In 2010, the European Parliament's Committee on Industry, Research and Energy on Innovation Union[352] reiterated its support for PCP and urged Member States to strategically use public procurement in order to develop innovative, sustainable and eco-efficient solutions to important public challenges. It reiterated its call to the Commission to review the opportunities for pre-commercial procurement within the current legislative proposals, to financially incentivize regional and local public authorities to engage in PCPs and to draft

[347] European Parliament, 'Resolution of 20 June 2007 on specific problems in the transposition and implementation of public procurement legislation and its relation to the Lisbon Agenda' 2006/2084(INI).
[348] European Parliament, 'Report on pre-commercial procurement: driving innovation to ensure sustainable high- quality public services in Europe' 2008/2139(INI) (European Parliament Report (2008)) paras 6, 29.
[349] European Parliament Report (2008) paras 33-6.
[350] European Parliament Report (2008) para21.
[351] European Parliament Report (2008) 7.
[352] European Parliament, 'Report on Innovation Union - Transforming Europe for a Post-Crisis World' 2010/2245(INI) (European Parliament Report (2010)).

best-practice guidelines and training programmes to developed the skills needed to deploy PCPs.[353]

In another more recent resolution, the European Parliament expressed again its support for PCP and listed the important objectives PCP may potentially achieve: creating new markets for innovative and green technologies, improving the quality and effectiveness of public services and creating competitive advantages for small European businesses.[354]

In conclusion, the Parliament has joined the group of EU institutions that support PCP. The Parliament simply reiterates support for the already undertaken initiatives. However, its political support offers the Commission the additional justification to stimulate the use of PCP.

2.2.5 Summing-up policy support for PCP

The EU is trying to catalyze a technological revolution in order to cope with the numerous and enormous challenges of the not so far-away future. Increased R&D investments were identified as a necessary pre-condition. At the same time, the EU noticed that despite similar amounts of public R&D investments, it is less successful than the US in incentivizing private actors to scale up their own R&D investments. The EU policy-makers sought the explanation for these different levels of private R&D investment into the US SBIR-type of measures. As a consequence, they decided to explore whether pre-commercial public procurement could be beneficial to the EU economy. Pre-commercial procurement has not found its way into legislation, but has been anchored in public policy. All main EU institutions (European Council, European Commission and the European parliament) have expressed their support for PCP. PCP is viewed by the EU policy-makers as a suitable instrument (i) to increase both public and private investments in R&D, (ii) to steer private R&D efforts towards innovative solutions for important and complex public problems and (iii) to indirectly enhance the innovative capabilities of (small) European businesses.

The initial focus on the implementation of PCP procedures in the ICT sector was justified by the beneficial effects the ICT sector has on economic growth and social welfare and by the innovative and dynamic character of this sector, which makes it responsive to innovation policy measures. Moreover, Europe holds competitive advantages in global ICT markets and increased private and public R&D investments have the potential to boost these advantages.

Subsequently, the Commission broadened the scope of PCP into all areas wherein the government plays an important role in funding R&D, such as transport and defence, as well as in the field of environmental technologies. Most recently, the focus has broadened

[353] European Parliament Report (2010) para 140.
[354] European Parliament, 'Resolution of 9 March 2011 on an industrial policy for the globalised era' 2010/2095(INI).

towards solutions to the major societal challenges: climate change, energy and resource efficiency, health and demographic change.

In the most recent innovation policy for 2020, the EU proposes to adopt a comprehensive approach to innovation policy.[355] PCP and commercial procurement are two important instruments within the innovation policy toolbox. According to the 2020 Innovation Union Flagship Initiative, suitable areas where PCP can play a role are: e-Health, sustainable construction, protective textiles, bio-based products, recycling and renewable energies, energy security, transport, climate change and resource efficiency, health and ageing, environmentally-friendly production methods and land management.

The main EU institutions have expressed their expectations that the application of the PCP can contribute to the achievement of the EU innovation goals in the above mentioned sectors. The expectations from the performance of PCP are thus high.

These policy expectations are based on research papers commissioned by the EU with a handful of experts. It is difficult to conclude whether these studies are objective or rather serve the purpose of confirming the political decisions which they underpin. In addition, the question arises whether the policy deployment follows the recommendations of these studies regarding the pre-conditions for efficient implementation of PCP.

In the next section, I will outline the evolution of the economic approach that underlines the current EU innovation policy and I will compare the PCP approach against relevant economic studies beyond those commissioned by the EU.

2.3 The economic foundations of PCP

2.3.1 Introduction

In the previous section I have outlined the policy process which led to the broad support for the implementation of PCP in the EU. The policy documents promoting PCP do not pay attention to the economic preconditions for the efficient implementation of PCP. They leave it to contracting authorities to make important value-judgments regarding such efficient implementation. However, policy documents explain the rationale behind the support for PCP.

According to the PCP Communication and to the preceding PCP Expert Group, innovation can bring tangible benefits to the society and to the economy and increased R&D

[355] COM(2010) 546.

investments represent the path towards innovation.[356] However, Europe copes with a situation of underinvestment in R&D and with underperformance in converting new inventions into new products and jobs.[357] The privatization process driven by the creation of the European Internal market has created a funding gap, particularly for risky R&D projects. This gap has not been filled by the European private financial market.[358] This negatively influences the economic performance of Europe and the perspective of finding solutions to important collective problems such as climate change, qualitative and affordable health care in the face of an ageing population, security threats etc.[359]

PCP is considered to be a policy instrument that can address the above mentioned shortcomings. When used strategically, public procurement of R&D would drive forward innovations that address public/collective needs and would concomitantly improve the competitive position of EU businesses in the global market.[360]

Based on the above, I can conclude that several economic assumptions underlie the policy choices for PCP. The most important are:

1. Innovation leads to (social) welfare;
2. R&D investment is a necessary pre-condition of innovation;
3. Venture capitalists underinvest in risky R&D projects;
4. Public needs can influence firms' strategies for creativity and innovation;
5. PCPs is a suitable instrument to develop technological, as well as services innovations.

In this section I will compare these economic assumptions against the most authoritative economic theories and studies. I will analyse a broad array of economic theories and studies, encompassing but going beyond those embraced by the European Commission. Based on this analysis, I will identify criteria for the effective application of the PCP procedure and delineate those situations when PCP is not a suitable instrument.

Before doing that, I will reflect on the problematic nature of the economic methodologies used to measure the impacts of public intervention on innovation or to predict the influence of certain conditions/factors on innovation (sub-section 2.3.2 below).

[356] PCP Communication 3.
[357] PCP Communication 4.
[358] PCP Expert Group 5, 24.
[359] PCP Communication 5.
[360] PCP Communication 3.

I will subsequently test in 2.3.3, the first two assumptions against relevant economic theories. To this end, I will outline the evolution of the economic thought regarding the role of innovation in the economy and the role of (private and public) R&D investment among the various determinants of innovation. I will also elaborate the economic rationale advanced by different economic theories, for public intervention in the innovation area.

In section 2.3.4, I will analyse the economic theories regarding the role of venture capital markets in support of innovation and I will reflect on the role of the government as risk-taking venture capitalist.

In section 2.3.5, I will compare the fourth assumption that public needs can influence firms' strategies for creativity and innovation against the economic theories on the role of demand in the innovation process. I will conclude on the pre-conditions for effectively employing public demand in support of innovation. In this section, I will also highlight the divergent approach as compared to the supply-side EU policy in the area of R&D subsidies.

In section 2.3.6, I will outline the restrictive EU intervention in supporting R&D directed towards services innovations and I will provide an overview of the limited economic theories on the dynamics of the innovation process in services. This will shed light on the relevance of PCP for services innovation.

Finally, I will conclude in section 2.4 on the pre-requisites for a successful implementation of PCP.

As this is primarily a legal research, I will not provide a critical analysis of the concerned economic literature, but purely an overview of some of the most important economic theories and empirical studies. The analysis is largely limited to economic literature on innovative technologies and covers only to a limited extent economic theories on innovation in services.

2.3.2 Innovation policy as decision-making under uncertainty

The challenge to provide the policy-makers with a sound analytical framework to predict whether an envisaged policy does more good than harm has not (yet) been met by economics.[361] Economics are limited in predicting or even determining in hindsight with scientific exactness whether a certain public policy has triggered technological evolution,[362] for the reasons presented below.

[361] Geoffrey A. Manne and Joshua D. Wright, '*Regulating Innovation: Competition Policy and Patent Law under Uncertainty*' (CUP 2009) 10-11.
[362] Eric D. Beinhocker '*The Origin of Wealth, Evolution, Complexity and the Radical Remaking of Economics*' (Harvard Business School Press 2006); Nassim Nicholas Taleb, '*The Black Swan The Impact of the Highly Improbable*' (2nd ed Random House Trade 2010).

The ideal measurement method is to identify the likely evolution of a certain industry in the absence of the public innovation policy and to determine whether the industry would have innovated as rapidly and in the same way.[363] For obvious practical reasons, this is an impossible approach to apply.

A method considered manageable by economists, is to compare the evolution and innovative efforts of an industry following the public intervention against the *expectations* of how the respective public policy would impact/(create incentives for) innovation.[364] To this end, economists use a series of indicators to measure/determine the effects (or outputs) of certain policies on innovation, such as changes in the innovation strategies, number of patents, number of patent citations, sales, firm growth, R&D expenditure etc. There are numerous problems in using such indicators and I will enumerate some of the most important of these below.[365]

Firstly, it is difficult to find pure indicators, which establish exclusively the effects on innovation of the public policy under study, and do not (partly) capture the effect of other types of public interventions.

Secondly, factors such as R&D spending regard an input to the innovation process, not an output of innovation while the knowledge spill-overs are impossible to measure. When economists seek to measure the benefits of public R&D spending on the increase in productivity of the private beneficiary, these appear to be lower than the equivalent benefits of private R&D spending and sometimes economists do not find any measurable effect at all. Scotchmer finds the cause of this, in the lack of suitable markers to measure the social value of the outputs of public R&D funding.[366]

Thirdly, patents are problematic, for being only weakly related to actual innovation performance. Not all innovations are patented and not all patents regard qualitative innovations (or R&D), or the (social) value of an invention may be greater than the value of a patent indicates.[367]

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[363] Jonathan B. Baker, 'Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation' (2007) Washington College of Law < http://ssrn.com/abstract=962261> accessed 12 December 2012.
[364] Baker (2007).
[365] A comprehensive outline of the limitations of economic measurements is offered by C. Freeman and L. Soete in 'Developing science, technology and innovation indicators: what we can learn from the past' (2007), UNU-MERIT Working Paper Series 2007-001 <http://arno.unimaas.nl/show.cgi?fid=6680> accessed 26 March 2013.
[366] Suzanne Scotchmer, '*Innovation and Incentives'* (Massachusetts Institute of Technology 2004) 282.
[367] Richard J.Gilbert, 'Competition and Innovation' (2007)17 http://escholarship.org/uc/item/9xh5p5p9> accessed 26 March 2013; Gianmarco I.P. Ottaviano, Dino Pinelli and Carole Juliette Maignan, ' Economic Growth , Innovation, Cultural Diversity What are we all talking about? A critical survey of the state-of-the-art' (2003)FEEM Working Paper No.12.2003, 18-9 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=389042> accessed 26 March 2013.

Fourthly, the problem with using the national gross domestic product (GDP) as indicator is that the positive effects of innovative products may show long after their introduction.[368] Moreover, GDP as an indicator does not sufficiently reflect the value of investment in R&D, as innovation may in many cases lower the price or may not create value for the private actor at all (particularly when the innovation is made publicly available).[369]

Regarding the capability to predict the best policy choices, Lipsey remarks that '*there does not exist a unique set of formally determined, optimum public policies with respect to technological change*'.[370] By looking at the technological evolution throughout the history of mankind, Lipsey concludes that the economic development of the Western part of the world should in large proportion be attributed to historical accidents and not to intentional public intervention. In the Western world, pluralism and separation of powers (science from religion) were major factors in stimulating the advancement of the society, together with the re-discovery of the Greek science, at a moment when it could escape the censorship of religion. He underlines in this context the important role of independent knowledge institutions which provided an '*effective memory*', essential for '*cumulative scientific advances*'.

As a consequence, when attempting to trigger technological change through public policy, Lipsey proposes to use a '*mixture of theory, measurement and subjective judgment*'.[371] Due to the limitation of science to predict whether and which type of intervention is the most effective, other economists consider that the use of political decision and participatory decision-making (which involves large parts of the population and those most affected by the consequences of a certain policy) offer as good of an option as any.[372]

Taleb[373] finds that the current economic models used to predict economic outcomes are inherently flawed for being based on limited samples of past information, insufficient to capture rare events (such as the 2008 financial crisis) that can trigger extreme/catastrophic impacts. The economic models tend to qualify such rare events (so-called Black Swans) as improbable, although they can be envisaged. Taleb warns for the danger in relying decision-making on such economic models and draws the attention to the potential extreme impact that large variations in random economic variables may have in the context of the global society characterized by increased interdependencies and nonlinearity.

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[368] Susanto Basu, John G. Fernald, Nicholas Oulton & Sylaja Srinivasan, 'The Case of the Missing Productivity Growth: Or, Does Information Technology Explain Why Productivity Accelerated in the US but Not the UK?' (2003) NBER Working Paper No. 10010 <http://www.nber.org/chapters/c11441.pdf> accessed 26 March 2013.
[369] Scotchmer (2004) 269.
[370] Richard G. Lipsey, 'Technological Transformation, Intellectual Property Rights and Second Best Theory' 4 *Review of Economic Research on Copyright Issues* (2007) 5-28.
[371] Lipsey (2007) 25.
[372] C. Freeman, '*The Economics of Industrial Innovation*' (Frances Pinter Publishers Limited 1982) 216-20. Rod Coombs, Paolo Saviotti and Vivien Walsh, *'Economics and Technological Change'* (Rowman& Littlefield 1987) 30.
[373] Taleb (2010).

Taleb develops the *'theory of the fourth quadrant'*, an area characterized by high uncertainty and extreme variations in certain atypical variables (which are rare and have an exponential impact on the end outcome), as well as by potential complex payoffs (whether positive or negative). Instead of trying to predict the probability of occurrence of Black Swans, Taleb advices to rather focus on precautionary measures in the eventuality of such events. He particularly advices to avoid decision-making driven by short-term profit, and he supports the idea to build-in necessary redundancy (as opposed to optimization/efficiency).

Taleb's argument is not new. Already in 1945, Frederick von Hayek, the Austrian policy philosopher reflected on decision-making under uncertainty.[374] He argued that no policy-maker can possibly possess the necessary knowledge on the political, social, technological and economic variables which can potentially influence the working of their policies in the real world, particularly on a long-term. However, this does not absolve the policy-maker (legislator) from evaluating the costs of the policy or its long-term value. Hayek criticised mathematical economics, which over-simplified things by often not taking into consideration the equally important *'knowledge of people, of local conditions, and of special circumstances'*. In his view, economics often disregard change in some variables and overly rely on *'statistical aggregates, which show a very much greater stability than the movement of the detail'*. Hayek used his observations as an argument against the central planning of an economy and as a praise of the price mechanism as one available conveyor of necessary relevant knowledge, which although not completely understandable or controllable, performs better than any known alternatives.

However, his reflections underline the limited predictive capabilities of economic models and the limited capacity of a human to process enormous amounts of information in decision-making (even if all the necessary information would be available). He concluded that economic theories can only provide *'very general statements or "pattern predictions"'*, but no predictions of individual events.[375] While economists/statisticians can observe certain regularities in investments, price levels etc, such regularities do not always apply, while economics cannot name the preconditions for such regularities. Theorems of macrotheory are certainly valuable in order to generate predictions in the presence of insufficient information. But they are not more than assumptions which may be proven wrong.[376]

Complexity economist Beinhocker eloquently summarizes it:

'The economy is too complex, too nonlinear, too dynamic, and too sensitive to the twists and turns of chance to be amenable to prediction over anything but the very shortest of terms.

[374] Frederick von Hayek, 'The Use of Knowledge in Society' 4 (1945) *American Economic Review* 35, 519-530.
[375] F.A. Hayek, 'Competition as a Discovery procedure', (translation) 5 (2002) *The Quarterly Journal of Austrian Economics* 11-12.
[376] Hayek (2002) 11-2.

Even if we were as rational as possible and had all the information we could want, the computational complexity of the economy is such that the future would happen before we would have time to predict it'.[377]

Behavioural economists confirm that individuals perform poorly at computing large amounts of information, while they are good at interpreting ambiguous information and at learning.[378] These theories are backed by psychologists who demonstrate that rational models for decision-making (such as logics or statistics) are in situations of uncertainty (when not all the determinants of a certain outcome can be known or calculated) less reliable than simple heuristics.[379] They confirm the view that the application of rational models to situations characterised by imperfect information may lead to disaster, as even small deviations from the model conditions may have an impact.[380] Although the theory is not as developed as to identify the generic conditions under which heuristics always work better than rational models, Gigerenzer suggests that beyond a certain point, more information may be harmful to making a correct decision. Beyond this point, experience plays a crucial role in selecting the proper heuristics from the adaptive toolbox of an individual (such as recognition heuristic, fluency heuristic, hiatus heuristics etc.).[381]

Complexity economists suggest another solution to policy-making in the context of insufficient information and uncertainty. They argue that public policy should focus on supporting institutions and societies to adapt quicker to changing complex situations (through infrastructure, network etc.), while leaving the selection of the successful innovations to the market forces.[382] Moreover, public policy should focus on setting ambitious goals and defining a portofolio of alternative trajectories/policies to work towards those goals. This entails though that the government should be prepared to *'experiment, collect feedback and change course, none of which is ever politically easy'*.[383] Scotchmer adds that, because results of R&D projects are inherently uncertain, assessments of the success and efficiency of public investments schemes in R&D should not be focused on the failed projects or comparison to better ideas developed after the investment decision. According to her, it is important to use mechanisms that can lead to good decision-making and to adopt a failure-tolerant approach.[384]

[377] Beinhocker (2006) 323.
[378] Amos Tversky and Daniel Kahneman, 'Judgement Under Uncertainty: Heuristics and Biases' 185 (1974) Science 4157.
[379] Gerd Gigerenzer and Wolfgang Gaissmaier, 'Heuristic Decision Making' 62 (2011) Annu. Rev. Psychol. 451. Heuristics can be defined as 'a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods'.
[380] Gigerenzer (2011) 451–2. Paul Davidson, *'The Keynes Solution'* (Palgrave Macmillan 2009) 35-43.
[381] Gigerenzer (2011) 450.
[382] Beinhocker (2006) 426.
[383] Beinhocker (2006) 324, 334.
[384] Scotchmer (2004) 56-7.

Solutions for decision-making in case of uncertainty are also provided by the precautionary principle, which has made its way into many international agreements, particularly in the field of environmental protection.[385] The precautionary principle advices the adoption of precautionary measures in case of uncertainty or risks with irreversible or catastrophic consequences. Uncertainty in the context of the precautionary principle entails that the outcome can be envisaged with a certain degree of plausibility, but it cannot be attributed any probabilities. In the case of risks, the outcomes can be identified and probabilities can be assigned.[386] The precautionary principle in its stronger forms, entails a low threshold for the plausibility of an uncertain outcome.[387]

The adopted precautionary action should be sufficient to protect flexibility of decision-making in the future, when more knowledge on the harm becomes available and should reflect the magnitude of the *irreversible* or *catastrophic* harm if precautionary action is not taken. However, action should be based on a cost-benefit analysis of the various options (including inaction).[388]

Economists also agree that it is not possible to take precautions against all uncertain outcomes or risks, as these are present in almost any human activity and precautionary measures may themselves create new uncertainty or new risks.[389] Whenever precautionary measures may create new uncertainty with catastrophic or irreversible outcomes, the precautionary measures should not be taken in the first place (such as a preventive war on terrorism that may increase terrorism).[390]

Actions adopted within the framework of innovation policy can often be regarded as precautionary measures intended to address uncertain outcomes or risks with catastrophic and/or irreversible consequences (such as climate change, loss of resources etc.). However, innovation policy may create itself new uncertainty or risks. For example, public intervention in the form of funding of R&D from the demand side (such as envisaged by PCP) may, on the one side, solve the problem of insufficient funding of innovative firms, but may on the other side, deter rather than encourage competitive investments in R&D (when public funding of R&D strengthens the market position of a certain undertaking and reduces the profit perspectives for other undertakings and implicitly their incentives to invest in R&D). Public R&D funding may also encourage inefficient companies and distort competition (by enhancing

[385] See for example, the 1992 Rio Declaration or the United Nations Framework Convention on Climate Change. One common definition sounds as follows: *'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'*.
[386] Cass R. Sunstein, 'Irreversible and Catastrophic' (2005) John M. Olin Law & Economics Working Paper No. 242, 37 <http://www.law.uchicago.edu/files/files/242.crs_.catastrophic.pdf> accessed 26 March 2013.
[387] Sunstein (2005) 9.
[388] Sunstein (2005) 55.
[389] Sunstein (2005) 12.
[390] Sunstein (2005) 55.

the market power of some companies which will discourage their competitors to invest in R&D themselves) and may divert needed funds from real needs (when their impact on stimulating private actors to become more entrepreneurial and invest more in R&D is low or non-existent). These outcomes are uncertain, but their consequences can hardly be qualified as catastrophic or irreversible. Therefore, there is no ground to argue that innovation policy should not be undertaken, particularly because the striven objective justifies action.

In conclusion, innovation policy-making is a form of decision-making under uncertainty. It cannot rely on economic mathematical models for answers, due to the fact that these do not and cannot compute all relevant information. Economists propose to employ experience and learning besides available information and to retain needed redundancy as well as avoid distortions to judgments by short-term pay-offs.

2.3.3 Economic approach to public innovation policy

The fact that economic models are not capable to determine with scientific exactness what triggers innovation poses difficulties to policy-makers. In this section, I will analyse what relevant lessons can be drawn by the policy-maker from the current economic knowledge on the role of public R&D funding.

This section will also test the first two economic assumptions mentioned in section 2.3.1:

- innovation leads to (social) welfare;
- R&D investment is a necessary pre-condition of innovation;

To this end, I will describe how the economic thought on the role and on the determinants of innovation evolved with a particular focus on R&D investments. I will also highlight the economic thinking on the role of government R&D investments in support of innovation. In the second part, I will describe the economic rationale advanced by different economic theories, to justify public intervention in the innovation area.

2.3.3.1 Evolution of economic thought

Already in 1776 economist Adam Smith[391] observed that innovation contributes to wealth creation (or economic growth). He saw innovation as exogenous, an external random phenomenon that is not determined by economic factors and cannot be predicted more accurately than weather. It was in 1934 that a more in-depth economic theory was developed by Schumpeter regarding the role of innovation in the economic system, based

[391] Adam Smith, *'An Inquiry into the Nature and Causes of the Wealth of Nations'* (5th edition Methuen & Co., Ltd 1904) para I.1.9, <http://www.econlib.org/library/Smith/smWN.html> accessed 27 August 2012.

on a historical analysis of large, sweeping changes that fundamentally restructure industries and markets.

He concluded that innovation had a dual role: creating new wealth-generating structures and destroying the old ones.[392] He saw economy as an equilibrium system. He considered that introduction of an innovation in a static economy creates a disequilibrium. This starts as a period of prosperity but changes gradually into a recession, as the economy adapts to the changed situation, the innovation weakens and the forces of competition and self-interest trigger increased production. This second wave of changes turns into a period of depression when inefficiencies and false expectations transform into unfavourable expectations. Depression is however accompanied by two favourable effects: the wide spread of the benefits of the innovation and the elimination of inefficient enterprises. Among the negative effects is that wages and prices, production and consumption fall far beyond the equilibrium values. A period of recovery follows under the effects of the forces of equilibrium (these are forces in the market which absorb the destructive effects triggered by innovation and adapt to them), which eventually leads to a new equilibrium.[393] Later, he admitted that other causes besides innovation may trigger the cyclicality of the economy.[394]

Schumpeter saw innovation as endogenous to the economic system and considered the entrepreneur to be its main driver. Moreover, he saw innovation as evolutionary. In Schumpeter's view, the evolutionary character is related to the selection of the viable innovations through competition and the cumulative character of knowledge which leads to innovation (innovations being often the result of efforts of many inventors and developers).

As classical economist, Schumpeter believed that *'technical progress is a simple time trend'* that cannot be influenced by intentional action such as government intervention.[395] He believed that non-intervention was more advantageous on a long term for the level and speed of performance.[396] Schumpeter also did not believe there was a linear process between invention and innovation. He thought that *'innovation is possible without anything we could identify as invention and invention does not necessarily induce innovation'*.[397]

In an article of 1957, the Nobel Prize winner economist Robert Solow added the mathematical dimension to Schumpeter's theory on innovation and renewed interest in the

[392] Joseph Schumpeter, *'Capitalism, Socialism and Democracy'* (4th edition, Unwin University Books 1954) 83.
[393] Joseph Schumpeter, *'Business Cycles: a Theoretical, Historical and Statistical Analysis of the Capitalist Process'* (McGraw-Hill 1939).
[394] Schumpeter (1939); Robert Loring Allen, *'Opening doors: the life and work of Joseph Schumpeter'* (vol 1, Transaction Publishers 1991) 71-87.
[395] Chris Freeman and Luc Soete, *'The Economics of Industrial Innovation'* (3rd ed, MIT Press 2000) 325.
[396] Reference found in Erik Gortz, 'Public and private expenditure and the Faroese business cycle' 236, in Gunnar Eliasson, Nils Karlson (eds) *'The limits of government, Policy Competence and Economic growth'* (Transaction Publishers 2001).
[397] J. Schumpeter (1939) 84.

economic study of innovation.[398] He considered that growth was a function of physical capital and human labour and he believed that shifts in the function were caused by technological change.[399] He argued thus that technological progress is the key driver of growth. However, he considered technical progress to be an exogenous variable (as a time trend similar to population growth) to which the economy continuously adjusts and is driven in a state of dynamic equilibrium. His theory became known as the exogenous growth theory.

Schumpeter and Solow concluded on the important role innovation plays in the economy, but were not preoccupied with the origins of innovation. W. Ruper Maclaurin was the first economist who studied how innovation processes take place. He developed in the 1940s the linear model of innovation at Massachusetts Institute of Technology.[400] According to his model, the innovation process can be divided into the following subsequent phases: basic science, invention, innovation, finance, acceptance/diffusion.[401]

The linear model of innovation was generally accepted at the time and was mainly based on the belief that massive public investments in R&D during and after the Second World War had led to breakthrough innovations.[402] Moreover, the belief that basic science (or basic research) was the source of inventions and discoveries was driven by the observation that throughout history, innovation efforts had increasingly concentrated in specialized public or private research and development laboratories. These specialized R&D efforts were made necessary by the increased complexity of technology and by its increased amount of scientific content.[403]

In the 1960s, Friedmann´s and Arrow's neo-classical theories[404] gained tremendous prestige and the costs and benefits of public R&D investments were increasingly being scrutinized.[405] Neo-classical theories argued that the market mechanism, although often wasteful and inefficient in the choice of the winning innovation, had been a viable mode of bringing

[398] Beinhocker (2006) 40-1. Robert Solow, *'A Contribution to the Theory of Economic Growth'*, (1956) 70 *Q.J. ECON*. 65; Robert Solow, 'Technical Change and the Aggregate Production Function', (1957) *The Review of Economics and Statistics*, 39, 312-20, 320.
[399] Output (Y) is a function of the quantity of physical capital (K) and human labour (L): Y= F (K,L).
[400] Benoit Godin, '"Innovation Studies": The Invention of a Specialty (Part II)' Project on the Intellectual History of Innovation Working Paper No.8 (2010) 6.
[401] Maclaurin, W. R. (1953), The Sequence from Invention to Innovation and its Relation to Economic Growth, *Quarterly Journal of Economics*, 67 (1): 97-111.
[402] According to Freeman, the massive public investments in R&D during and after the WWII brought breakthrough innovations.
[403] Scientific content can be defined as the body of learning which is a necessary precondition of future innovations. This is a departure from initial innovative processes which were exclusively associated with the persons involved in the production. Freeman & Soete 2000 (n113); C. Freeman and L. Soete, 'Developing Science, technology and innovation indicators: what can we learn from the past' (2007) United Nations University Working Paper Series, n. 2007-001,10 <http://litbang.bantenprov.go.id/2012/wp-content/uploads/gravity_forms/26-88014c92d2ae36634af6fe9f3e6a4b4d/2012/10/Developing-science-Technology-and-Innovation-indicators-Freeman.pdf> accessed 26 March 2013.
[404] Milton Friedmann, *'Capitalism and Freedom'* (The University of Chicago Press 1962). Kenneth Arrow, 'Economic Welfare and the Allocation of Resources for Inventions' 619 in R.R. Nelson (ed.), '*The Rate and Direction of Inventive Activity'* (NJ: Princeton University Press 1962).
[405] Freeman (1982) 15.

remarkable technological advances[406] and that the government should intervene only in case of market failures through investment in basic research, education and infrastructure. Market failures occurred when the results of research (and particularly of basic/fundamental research) could only be appropriated to a limited extent. In such cases, neo-classical economists believed that a free market underinvests in invention (or creation of new knowledge).[407] Moreover, neo-classics argued that only scientists have the necessary information to make correct decisions in which research to invest and public funding should not restrict in any way their choice of the R&D project.[408]

During the same period, different US Federal agencies commissioned studies to measure the role of basic research as source of innovation and reached diverging conclusions.[409] These studies took into consideration other drivers of innovation besides investments in R&D. Demand of customers was advanced as an important driver. This was interpreted to mean that investment by the government in applied research may lead to more innovation than investments in basic research.[410]

The linear model of innovation was thus being increasingly questioned. This also happened under the influence of Schmookler's book 'Invention and Economic Growth', in which he argues that market demand (or extent of the market potential) is the most important driver of the inventive activity.[411] In the 1990s economists paid more attention to the role of users and market demand in driving innovation. These theories are discussed in section 2.3.4.

OECD also contributed to the debate. Studies on what factors contribute to a strong technological base of the more advanced economies, concluded that other factors besides scientific and technological capabilities were crucial: capital availability, management, competence, attitudes, entrepreneurship, marketing skills, labour relations, education and culture.[412]

As a consequence, public innovation policy moved from an initial exclusive focus on increasing national R&D capabilities towards a more integrated approach which recognizes

[406] R.R. Nelson, 'Capitalism as an engine of progress' (1990) 19 Research Policy 195.
[407] Arrow (1962) 615, 623-4. Under conditions of uncertainty which govern the results of innovation, the amount of public investment and its efficiency are difficult to determine. To mitigate these problems, he advocated the use of past performance in the selection of research performing firms as well as other contractual incentives, in the award of public R&D contracts which focus on costs, rather than end-results.
[408] M. Polanyi, 'The Republic of Science' (1962) 1 *Minerva* 54-72.
[409] Based on an analysis of major weapon technologies, the report commissioned by the US Department of Defense concluded that only 0,3% of the innovations derived from basic research. Another report of the US National Science Foundation concluded on the basis of 5 technological innovation that in 70% of the cases, basic research was the direct source of the innovation. Charles W. Sherwin and Raymond S. Isenson, 'Project Hindsight' 156 *Science* (1967). IIT Research Institute, 'Technology in Retrospect and Critical Events in Science (TRACES)', (Washington 1968) Quoted from Benoit Godin, 'Measurement and Statistics on Science and Technology: 1920 to the Present' (Routledge 2005).
[410] Benoit Godin and Joseph P. Lane, '"Pushes and Pulls": The Hi(story) of the Demand Pull Model of Innovation', Project on the Intellectual History of Innovation, Working Paper No.13 (2013) 8-9.
[411] J. Schmookler, *'Invention and Economic Growth'* (Harvard University Press 1966).
[412] OECD, 'Gaps in Technology: General Report' (Paris 1968); OECD, 'Gaps in Technology: Comparisons Between Countries in Education, R&D, Technological Innovation, International Economic Exchanges' (Paris 1970) 23

the influence of the whole economic environment on technical change, and supports the innovation process beyond the R&D stage.[413]

In the 1970s, innovation groups were set-up in the US and Europe to systematically study how innovation emerges. The most prominent representative of such groups in Europe is Chris Freeman who led the Science Policy Research Unit (SPRU) at University of Sussex for sixteen years. At SPRU, the economic theory of systems of innovation was developed.

Freeman argued that neither R&D, nor market demand is the main driving factor behind innovation activity. He believed that innovation was a 'coupling process' between supply (technological knowledge) and demand, that takes place in an evolving environment with imperfect information where uncertainty prevails and *'chance plays a much greater role in competitive survival and in growth than it is comfortable to admit'*.[414]

Later, the theory was refined and innovation was depicted as a non-linear process that is influenced by interdependent interactions between firms and other organizations. The emphasis was laid on the role of institutions (such as firms, public laboratories, universities, financial institutions, government bodies etc.) in a national innovation system. Systems of innovation were defined as *'the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies'*.[415] Innovation is thus not only influenced by the independent elements of the systems, but also by the relations between these elements.[416]

The innovation system economists also paid attention to the role of public policy. In their view, innovation policy should be more detailed and comprehensive than required by neo-classics. They argued that 'system failures' explain the suboptimal results in innovation and advocated a broader justification for government intervention than under the 'market failure' approach. Innovation policy should be about facilitating interactions and identifying technological opportunities.[417] They also underlined the narrow and vertical focus of public institutions involved in stimulating innovation and their fragmented approach.[418]

In terms of choices of areas for public support, Freeman proposes to prioritize public support based on the contribution of science and technology to social welfare.[419] A few years later (in 1982), Freeman argued that as a consequence of the increased knowledge on the drivers

[413] Freeman (1982) 193-8.
[414] Christopher Freeman, 'The Determinants of Innovation' *Futures* June (1979) 213.
[415] C. Freeman, 'The "national system of innovation" in historical perspective' 19 Cambridge Journal of Economics 1995.
[416] Charles Edquist, Leif Hommen, 'Systems of innovation: theory and policy for the demand side' *Technology In Society* 21 (1999) 66.
[417] Freeman (1982).
418 J. Edler, S. Kuhlmann, R. Smits,'New Governance for Innovation, The Need for Horizontal and Systemic Policy Co-ordination', Report on a Workshop held at the occasion of the 30th anniversary of the Fraunhofer Institute for Systems and Innovation Research (2002) 5.
[419] Freeman (1974) 307.

of innovation, public innovation policies shifted in focus from enhancing the competitive advantage of the national firms and achieving economic growth towards improving the quality of innovations and '*contribut[ing] to social welfare, conceived in a wider sense*'.[420]

Economic historian Godin identifies the industrialist Carty in 1924, followed by the policy-maker V. Bush in 1945 to be among the first ones who supported the idea that public funding of basic research (science) was supposed to bring social benefits. They believed that public funding of basic research was '*the seed of future great inventions which will increase the comfort and convenience and alleviate the sufferings of mankind*'.[421] In the 1960-70s, there was increasing attention to the social impact of technology.[422] However, social innovation as reaction/adjustment to the undesired effects of technical innovations, intended to meet social/public needs has become of more interest to researchers and particularly to policy-makers in the twenty-first century.[423]

In the 1980s, neo-classics have started to show interest in the black box of innovation. Paul Romer was the first neo-classical economist to model innovation as an endogenous factor to the economy and he put the basis of the endogenous growth theory.[424] He attributed the source of growth not to the entrepreneur, but to the nature of the technology. Technology has a cumulative, accelerating feature. The more knowledge is accumulated, the higher are the payoffs. This was coined as the 'increasing return' phenomenon. The endogenous growth theory also found support in the perceived success of massive public spending in R&D in the aircraft, nuclear, space and security sectors during and after the Second World War. Public R&D spending was considered the source of remarkable innovations,[425] as well as the source of broader economic growth.[426]

In 1986, Stanford mechanical engineering professor Kline and Stanford economy professor Rosenberg theorized the chain-linked model of innovation. The chain-linked model suggests that innovation is triggered by either research or the existence of a potential market and goes through the following stages: invent and/or produce analytic design, detailed design and test, redesign and produce and distribute and market. Important feedback loops are created between these stages.[427] When science does not provide the necessary knowledge,

[420] Freeman (1982) 198-201.
[421] Quoted from Benoit Godin, '*The Making of Science, Technology and Innovation Policy: Conceptual Frameworks as Narratives, 1945-2005*' (Montreal 2009) 18.
[422] Quoted from Benoit Godin, 'Social Innovation: Utopias of Innovation from c.1830 to the Present' Project on the Intellectual History of Innovation Working Paper No. 11 (2012); E.G. Mesthene, '*Foreword*', in R.S. Rosenbloom, R. S., and R. Marris (eds.), *'Social innovation in the City: New Enterprises for Community Development'* (Harvard University Press 1969); OECD, 'Science, Growth and Society' (OECD Publications Service 1972).
[423] Godin (2012) 36-7.
[424] P. M. Romer, 'Endogenous Technological Change' 98 *Journal of Political Economy* (1990).
[425] During the Second World War, government funded R&D successfully led to the development of weapons and of medical treatment for infectious diseases. Nelson (1990) 209.
[426] Davidson (2009) 13-8.
[427] Stephen J. Kline and Nathan Rosenberg, 'An Overview of Innovation', in Ralph Landau and Nathan Rosemberg (eds), '*The Positive Sum*

an innovator starts with a repetitive process of trial and error of several combinations of existing knowledge. This process follows the following steps: the first best estimate of a workable design, build it, test it, incorporate learning, redesign, retest, incorporate learning and so on. This process is costly and justifies continuous investment in basic research.[428]

The same view of innovation models is shared by complexity economist Brian Arthur. He explains that innovations occur sometimes when the scientific phenomena are not understood (for example, the bicycle was invented when the physical laws of equilibrium were not understood); other innovations emerge as applications of the scientific knowledge (for example the synthetic dyestuffs industry that emerged in Germany at the end of the 19th century as a direct result of knowledge advances in organic industry[429]). Moreover, in the context of increasingly complex technologies, science and technologies co-evolve. Arthur uses the concept of 'combinatorial evolution' to capture the idea that technologies are often made of numerous sub-technologies that emerge from existing knowledge, while new knowledge is also created during the development process. Certain major innovations require decades of sequential innovations (little fixes and advancements) before they can compete with incumbent competitors.[430]

By now economists have not succeeded to empirically prove that R&D investments are essential to growth.[431] However, economists broadly embraced the idea that R&D is one of the key determinants of economic growth.[432] OECD has also confirmed there is a correlation between amount of investment in R&D and the economic performance of nations.[433] It was also the OECD who admitted that attempting '*to attribute so much economic growth to technical advance, so much to capital formation, and so much to increased educational attainments of the work force, is like trying to distribute the credit for the flavour of a cake between the butter, the eggs and the sugar. All are essential and complementary ingredients.*'[434]

This has in recent history led to calls for 'knowledge economies' such as the EU (which rely on innovation to drive growth) to invest more than 2 percent of GDP annually in R&D, in order to

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Strategy – Harnessing Technology for Economic Growth' (National Academy Press 1986) 286.
[428] Kline & Rosenberg (1986) 296.
[429] For a detailed account of the emergence of these innovations, see Johann Peter Murmann, 'Knowledge and Competitive Advantage in the Synthetic Dye Industry:1850-1914 : The Coevolution of Firms, Technology and National Institutions in Great Britain, Germany, and the United States' 4 Enterprise Society (2000).
[430] Brian Arthur, *'The Nature of Technology - what it is and how it evolves'* (Free Press 2010) 157-9.
[431] Godin (2009) 91, 94.
[432] Hulya Ulku, 'R&D, Innovation, and Economic Growth: An Empirical Analysis' (2004), IMF Working Paper, No.185, 4-5 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=879010##> accessed 26 March 2013; Rachel Griffith, Stephen Redding, John van Reenen, 'Mapping the Two Faces of R&D: Productivity Growth in a Panel of OECD Industries' (2000) The Institute for Fiscal Studies Working Paper 02/00 <http://eprints.ucl.ac.uk/4074/1/4074.pdf> accessed 26 March 2013.
[433] OECD, 'Technology and the Economy: the Key Relationships' (Paris 1992); OECD, 'Science and Technology Policy Outlook' (Paris 1992); OECD, 'Technology and Industrial Performance' (Paris 1996).
[434] Godin (2009) 96; OECD, 'The New Economy: Beyond the Hype' (OECD 2001) 4.

increase the stock of new knowledge and ensure a sufficient flow of innovations.[435] This is the rationale behind the call of the European Council in Barcelona to reach the 3% of GDP investment in R&D (out of which 2% should come from the private market).[436]

Economists conclude thus that innovation (technological advance) leads to economic growth and that R&D investments constitute an essential, but not sufficient condition to support innovation. Other economic factors (such as institutions and networks) are also indispensable. Due to the complexity of the economic factors that co-impact innovation processes, designing the right mixture of measures and implementing such a broad, overall encompassing public innovation policy remains a challenge.

In the 21st century, the increased recognition of the complexity of the economy and of the limitations of economics in measuring or predicting the effects of public intervention on the decisions of firms to innovate, has led to new approaches to innovation policy.

Complexity economists provide such an approach.[437] They argue that economy is a complex adaptive system with many dynamically interacting parts and networks, within which the micro-level interactions of the parts leads to macro-level patterns of behavior. The evolution 'algorithm' (differentiate, select, amplify) explains the growing order and complexity of the economic system and of the innovation process.[438] Unlike the neo-classics, complexity economists do not assume economy is an orderly system made of perfectly rational individuals tending towards equilibrium, but a complex system, impacted by numerous random factors (such as individual capabilities, circumstances at birth, twists of fate etc.) and made of imperfect individuals who '*use inductive rules of thumb to make decisions*' and '*are subject to errors and biases*', but also capable to adapt to changing circumstances.[439]

Complexity economists advice to employ public policy as an experimental endeavor.[440] The experimental public policy should focus on *´fostering entrepreneurship in the discovery and exploitation of (ever-changing) opportunities´*, by creating knowledge and making it available and by making information about opportunities available.

Another approach proposed by Edler et. al in the context of demand-side instruments is to develop evaluation metrics and methodologies which are capable to capture the integrated effects of a whole set of policy instruments and to adopt an integrated approach

[435] Shahid Yusuf, 'From Creativity to Innovation' (2007) World Bank Policy Research Working Paper 4262, 10-1 <http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2007/06/21/000016406_20070621101544/Rendered/PDF/wps4262.pdf> accessed 26 March 2013.
[436] Presidency Conclusions March 2002.
[437] Brian Arthur, Eric Beinhocker are such complexity theorists.
[438] Beinhocker (2006) 11-2, 17-8.
[439] Beinhocker (2006) 97.
[440] Hasan Bakhshi, Alan Freeman and Jason Potts, 'State of Uncertainty - Innovation policy through experimentation' (2011) NESTA Provocation 14 <http://www.nesta.org.uk/library/documents/Provocation_14_State_of_Uncertainty_v7.pdf> accessed 27 March 2013,

to all the stages of set-up, implementation, assessment and fine-tuning of demand-side policies. Hence, the policies should be formulated as programmes with bounded goals, timescale and budget, and should be accompanied by a logic model that compares the goals and the employed activities to achieve these goals against the outputs, and outcomes.[441]

At the set-up stage, this means that the policy should be formulated only after policy-makers have acquired sound knowledge of the current state-of-the-art in the targeted sector, has imagined future scenarios regarding technological trajectory and diffusion patterns and has identified which incentives move the key actor groups. This could be done through systematic consultation with relevant stakeholders, such as potential customers, intermediary actors etc. In other words, the policies should only be implemented in markets where the measures would achieve the strongest impact (e.g. highly innovative markets, responsive to customers' needs, strong technological base in Europe, depend on public policy intervention etc.). Such an analysis would also help to establish the baseline (the choice and delineation of the market and the definition of appropriate indicators) against which the impact of the policy can be measured.

Subsequently, the policy-maker should evaluate the appropriateness of the whole policy (the conceptualization stage), through surveys and interviews with (potential) buyers, suppliers and through analysis of the legal texts and tender documents. At the conceptualization stage the problem of non-coordination of inter-related or even conflicting policies should be addressed. This entails that the policy-maker should consider the whole conundrum of policy measures which may have an impact on its objectives, in order to catch their interactive effects and to detect the failures in linking them. Immediate, short-term and long-term goals of the policy should at this stage also be formulated.

The achievement of these goals should be subsequently assessed (the impact assessment stage) at different stages during and after the implementation of the policies. The assessment should, according to the authors, take three types of impacts into consideration: 1) impact on the intermediary actors shaping the market conditions (such as purchasers, standard setting bodies, innovation agencies, regulatory bodies etc.); 2) impact on the behaviour of the innovators; 3) impact on the market development itself (sales incomes, patents, number of producers etc.). Lessons drawn from the assessment exercise should be processed in the design and implementation of the policy as going along (the formation stage).

It is not within the reach of this research project to evaluate whether this type of highly nuanced industrial policy in fact possible. However, regardless of the embraced theoretical

[441] J. Edler et al (2012) 33-47.

argumentation, a withdrawal of public support for innovation in Western countries can hardly be conceived.[442] Examples from the recent history of innovation, which indicate that important scientific and technological discoveries and inventions find their origin in publicly funded projects, have even lead some economists to argue that it is *'a mistake to say that the private sector is the only, or even the main, engine of technological growth'*.[443]

2.3.3.2 Economic justification of public intervention in support of innovation

In the previous section, I outlined the evolution of economic thought on the role innovation plays in the economy and on the role R&D plays among the determinants of innovation. In this section, I will focus on the different economic justifications for public intervention in general and on the accepted economic justifications for public R&D investments in particular. I will compare these economic justifications against the market failures PCP allegedly seeks to address.

Neo-classics argue that public intervention should only be justified when the private market is not capable to achieve a certain public interest and after the causes of this failure are identified. In addition, the government should be convinced that the envisaged form of intervention can lead to a better outcome than the one achieved when left to the market. This can be demonstrated through a societal cost-benefit analysis, which involves an analysis of the causes of the market failure and demonstrates the (social) benefits of the intervention, compared to non-intervention or intervention in another form/field.[444] A public interest is for example present in the case of clean technologies which have the potential to address societal challenges such as global warming[445] or in the case of drugs for neglected tropical diseases.[446]

In the case of innovation, neo-classics argue that the free market (or price) mechanism achieves better efficiency results than centralized economies,[447] but nevertheless, in certain

[442] Scotchmer (2004) argues: 'In the US, for example, R&D performed by industry now comprises a hefty three-fourths of the total. Nevertheless, the R&D performed by universities and the federal government is also substantial. Most industrial R&D is applied, while most R&D in universities is basic research. Even though universities perform only 14 % of R&D, they perform about half of total basic research. Federal government funds 26% of total R&D, including grants to universities, firms, and federally funded research and development centers, which are run by firms and universities but are not owned by them. Only ¼ of the federally funded research takes place intramurally in government laboratories. Even though the federal government funds 26% of R&D, its employees perform only 7% of the total R&D. This is why industry and universities perform much more R&D than they fund. Industry only receives 10% of its R&D budget from the government.'

[443] Such as the packet-switching technology of the Internet, the digital computer, the world-wide web protocols, the technology for inserting foreign genetic material into bacteria, the first bioengineered human protein, human insulin or the human growth hormone. See Scotchmer (2004). See also Marianna Mazzucato, 'The Entrepreneurial State' (Demos 2013).

[444] B. Baarsma, C. Koopmans, J. Theeuwes, 'Beleidseconomie – Een rationele onderbouwing van overheidsingrijpen' (Pallas Publications – Amsterdam University Press, Amsterdam 2010) 39-41. C. Teuling, L. Bovenberg, H. van Dalen, 'De cirkel van goede intenties – De economie van het publieke belang' (Amsterdam University Press 2005).

[445] D.C. Popp, 'R&D Subsidies and Climate Policy: Is there a 'Free Lunch'?' (2006) 77 *Climate Change* 311-41.

[446] Pharmaceutical companies are reluctant to invest in R&D in tropical diseases, due to the risk that the selling-price of the medicine would not cover the investments. See Michael Kremer and Rachel Glennerster, *'Strong Medicine – Creative Incentives for Pharmaceutical Research on Neglected Diseases'* (Princeton University Press 2004).

[447] Ph. Aghiou, N. Bloom, R. Griffith and P. Howitt, 'Competition and Innovativeness: an inverted-U relationship' (2005) *Quarterly journal of Economics* 701-28; J. Boone and E. Van Damme, 'Marktstructuur en innovatie', in B. Jacobs and J.J.M. Theeuwes (red), 'Innovatie in Nederland – De markt draalt en de overhead faalt' 71-92, (Konijnklijke Vereniging voor de Staathuishoudkunde Preadviezen 2004).

cases outcomes are inconsistent with the expectations of the society.[448] This is due to the fact that the price mechanism does not capture social value:[449] 1) when innovations presents the characteristics of a public good; 2) when innovations entail positive externalities;[450] 3) when information asymmetries are present; or 4) when monopolies are formed.[451]

An innovation has the characteristics of a public good if, once disseminated, users cannot be denied further use and cannot be mandated to pay for it. Among the innovation activities, basic research is one of the purest forms of public goods. It requires big investments, while it does not produce an economic advantage on a short term and can often not be appropriated.[452] This particularly the case of fundamental research, without a concrete commercial application in sight.

Innovations may present beneficial spillovers (or positive externalities) which cannot be translated into benefits for the producers or can only partially be exploited due to the short time-span over which the innovation can be appropriated.[453] Environmental innovations for example, present two types of positive externalities which cannot be translated into private return on the R&D investment: knowledge externalities and social/environmental benefits. Due to this, an unaided market will not invest sufficiently in the creation of new knowledge. Economists take the view that knowledge externalities and spillovers are desirable for the emergence of innovation and public intervention in the form of funding can incentivize private actors to invest in R&D and produce sufficient amounts of knowledge.[454]

In the case of information asymmetries, the private investment market fails to engage sufficient funds in highly experimental and uncertain innovations that may potentially yield large economic and social benefits, because it lacks information on the innovative capabilities of the innovator or the private funder and the innovator are not aware of each other's existence.

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448 Such as when innovation contributes to depletion of natural resources instead of enabling their conservation. Robert Cooter, Aaron Edlin, Robert E. Litan, and George L. Priest, 'The Importance of Law in Promoting Innovation and Growth', in The Kauffman Task Force on Law, Innovation and Growth, *'Rules for growth – Promoting Innovation and Growth Through Legal Reform'* (Ewing Marion Kauffman Foundation 2011) 11-2. Yusuf (2007) 3. Stiglitz argues the need for public intervention, justified by the fact that the relation between fluctuations in the economy and fluctuations in innovation goes both ways, and by the fact that the free market left to itself will not always choose the most positive equilibria resulting from the positive feedback between economy and innovation. See Joseph E. Stiglitz, 'Endogenous Growth and Cycles' 121-154, in Yuichi Shionoya and Mark Perlman (eds), *'Innovation in Technology, Industries and Institutions-Studies in Schumpeterian perspective'* (The University of Michigan Press 1994).

449 Richard Gilbert, 'Holding Innovation to an Antitrust Standard', (2007) 3 *Competition Policy International* 2.

450 Externalities are about benefits (and costs) of private economic activity that those who make the relevant decisions do not see as benefits (or costs) to them'. See R.R. Nelson, 'The market economy, and the scientific commons', (2004) 33 *Research Policy* 462.

451 Commission, 'Community Framework for State aid for Research and Development and Innovation' (Framework for State aid for R&D&I) 2006/C 323/01 (Framework for State aid for R&D&I). R. Inman, 'Markets, Governments and the "New" Political Economy', in A.J. Auerbach and M. Feldstein, *'Handbook of Public Economics'* (vol II, Elsevier 1987) 647-777. B. Baarsma et al (2010).

452 G.M. Peter Swann, 'Funding Basic research – when is public finance preferable to attainable 'club goods' solutions?' 335-60, in Aldo Geuna, Ammon J. Salter, W. Edward Steinmueller (eds)*'Science and Innovation– Rethinking the Rationale for Funding and Governance'* (Edward Elgar Pub 2003). Erik Brynjolfsson and Xiaoquan (Michael) Zhang, 'Innovation Incentives for Information Goods' (2006) MIT Sloan School Working Paper 4780-10, 3 <http://seeit.mit.edu/Publications/brynjolfsson-zhang6-14-06.pdf> accessed 27 March 2013.

453 Lipsey (2007) 5-28.

454 Stuart Minor Benjamin and Arti K. Rai, 'Fixing Innovation Policy: A Structural Perspective' (2008) 77 *George Washington Law Review* 12. See also Paul Romer, 'The Origins of Endogenous Growth' (1994) 8 *J. ECON. PERSP.* 3, 20–21.

In the case of monopolist markets, a market failure arises when the monopolist does not have sufficient information on whether the consumers are ready to pay the fixed costs of the production of a certain product. In this case, public intervention in the form of funding of basic research is likely to stimulate the monopolist to invest in innovation. [455]

Some economists also talk of a market failure when competition (or the market selection mechanism) is too rapid and may punish the most innovative firms which undertake risky R&D projects with long-term perspectives, while being inefficient on a short-term. Capital markets intervene in this case, by providing them with the funding necessary to bridge the period until the innovative products come on the market. When capital markets do not function well, most innovative firms may be excluded from the market.456

Other justifications for public intervention which are accepted by neo-classical economics are: the strategic trade policy (which entails public subsidies to national companies active in foreign markets, in order to ensure them a dominant position), and co-ordination (when users get locked-in to an old standard/technology and are not willing to pay the costs of transaction to the new standard).[457]

Neo-classics believe that performing innovative activities and bringing innovative solutions to the market remains principally the role of the private market.[458] Public policy should only be employed to the extent that is needed to correct failures of the private market. [459] Even when the intervention is restricted, the neo-classics warn that correcting market or systemic failures may come with high costs[460] as policy decisions are not always sufficiently informed and unbiased to achieve better results than the private market.[461]

As a consequence, neo-classics argue that public intervention must be used with care and must be quickly transposed into stable rules, as private initiative is stimulated in an environment characterized by legal/political certainty.[462]

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455 Swann (2003) 335-360.
[456] Geroski, P. A., & Mazzucato, M., 'Myopic Selection' (2002) 53 *Metroeconomica* 2, 181-99.
[457] G.M. Peter Swann, 'The economic rationale for a national design policy' (2010) BIS Occasional paper no.2, 10-4 <http://www.dx.org/site/design_exchange/assets/pdf/Economic_Rationale_for_National_Design_Policy_UK.pdf> accessed 27 March 2013.
[458] B. Baarsma et al (2010) 39-40.
459 Because innovation is 'highly cumulative, (…) small changes in initial innovation conditions can have huge future impacts. Benjamin and Rai (2008) 11. In the Faroese Islands of the 1980s, the excessive public intervention through subsidies and demand driven economic growth led to near state bankruptcy. See Erik Gortz, 'Public and private expenditure and the Faroese business cycle' 235 in Gunnar Eliasson, Nils Karlson (eds) *'The limits of government, Policy Competence and Economic growth'* (Transaction Publishers 2001).
460 The public costs of correcting market failures are high because the public intervention will try to bring about private transactions between partners with non-reciprocal interests. See Teuling et al (2005). See also B. Baarsma et al (2010) 39-40.
[461] Hans W. Friederiszick, Lars-Hendrik Roller, and Vincent Verouden, 'European State Aid Control: An Economic Framework' (2005) 637 <http://ec.europa.eu/dgs/competition/economist/esac.pdf> accessed 8 April 2013; Baarsma et al (2010).
462 Teuling et al (2005).

According to the innovation systems theorists, the justification for public intervention should be broader. The following system failures justify government's intervention: infrastructural failures (when the infrastructure for certain desirable economic activities such as universities, labs etc. are too costly to be funded by private actors),[463] institutional failures (when the legal system (IP protection system) or the political and social culture and values do not create a climate supportive towards innovative activities),[464] interaction failures (when strong network ties between the different actors in the national innovation systems lead to ignorance of other important external factors, or when there are no ties between complementary technologies or actors or there are ties between non-complementary actors),[465] transition and capability and learning failures (when firms are not capable to adapt to changes in their environment, such as new technologies)[466].

Other economists suggest that the state is capable to play a more active role on the innovation scene than correcting market failures and creating the right infrastructure and linkages between innovation actors.[467] By investing in early stage, highly uncertain projects, it can drive the innovation process rather than just incentivize it.[468]

According to Mazzucato, the US government invested in forward-looking innovations through its Small Business Innovation Research ('SBIR') programme, and managed to play a leading role in bringing about innovative breakthroughs. US state investment in different types of risky and uncertain research (whether basic or applied research) was there far earlier than private investment.[469] Mazzucato uses as argument two studies, one conducted by Ruttan and another by Block and Keller on the role US state investments has played in the development of technology. Based on a study of state investments in six technology areas (the US 'mass production' system, aviation technologies, space technologies, information technology, internet technologies and nuclear power) Ruttan observes that the US government engaged funds in the most risky and uncertain early research in areas where it spotted a window of technical and commercial opportunity, and continued to oversee the innovation process up to commercialization. Government investment constituted the engine for the creation of these technologies and in certain cases of technologies that require large investments at early stages (such as nuclear power) even the indispensable incentive for their

[463] Edquist C., 'Innovation Policy: a Systemic Approach', in D. Archibugi and B.Å. Lundvall (eds) *'The Globalizing Learning Economy'* (OUP 2001); Smith K., 'Innovation as a Systemic Phenomenon: Rethinking the role of Policy' (2000) 1 *Enterprise and Innovation Management Studies* 1, 73-102.
[464] Carlsson B. and S. Jacobsson, 'In Search of Useful Public Policies: Key Lessons and Issues for Policy Makers' in B. Carlsson (ed) *'Technological Systems and Industrial Dynamics'* (Kluwer Academic Publishers 1997).
[465] Malerba F., R. Nelson, L. Orsenigo and S. Winter, 'History-friendly models of industry evolution: the computer industry' (1999) 8 *Industrial and Corporate Change* 1, 3-40.
[466] Chaminade C. and C. Edquist, 'From Theory to Practice: The Use of the Systems of Innovation Approach for Innovation Policy' in J. Hage and M. Meeus (eds), *'Innovation, Science and Institutional Change'* (OUP 2006).
[467] Mazzucato (2013) 18-9.
[468] Mazzucato (2013) 49.
[469] Mazzucato (2013) 49.

development.[470] Block and Keller confirm that between 1971 and 2006, 77 out of 88 of the most important innovations[471] were in their early stages but also beyond, heavily funded by the federal government.[472]

Some complexity theorists argue that public policy is an exogenous factor that stimulates the emergence of a variety of innovations to be subsequently exposed to the selection process in the marketplace.[473] They see the policy-maker as an adaptive agent, subject to evolution through policy experimentation and policy learning. The more recent approaches in complexity theory, advocate to completely drop the debate on state versus private markets and concentrate on an effective interplay between the two forces to create an effective evolutionary system.[474] An evolutionary systems follows the evolutionary algorithm (differentiate, select, amplify): it involves actors able to adapt to changing circumstances and an evolutionary innovation strategy following many small trajectories and making the choice for the most successful trajectory only when uncertainties are much lower. An evolutionary system also implies tolerance to *'redundancy, overlap and excess capacity'*.[475]

In conclusion, economists disagree on the situations when public intervention in the innovation processes is justified and on the extent to which it should be employed. Both neo-classics and systems of innovation theorists admit that private innovation efforts do not always lead to the desired result. Neo-classics delineate specific circumstances (market failures) under which intervention is justified, while systems of innovation theorists adopt a broader view on the conditions and means of intervention. Complexity theorists advise to drop the debate altogether and focus on the effective interplay between the state and private actor.

In practice, innovation policies in the US and the EU are complex and encompass numerous supporting actions. The EU policy making, for example, moved from a 'grants and subsidies' approach to an 'infrastructure building' approach. Although the market failure justification for policy intervention is still used, the *'policy maker is no longer seen as a surrogate for a perfectly informed social planner correcting imperfect market signals to guide private decisions towards more desirable outcomes'*.[476] Innovation policy action is not always based on an economic calculation of size of a market failure and of costs and benefits of a planned public measure. Often, decisions are based on political considerations. The EU policy approach also differs among different areas, such as is the case of R&D funding. On the one

[470] V. Ruttan, *'Is War Necessary for Economic Growth?: Military procurement and technology development'* (OUP 2006).
[471] They rate the importance of the considered innovations based on R&D Magazine's annual awards.
[472] Block F and Keller M, 'Where do innovations come from?' in F Block and M Keller (eds), State of Innovation: The US government's role in technology development (Columbia: Paradigm 2010).
[473] J. Stan Metcalfe & Luke Georghiou, 'Equilibrium and Evolutionary Foundations of Technology Policy', CRIC Discussion Paper No 3 (September 1997) 7 available at http://www.cric.ac.uk/cric/Pdfs/dp3.pdf accessed 28 December 2013.
[474] Beinhocker (2006)427.
[475] Beinhocker (2006) 339-40.
[476] Metcalfe & Georghiou (1997) 23.

hand, the EU applies strict assessment of the economic conditions to conclude on compliancy of national R&D subsidies. On the other hand, the EU does not attach any economic conditions to the application of public procurement of R&D services. This is further discussed in section 2.3.5.

2.3.4 Public funding of R&D when the venture capitalist fails

The PCP Communication and the preceding PCP Expert Group report outlined the following assumption: PCP is necessary due to underinvestment of private venture capitalists in risky R&D projects.

In this section, I will outline some of the most important economic studies regarding the role of venture capital markets in the innovation process in the US and in the EU. I will highlight the conclusions of these studies regarding the role of public R&D investments to compensate for less well functioning venture capital markets. This will test the above mentioned assumption and will provide guidance to public procurers on the conditions for effective deployment of PCP.

Economists[477] point out that the presence of a large number of new firms is an important prerequisite for innovation. They perform the role of exploratory devices to test the viability of innovations, and put competitive pressure on incumbent firms. They are a source of new knowledge even in case of failure. However, the positive effect on economic growth is not obtained unless a sufficient number of high-growth start-ups emerge from among the new firms. This depends to a large extent upon access of younger innovative firms to finance.[478]

In general, venture capital is attributed the merit of mitigating the problem of access to finance of such young innovative firms and of spurring their growth.[479] Venture capital is considered the most efficient financial institution to operate under conditions of uncertainty and information asymmetries which characterize innovative projects in young firms.[480]

In the US, venture capitalists address the uncertainty and information asymmetry problems through intensive scrutiny of business plans, the existence of a syndication partner who shares the decision that the investment is attractive, staged funding, intensive monitoring of

[477] Erik Stam, 'Entrepreneurship and Innovation Policy' (2008) 34, 40-1, Jena Economic Research Papers 006, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1115262> accessed 8 April 2013. Matthew Spiegel and Heather Tookes, 'Dynamic Competition, Innovation and Strategic Financing' (2008) 3 <http://www4.gsb.columbia.edu/filemgr?file_id=72705> accessed 8 April 2013.
[478] J.E. Stiglitz and A. Weiß , 'Credit rationing in markets with imperfect information' (1981) 71 *The American Economic Review* 393-410. M. Binks and C.T. Ennew, 'Growing Firms and the Credit Constraint' (1996) 8 *Small Business Economics* 17-25.
[479] D. Engel, 'The Impact of Venture Capital on Firm Growth: An Empirical Investigation' (2002) ZEW Discussion Paper No. 02-02 <ftp://ftp.zew.de/pub/zew-docs/dp/dp0202.pdf> accessed 8 April 2013.
[480] Stefano Caselli, Stefano Gatti, Francesco Perrini, 'Are Venture Capitalists a Catalyst for Innovation, or do they simply exploit it ?' (2006) 6 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=890669> accessed 8 April 2013.

managers (through representation on the board of directors).[481] The existence of an efficient financing system with a mature venture capital market is believed to be the reason for the sustained economic growth in the US in the 1990s.[482]

Based on a study of twenty industries in the US over a period of three decades, Kortum and Lerner conclude that venture capital funded firms acquire a larger number of patents compared to large firms with R&D divisions, or compared to projects financed through private R&D funds.[483] However, Kortum and Lerner point out that venture funding does not have an uniform impact. During 'hot' financial periods, the impact tends to decrease, as venture capitalists tend to overestimate the value of projects and over-invest in similar projects which leads to excessive duplication, or tend to increase the size of their investment, at the cost of reducing their capability to keep control through '*staged capital commitments*'.[484]

Kline and Rosenberg underline that the incentive of venture capital to finance potentially breakthrough innovations is influenced by the level of envisaged costs. The trend of increasing development costs of new products in many high tech sectors, particularly when those involving radical improvements in product performance, combined with the uncertainty and unpredictability of needed efforts, leads to reticence of venture capitalists to invest in such projects.[485]

Mazzucato notices that the incentives of venture capitalists to invest in high risk long-term projects may also be diminished by policies regarding management fees and bonuses for high returns, which determine venture capitalists to focus on shorter term investments (of 3 to 5 years, although they are usually set up for period of 10 years).[486]

According to Chemmanur et al, this issue is less apparent in Corporate Venture Capital ('CVC') in the US.[487] CVC performs better in nurturing innovation in the funded firms than independent venture capitalists due to less concerns with the short-term financial returns of the portfolio projects (as a consequence of the payment structure in the form of a fixed salary with corporate bonuses) as well as due to the unique knowledge of the industry. These features allow the corporate venture capitalist to be more open to experimentation and more tolerant to failure. CVCs appear to generate more innovation productivity (in terms of

[481] Gompers, Paul, and Josh Lerner, *'Capital Market Imperfections in Venture Markets: A Report to the Advanced Technology Program'* (Department of Commerce 1999) 11.
[482] Caselli et al (2006).
[483] S. Kortum and J. Lerner, 'Assessing The Contribution Of Venture Capital To Innovation' 31 (2000) *Rand Journal of Economics* 674-92.
[484] Kortum and Lerner (2000) 686. Gompers and Lerner (1999) 8.
[485] Kline and Rosenberg (1986) 295.
[486] Mazzucato (2013) 41.
[487] These are internal VC funds established by corporations as subsidiaries.

number of patents and citations) from younger, riskier firms, but obtain growth on a long-term.[488]

Tolerance to early failure has also been identified by other studies to be particularly important in spurring innovation productivity in firms exposed to high failure risks (such as ventures born in recession periods, ventures at early development stages and ventures in highly uncertain innovations).[489] Economists argue that technological revolutions are preceded by a period of increased experimentation in the economy, which comes along with inevitable failure of numerous start-ups and destruction of mature firms and which necessitates highly active financial markets, which are willing to fund new firms even if the failure risk is high.[490] In this context, the youngest and most experimental firms are impacted by the financial risks even in times of financial equilibrium and are most vulnerable to financial shocks.[491]

Thus knowledge of the industry, openness to experimentation and tolerance to failure are key attributes that explain the success of venture capital.

Unlike in the US, European venture capital has not been associated with support of innovation, but rather with exploitation of existing technological capabilities of funded firms.[492] Moreover, economists noticed that in conditions of depressed financial markets, the level of venture capital investments at seed and start-up stage tends to fall abruptly in Europe.[493] The lack of early-stage venture capital for young companies in Europe was considered as one of the most important reasons why Europe has fewer young firms as leading innovators in high-tech sectors as compared to the US.[494]

Another aspect increasing the difficulties of young innovative firms in funding innovative undertakings, has been the lack of large public budgets for high-tech R&D such as have been available in the US.[495] According to Auerswald and Branscomb the amount of US government funding just for early stage technology firms, equaled by 2003 the total

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[488] Thomas J. Chemmanur, Elena Loutskina, Xuan Tian, 'Corporate Venture Capital, Value Creation, and Innovation' (2012) *Rev. Financ. Stud.* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1364213> accessed 8 April 2013; Jean-Sebastien Lantza and Jean-Michel Sahut, 'Corporate Venture Capital and Financing Innovation' (2010) 8 *Problems and Perspectives in Management.*

[489] Xuan Tian & Tracy Yue Wang, 'Tolerance for failure and Corporate Innovation' (2011) *Rev. Financ. Stud.* 3 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1399707> accessed 8 April 2013.

[490] Ramana Nanda and Matthew Rhodes-Kropf, 'Financing Risk and Innovation' (2011) 1-2 Working Paper 11-013 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1657937> accessed 8 April 2013.

[491] Nanda and Rhodes-Kropf (2011) 5, 38.

[492] Caselli et al (2006) 22.

[493] In 2002, the level of venture capital investment has fallen from EUR 6,7 billion in 2001 to EUR 4,2 billion. See Independent Expert Group, 'Raising EU R&D Intensity – Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development' EUR 20717 (2003) 6.

[494] Veugelers, R. and M. Cincera, 'Europe's missing yollies' (2010) Bruegel Policy Brief 2010/06.

[495] Chris Hendry, 'Commercialising University Research", paper for ESRC Sustainable Technologies Programme' http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CDQQFjAA&url=http%3A%2F%2Fwww.esrc.ac.uk%2Fmy-esrc%2Fgrants%2FRES-332-25-0003%2Foutputs%2FDownload%2F70d2fe7a-9b21-46d2-aee9-1d106f92f9d4&ei=z7ViUc3XIsjBtAbPwIGgAg&usg=AFQjCNFsdvGVcAD-zkX9QuI6ZcflTxO7dw&sig2=gR-tL1zn4OrY8XbO8jkBDw> accessed 8 April 2013; PCP Expert Group 13.

investments of 'business angels' and was approximately two to eight times larger than private venture capital.[496]

In the US, the government has acted as an entrepreneurial venture capitalist through the Small Business Innovation Research (SBIR) programme and has played a vital role beyond the basic research phase of projects.[497] Mazzucato points out the fact that US SBIR agencies have sometimes invested in highly uncertain, high risk undertakings in fields such as genomics or ICT, long before venture capital funding was available. One important characteristic which has ensured the success of the US SBIR program in stimulating technologies which escaped the attention of the traditional venture investor, was the decentralized institutional set-up, with program managers looking to fulfill very specific technical needs of the Federal agency.[498]

Economists warn that in public venture capital programs such as the SBIR the same pitfalls as in the private venture capital arena may occur. The impact of the additional public funding proves to be low when short-term reward mechanisms lead public managers to choose firms with better prospects of success and already sufficiently funded by venture capitalists.

In conclusion, several lessons can be drawn for the contracting authority and policy-maker from the economic studies analysed in this section.

Firstly, venture capital funding is often oriented towards close to market innovations and overlooks the riskier undertakings even in times of financial bonanza. This entails that public R&D funding should target the most cutting-edge and riskier projects, that require large investments and/or long-term return on investments.

Secondly, small innovative firms and particularly start-ups experience more acutely the difficulties to access private capital for promising but risky R&D projects.

Thirdly, public investment should also focus on firms that have already been funded by VCs but that do not succeed in obtaining follow-on capital.

Fourthly, public R&D funding should concurrently be complemented by measures to increase the efficiency of the private market on a long-term, such as facilitating the deployment of early-stage technologies and providing tax incentives to stimulate entrepreneurship.[499]

[496] P.E. Auerswald and L.M. Branscomb 'Valleys of death and Darwinian seas: financing the invention of innovation transition in the United States' 3-4 (2003) 28 *Journal of Technology Transfer*.
[497] Mazzucato (2013) 41.
[498] Lerner (2002) 17.
[499] Lerner (2002) 17.

Fifthly, the investment decisions should be made by program managers in decentralized agencies, who possess state-of-the art knowledge on the market structure and status of development of innovations.

Finally, a high degree of experimentation and tolerance to risk must be accepted.

2.3.5 The role of public needs/demand in innovation – lessons for public policy

2.3.5.1 Introduction

Until 2000, the EU innovation policy had a strong focus on supply-side instruments, such as R&D subsidies, tax measures etc. The approach has been criticized for its negative effects on demand-driven innovation.[500]

Since 2000, the EU institutions started to contemplate the adoption of complementary demand-side measures. The demand-side innovation policy was defined as '*all public action to induce innovation and/or speed up the diffusion of innovation through: increasing the demand for innovation (i.e. the willingness and ability to buy and use an innovation); defining new functional requirements for products and services and/or improving user involvement in innovation production (user-driven).*'[501]

Among the various demand-side measures, public procurement is the most direct measure.[502] The EU institutions acknowledged since 2000 the need to change the public procurement practices and re-direct public purchases towards new technologies.[503] Public procurement was considered a large source of finance[504] for innovation in those sectors where the government was an important customer.[505] Pre-commercial procurement was given an important role within the demand-side innovation policy.

However, the European Commission adopted a fundamentally different approach to the implementation of the PCP as compared to R&D subsidies.

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[500] A. Gavras, L. Hommen, M. Rolfstam, M. Mavis, N. Vasileiadis, L.S. Cardoso, D. Tsigos, D. Serpanos, 'Procurement as an Innovation Instrument' (2006) 70-2 <http://www.inno-utilities.org/public/Documents/Inno-Utilities-Book.pdf> accessed 28 December 2013; IVA, 'Technical development in deregulated markets: What we can learn from the telecom, energy, railway and defence sectors' (The Royal Swedish Academy of Engineering Sciences 2003).

[501] Jakob Edler, 'Review of Policy Measures to Stimulate Private Demand for Innovation. Concepts and Effects' (2013) 9 <http://www.innovation-policy.org.uk/share/12_Review%20of%20Policy%20Measures%20to%20Stimulate%20Private%20Demand%20for%20Innovation.%20Concepts%20and%20Effects.pdf> accessed 28 December 2013

[502] Other demand-side measures cover financial (subsidies, tax reductions etc.) and non-financial (information campaigns, labels, trainings etc.) support for private demand. See Edler (2013).

[503] COM (2002) 499, 14.

[504] In 2008, EU public procurement amounted to around 2155 billion Euro, equivalent to 17- 18% of EU GDP, out of which approximately 389 billion Euro was covered by the rules set out in the EU Directives on public procurement. See Mario Monti, 'A New Strategy for the Single market at the Service of Europe's Economy and Society' (2010) 76, <http://ec.europa.eu/bepa/pdf/monti_report_final_10_05_2010_en.pdf> accessed 8 April 2013.

[505] COM (2003) 226 final; Independent Expert Group, 'Raising EU R&D Intensity – Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development' 20, EUR 20717 (2003).

In the area of R&D subsidies, the EU adopts a straightforward economic approach. R&D subsidies are only considered beneficial when needed to correct a market failure and to the extent it is effective and it is necessary to incentivize the private actor to invest itself (more) in innovative activities. The European Commission has the competence to check whether national R&D funding schemes or individual R&D funding measures are justified. Due to restrictive capacity, the Commission has developed certain conditions to assume suitability of funding measures. These conditions regard types of activities that potentially target market failures, categories of private undertakings particularly affected by market failures, as well as amount and percentage of funding for different type of R&D projects.[506] The EU performs a case-by-case assessment of the compliancy of the measure when the above mentioned conditions are not fulfilled.

The strict supervision by the European Commission of R&D subsidies is justified with the argument that EU Member States are often tempted to provide financial support to domestic firms with strong lobbying and that this may lead to the exclusion from the market or the delayed reward of the most competitive and innovative firms to the detriment of consumers' welfare.[507] The EU State aid rules aim to promote a more integrated European market in which firms compete effectively and are able to benefit of economies of scale.[508]

In contrast to this, the guidance on the implementation of the PCP (the PCP Communication and the accompanying PCP Staff Working Document) does not define economic conditions for its effective deployment. Neither do they define the necessary safeguards to avoid damages to competition. In section 1.7.3, above I argued that the European Commission missed the opportunity to provide a clear conceptual outline of the rationale behind the use of PCP. PCP was labelled as a demand-side innovation policy instrument. However, it is often limited to participation by national companies and does not entail any guarantee or commitment for a subsequent purchase of the resulting innovation by the funding agency.

In this section I will outline the most important economic theories on the role of demand in driving innovation and I will address the fourth PCP assumption that public needs can influence firms' strategies for creativity and innovation. I will subsequently derive pre-conditions for the effective use of public demand as innovation policy instrument.

[506] These conditions are described in section 5.3.5.
[507] For example, aid may negatively impact foreign competition and lead to higher prices for the consumer. Friederiszicket al (2005) 638, 644-5. *See also* COM(2005) 107 final 3.
[508] Midelfart-Knarvik, K. H., and H. G. Overman., 'Delocation and European integration: Is structural spending justified' 35 (2002) *Economic Policy* 325.

2.3.5.2 Demand-side innovation policy instruments

According to Mowery and Rosenberg, modern economic theories regarding the role of demand[509] in the innovation process had emerged in the mid 1960's in the US, when it was considered that federal funding of basic research did not lead to solutions for *'pressing economic and social problems'* and that government needed to steer itself innovative efforts towards such solutions.[510]

However, the idea that funding should be oriented towards addressing societal needs is even older.

The economic historians Godin and Lane trace the first studies on the role of 'needs' back to 1935 and 1939, when J. Huxley, an English evolutionary biologist and J.D. Bernal, an Irish mathematician, argued that science should be oriented towards fulfillment of social needs.[511] Huxley criticized the bias of public funding towards research in the interest of industry to make immediate profit as opposed to long-term beneficial projects to the consumer and the individual citizen.[512] Bernal saw science in a capitalist society working towards destruction, but he believed that science should and could be steered towards playing a powerful role in curing social injustice and meeting real social desires.[513]

These studies referred to the concepts of 'social needs' or 'collective needs'. [514] Social or collective need means a social problem identified by the government or expressed by society collectively through the political process. The core idea of these studies was that the government should turn the above mentioned needs into public goals, and should fund the development of technologies to address these needs.[515]

However, social needs are not the same as the economic term of 'demand'. The second encompasses trade-offs between quantity, price and performance and entails the willingness and ability of customers to buy and use an innovation.

In 1967, another non-economist referred in a paper commissioned by the Center for Business Research at the University of Manchester to the role of needs in the more economic sense. The Australian chemist James Albert Allen concluded that *'the recognition of a need at the*

[509] Demand can be defined as the 'willingness to pay a certain price for the satisfaction of a need or want'. See Edler (2013) 8.
[510] Mowery, D. and Rosenberg, N., 'The Influence of Market Demand upon Innovation: A critical review of some recent empirical studies' 8 (1979) *Research Policy* 105.
[511] Godin and Lane (2013).
[512] Quoted from Nature November 30, 1935, 865.
[513] J.D. Bernal, *'The Social Function of Science'* (The Macmillan Company 1939) 409-10.
[514] Godin and Lane (2013).
[515] A. Brook, 'Raising Education Achievement and Breaking the Cycle of Inequality in the United Kingdom', OECD Economics Department Working Papers No.633 (1971) 15.

distribution end and the prospect of exploiting it is probably the most powerful driving force for the total process [of innovation]'.[516]

However, the landmark economic contributions on the role of market demand (rather than social needs) come from Mowery and Rosenberg (1979), Kline and Rosenberg (1986), von Hippel (1986) and Porter (1990).

In a 1979 study on the role of demand in the innovation process, Mowery and Rosenberg, two Stanford economists, distinguished between the role of demand at different moments in the innovation process. They admitted that demand had a dominant role at the diffusion phase, but criticized the overemphasis of the role of demand in determining the emergence of innovative solutions. The decision of firms to innovate is not always caused by the existence of customers' demand or the likelihood of future demand.

They concluded that market demand, defined as willingness of customers to pay for purchasing innovative solutions, is not always and definitely not the only factor motivating firms in investing efforts in the desired innovations . They argued that additional and at least equally important supply-side conditions were necessary, such as new technological opportunities/capabilities which lower production costs and make it possible to bring to the market the desired innovation.[517] Moreover, they expressed doubts on whether firms have the capabilities to perceive the demand curve for products[518] and observed that the most radical innovations responded the least to market 'needs'.[519]

They concluded that there is an important role for the government to give a decisive impulse to the innovation process in areas in which the market does not generate the necessary incentives or R&D resources to determine the emergence of innovative solutions for urgent social needs. However, public demand will be effective in those areas where the technological basis is ripe as a consequence of nourishment though supply-side measures.[520]

They also signaled the importance of exchanges of information regarding desired products and product characteristics, between users and producers and between non-commercial basic research institutions and private firms and laboratories.[521]

In 1986, Rosenberg teamed up with Stanford mechanical engineering professor Kline and conceptualized the chain-linked innovation models. They concluded that innovation is

[516] James A. Allen, *'Studies in Innovation in the Steel and Chemical Industries'* (University of Manchester Press 1967) 23.
[517] Mowery and Rosenberg (1979)142.
[518] Mowery and Rosenberg (1979) 145.
[519] Mowery and Rosenberg (1979) 143-4.
[520] Mowery and Rosenberg (1979) 149
[521] Mowery and Rosenberg (1979) 149.

triggered by either research or the existence of a potential market.[522] Even when innovation is triggered by basic research, it still needs to be coupled to market needs in order to be commercially successful. Kline and Rosenberg support their argument with a quote from the journal of Thomas Edison, who, after inventing a vote counting machine only to find out later that the Congress was not interested, allegedly said that he would never again spend time on an invention with no sound market prospect.[523]

In the same year, MIT economist von Hippel outlined his 'lead-users' theory.[524] He argued that manufacturers experience significant benefits when they identify the most experienced and leading-edge users ('lead-users') and involve them in the product development process. He defined 'lead-users' as individuals, firms or organisations which present early needs (months or years before they become general needs in the market place) and tend to benefit significantly from obtaining an early solution to these needs. Based on empirical studies in the chemical and computer industries, he concluded that lead-users may contribute to the innovation process not only with sharing data regarding their needs (and future general needs) but also with *'rich insight to working and tested prototypes of the desired novel product, process, or service'* and even with the development of solutions.[525] Lead users will also tend to be early adopters[526] of the innovations, due to the significant benefits they gain from adoption.[527]

Harvard economist Porter studied in 1990 the role demanding and sophisticated markets (as opposed to individual lead-users) play in creating global competitive advantages for local companies. Based on a four-year study of internationally successful industries in ten important trading countries (Denmark, Germany, Italy, Japan, Korea, Singapore, Sweden, Switzerland, the UK and the US), Porter concluded that the quality, and to a lesser extent the size of demand in the markets where firms are located have a significant influence on the innovation rate of the industry and as a consequence on their competitive advantages on a global level.[528] He explained that local markets which give early and clear signals of emerging buyer needs help build a competitive advantage of local firms on foreign markets. The most significant effect is observed when the needs are stringent and the lead market widely embraces the resulting products. In addition, the needs of the local buyers have to *'anticipate or even shape those of other nations'*, which happens when a nation is *'exporting*

[522] Kline & Rosenberg (1986) 286.
[523] Kline & Rosenberg (1986) 278.
[524] Glen L. Urban and Eric von Hippel, 'Lead User Analyses for the Development of New Industrial Products' (1986) <http://web.mit.edu/evhippel/www/papers/Lead%20Users%20Eric%20von%20Hippel%20and%20Glen%20Urban%20-%201988.pdf> accessed 8 April 2013.
[525] Edler (2006) 19.
[526] However, lead users are not the same as early adopters. Lead users feel the need before the product is available on the market, before early adopters.
[527] Von Hippel (1986)
[528] Michael E. Porter, 'Competitive Advantage of Nations' 81 (1990) *Harvard Business Review*.

its values and tastes as well as its products'.[529] He advocated the legitimate role of the government in challenging firms and rewarding the most innovative ones, without falling into the industrial policy pitfalls, such as protecting inefficient companies from foreign competitions.[530]

The theories of von Hippel and Porter inspired Gheorghiou to develop the concept of 'lead markets'.[531] These are markets with multiple or large single users who are willing to adopt innovations early and pay the premium price for them. In addition, a lead market provides *'the more general conditions favourable to innovation such as an efficient and responsive regulatory structure, security for intellectual property etc.'*.[532] Policy action to support the emergence of lead markets includes the use of innovation-oriented public procurement. The European Commission has embraced this approach and has launched several lead-market initiatives, focused on the early uptake of innovations.[533] Moreover, the EU concept of lead-market constitutes a diluted version of the demanding and sophisticated market in Porter's study. Lead-markets entail early adoption of innovations, but do not cover definition of advanced requirements to influence the early R&D decisions of the innovating companies. PCP has thus not been part of these initiatives. The above described studies argue thus that companies are incentivized to engage in innovative activities when sophisticated end-users articulate advanced and stringent needs, and adopt the developed innovation at an early stage and on a sufficiently large scale. Although they do not refer to the involvement of the end-user in *funding* the R&D trajectory, these studies show that for demand to have an impact on the innovative activities of private actors, it needs to entail the involvement of the end-users and a clear prospect of early commercialisation at a sufficiently broad scale.

Other studies that investigate how *public* demand shapes the innovation process, focus on the role of a public agency in financing the R&D stages and on the role of a public agency in adopting the innovation at an early stage.[534]

They warn that the decision of a public agency to support one specific innovation at an early R&D phase should be based on a solid knowledge on the technological trajectory and market trends, in order *'to avoid lock-in to a technology that is premature or for which*

[529] Porter (1990) 82.
[530] Porter (1990) 87.
[531] Luke Georghiou, 'Effective Innovation Policies for Europe – the Missing Demand-Side', in Economic Council Secretariat (eds), *'Globalisation Challenges for Europe'* (18 ed, Prime Ministers Office Publications Finland 2006) 173-194.
[532] Gheorghiou (2006) 13.
[533] http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/#h2-3
[534] Nesta, 'Demand and Innovation How Customer preferences shape the innovation process' (2010) 14 The Work Foundations Working Paper <http://www.nesta.org.uk/library/documents/Working-Paper-Demand-and-Innovation-v7.pdf> accessed 8 April 2013. Edler (2013).

accompanying business infrastructure is not ready'.[535] Otherwise, the public agency should fund parallel development trajectories.[536]

As early-adopter, a public agency can significantly benefit the innovating company in the following ways:

- by paying a premium for the early use of innovations, the public purchaser ensures early revenues for the innovating firm, which allows the firm to develop the technology up to the point when it is competitive compared to established technologies available on the market.[537]

- as early-user, the public purchaser can provide important feedback to innovators, [538]

- as early-user, the public purchaser can provide credibility to small firms by taking away the perception of risk in adopting that new product/service.[539]

In conclusion, economists agree that public demand can effectively be employed to incentivize the emergence of innovations and to redirect private innovation efforts towards such desired innovations. Based on the review of relevant economic literature, Dalpé et al[540] summarize the following cumulative conditions for an efficient use of public procurement at both the R&D stage and at the early-adoption stage:

- It is employed at the early stages in the life cycle of a product and of an industry;

- competition is maintained throughout the whole innovation process;

- the government is itself a technologically advanced end-user of the innovation;

- the government is capable to offer a sufficiently sizeable market for the developed innovation;

- the adaptation of the product to larger markets is not cumbersome.

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[535] Kincsö Izsak & Jakob Edler, 'Trends and Challenges in Demand-Side Innovation Policies in Europe Thematic Report 2011 under Specific Contract for the Integration of INNO Policy Trend Chart with ERAWATCH (2011-2012) 18 (2011) <http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=7011> accessed 2 February 2013.

[536] Luís M B Cabral, Guido Cozzi, Vincenzo Denicolò, Giancarlo Spagnolo and Matteo Zanza, 'Procuring Innovation', CEPR Discussion Paper Series No.5774 <www.cepr.org/pubs/dps/DP5774.asp.asp> accessed 8 April 2013.

[537] OECD (2011) 23; F. Malerba, L.Orsenigo, R.Nelson and S.Winter, 'Public policy and changing boundaries of firms in a history-friendly model of the coevolution of the computer and semiconductor industries' 67 (2008) *Journal of Economic Behavior & Organization*.

[538] In the UK, for example, studies show that in many sectors, a large share of spending on innovation is oriented towards marketing and preparing the market, rather than on understanding the needs and preferences of customers. See DTI, 'Innovation in the UK: Indicators and insights' (2006) DTI occasional paper No.6 <http://www.dti.gov.uk/files/file31569.pdf> accessed 8 April 2013.

[539] Edler and Georghiou (2007) 955.

[540] Dalpé, Robert, DeBresson, Chris & Xiaoping, Hu, 'The public sector as first user of innovations' (1992) 21 *Research Policy* 252.

Using *public* demand to drive innovation in the context of PCP requires thus that the involved public agency is the potential end-user of the developed innovation and has the willingness and ability to purchase and use it if developed to expected levels of performance and price. As shown in section 1.7.3 above, in such a case, there is a clear conceptual delineation between an R&D subsidy and a PCP contract. When PCP is employed to develop an innovation for a social need, there may be no prospective private customers/consumers at the end of the R&D trajectory, willing and able to buy and use the innovative products. In this case, the PCP leads to the granting of a supply-side subsidy.

2.3.5.3 Empirical studies

A number of economic studies analyse concrete cases when public procurement was used as innovation policy instrument, while others rank public procurement as compared to other innovation policy instruments in terms of positive impact on innovation.

One of the most used examples by economists to demonstrate that public demand can compensate for customers' distrust of the reliability of a new product which is objectively superior to the more established competing products, finds itself in the transistors sector.[541] The initial transistors were initially not competitive in terms of quality and price against vacuum tubes. The financial support from the US Department of Defense ('DoD') within the US SBIR for the continuous improvement of the technology, which by mid 1970s had eliminated vacuum tubes from the market. A similar example is that of the jet engines. Although it cannot be argued that the technology would not have emerged without the SBIR funding by the DoD, it is widely accepted that DoD speeded the time to the market of jet engines. Jet engines eventually replaced piston engines in the civil aircraft industry. The same happened in the case of Internet, after DoD required the development of a packet/switch network instead of the existent circuit/switched network.[542]

In Europe, the most well-known example of a successful use of public procurement to steer private R&D efforts towards environmentally friendly solutions in the household appliances sector comes from Sweden. [543] Between 1988-1998, the Swedish Energy Authorities applied catalytic procurement to stimulate technological advancement in the energy sector. More concretely, it coordinated end-users, in the residential, the service, and the industrial sector and technology experts in identifying potential technological improvements in terms of energy efficiency and articulating procurement requirements for such improved products.

[541] Mowery and Rosenberg (1979) 148.
[542] Malerba et al (2008).
[543] Lena Neija, Kerstin A˚strand, 'Outcome indicators for the evaluation of energy policy instruments and technical change' 34 (2006) *Energy Policy* 2662–2676; Neij, L., 'Methods to evaluate market transformation programs - experience of the Swedish market transformation program' 29 (2001) Energy Policy 67–79.

Through a competitive procedure, the best prototype which met the requirements was then selected and awarded.

The program was accompanied by unique combinations of policy instruments for each developed technology, such as subsidies for the installation costs, training of maintenance personnel, information campaigns, labeling. The catalytic procurement program was also characterized by intensive interaction between the actors involved and by an ongoing monitoring and learning process. Thus, failure in the process of technical change was identified at an early stage and action was taken to redesign or terminate the policy intervention.

The economic analysis of the Swedish programme concludes on its success in bringing improvements in technological performance and in some cases cost reduction. The program proved less effective in impacting other outcome indicators such as increasing sales data, market share, changes in manufacturers' assortment, change in knowledge, attitudes and behaviour of important actors. Moreover, not all of the 30 procurements of technologies included in the program scored positively in terms of outcome.

Economists who evaluated the Swedish program admit though the limitation of the available data necessary for the evaluation, such as lack of information on the levels of the outcome indicators before the start of the program. Moreover, by using outcome indicators, the evaluation of the program reflects the impact of all the public instruments used without distinguishing between them.

Other studies assess the prospect of having a public customer at the end of the R&D trajectory impacts the innovative efforts of the industry. Beise and Rennings[544] conclude on the basis of case-studies of fuel-efficient passenger cars and wind energy that legislation (imposing technological performance requirements) combined with anticipation of international demand created the proper conditions for innovation. International demand appears to have a positive impact on innovation efforts in the vaccine industry as well. A study by Smita Arinivas on the evolution of the vaccine industry in India concludes that technical advance is most stimulated by international procurement when the sector is free from accusations of protectionism and when delivery terms are long and the number of competing suppliers is large. Besides demand, prior learning, enhanced by open

[544] Marian Beise & Klaus Rennings, 'Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations' 52 (2005) *Ecological Economics* 5– 17.

dissemination of technical standards and regulations and the participation of developers and manufacturers in networks, is essential.[545]

Other studies, based on surveys of private firms/innovators reach various conclusions regarding the positive or significant impact of public procurement on innovation. These studies do not distinguish between the type of procurement and do not make clear whether the conclusions are related to the active deployment of public procurement in support of innovation at the specific time or previous to the survey.

For example, based on a survey of Finnish innovators from different sectors, Palmberg[546] concludes that public procurement was the least valuable among different sources of innovation. Miles et al.[547] show that UK firms, out of the seven wider conditions that matter for innovation, rate the intensity of competition and demand for new products and services as the most important after availability of human resources. The study concludes that firms are willing to innovate when innovation delivers them economic and competitive advantages. The extent of these advantages depends on the demand for innovation and the intensity of competition they encounter on the market within which they operate. The stronger and the more clear the demand for innovation in a market, the more willing the firms will be to innovate.[548]

Based on qualitative and quantitative analyses of public demand, Rothwell and Zegveld[549] and Geroski[550] show that on a long-term, public procurement had a more positive impact on innovation than R&D subsidies. Other studies bring evidence that the impact of public procurement on market success of innovations (indicated by turnover from sales of products which are new to the market) is similar in Germany to the impact of university knowledge spilling over to firms, and scores better than regulation and subsidies.[551] The same study indicates that regular procurement rather than defence procurement has a stronger influence and that its impact is most clear on small firms in economically challenged regional markets, with limited financial resources.

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[545] Smita Arinivas, 'Industrial Development and Innovation: Some Lessons from Vaccine Procurement' 34 (2006) *World Development* 1742–1764.

[546] Christopher Palmberg, 'The Sources of Innovation – Looking Beyond Technological Opportunities' 13 (2004) *Econ. Innov. New Techn.* 183–197.

[547] In a functional model of innovation systems the seven conditions which influence innovation are: qualitative public research, openness (of individuals to seek and share knowledge and the existence of physical infrastructure which facilitates effective exchange of knowledge), commercial motivation and entrepreneurship, demand for innovation, a competitive market that facilitates entry, rewards successful innovators and selects out poor performers, access to finance and available and qualitative human resources. See N. Miles, C. Wilkinson, J. Edler, M. Bleda, P. Simmonds and J. Clark, 'The wider conditions for innovation in the UK - How the UK compares to leading innovation nations' (2009) 11-2.

[548] Miles et al (2009)16-17.

[549] Rothwell, R.; Zegveld, W., 'Government regulations and innovation – Industrial Innovation and Public Policy' in Rothwell, R./Zegveld, W. (ed), *'Industrial Innovation and Public Policy'* (Pinter 1981) 116-47.

[550] Geroski (1990) 182-98; Dalpé, R., 'Effects of Government Procurement on Industrial Innovation' 16 (1994) *Technology in Society* 65-83.

[551] Birgit Aschhoff and Wolfgang Sofka, 'Innovation on Demand – Can Public Procurement Drive Market Success?' (2008) ZEW Discussion Paper No. 08-052 <ftp://ftp.zew.de/pub/zew-docs/dp/dp08052.pdf> accessed 8 April 2013.

A more recent survey performed on 10% of the public sector suppliers in the UK, shows that public procurement is the second most important incentive for innovation, following changes in the market demand and preceding internal R&D or private buyers. The survey also concludes that 51,4% of the suppliers who had performed R&D in the previous three years, had increased their R&D expenses as a result of participation in a public award procedure.[552]

The empirical studies support thus the conclusion of the previous subsection that public demand can have an positive impact on innovation.

2.3.6 Services innovation

The 2007 PCP Communication and the accompanying PCP Staff Working Document are not clear on whether PCP is a suitable instrument for the development of innovative services, particularly when they are not built around a(n innovative) technology. On the one hand, the policy documents talk about the role of PCP to assure the development of technological solutions to meet challenging societal needs.[553] On the other hand, they indicate that the result of a PCP can be either an innovative product or an innovative service.[554]

In this section, I will outline the general approach of EU innovation policy to services innovation and I will sketch the main economic theories in this area. Based on this, I will test the fifth assumption that PCP is a suitable instrument to stimulate technological, as well as services innovations.

2.3.6.1 EU policy in support of services innovation

Innovation theories have until recently focused on technologies.[555] And so has EU's innovation policy. But service sectors have increasingly been recognized as important drivers of competitiveness and growth.[556] By 2009, services represented 74,1% of the gross value-added, generated by the EU 27[557] and promised to provide most of the future new jobs and to play an important role in improving the living standards in Europe.[558]

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[552] Luke Gheorghiou, Jakob Edler, Elvira uyarra, Jilian Yeow, e Gheorghiou, Jakob Edler, Elvira uyarra, Jilian Yef" " CChoice, design and assessment, *Technological Forecasting & Social Change* (2013) 7

[553] PCP Communication 4, 9, 10; PCP Staff Working Document 2-3, 10-1.

[554] PCP Communication 2-3, 8; PCP Staff Working Document 3-4, 8.

[555] Service firms were, for instance, included for the first time in the third Community Innovation Survey (CIS-3)capturing innovation performance in 1998-2000. See Commission, 'Challenges for EU support to innovation in services – Fostering new markets and jobs through innovation' 12 SEC(2009) 1195.

[556] Henk L.M. Kox and Luis Rubalcaba, 'Business services and the changing structure of European economic growth' (2007) MPRA Paper No.3750 < http://mpra.ub.uni-muenchen.de/3750/1/MPRA_paper_3750.pdf> accessed 8 April 2013; J.A. Camacho and M. Rodriguez, 'Integration and diffusion of KIS for industry performance' in Rubalcaba, L. and Kox, H. (eds), *'Business Services in European Economic Growth'* (Palgrave/Macmillan 2007) 128-143; M. Tomlinson, 'The contribution of services to the manufacturing industry', in B. Andersen, J. Howells, R. Hull, I. Miles and J. Roberts (eds.), *'Knowledge and innovation in the new service economy'* (Edward Elgar 2000) 36-48; P. Windrum and M. Tomlinson, 'Knowledge-intensive services and international competitiveness: a four country comparison', 11 (1999) *Technology Analysis and Strategic Management* 391-408.

[557] Eurostat yearbook 2011, 36.

[558] SEC(2009) 1195 final 9, 15.

Despite the perceived importance of services in the EU economy, economists remarked that the present innovation system policies are not well adapted to accommodate the new realities.[559] The EU had only recently taken into consideration the potential of public policies to stimulate innovation in services.[560] The EU funding of R&D in services, although at roughly equal levels with the manufacturing firms, had occurred incidentally and mainly in ICT – related services.[561]

The Council of the EU invited in 2006 the European Commission to analyse the status of innovation in services and to assess the necessity to adjust policy accordingly, in order to take into account non-technological innovation.[562] A study commissioned on the basis of this mandate confirmed that R&D and innovation in services need to be stimulated through public policy.[563] As a consequence, the Commission developed in 2007 a policy framework aiming at better supporting innovation in services,[564] and set-up a Working Group on R&D in Services ('Group') to refine potential policy measures to be included in the innovation strategy for the services sector.[565]

The Group concluded that, due to the heterogeneous nature of services, it is difficult to design a single uniform policy to stimulate R&D in services and that more knowledge is needed to this end.[566] According to the Group, R&D in services is often based on collaborations between disciplines, across sectors and regions and *'it is often affected more by mainstream policies than by those aimed directly at innovation'*.[567]

Based on the Group's recommendations, the Commission concluded in a 2009 Staff Working Document that, although less European service firms have reached the top-50 of global players compared to their American counterparts and although innovative small-, medium- and micro-enterprises ('SMEs')[568] active in knowledge intensive services experience difficulties in accessing private finance, this is not sufficient proof of market or systemic failures to justify

[559] Rubalcaba, Jorge Gallego and Pim Den Hertog, 'The case of market and system failures in services innovation', 30 (2010) *The Service Industries Journal* 549–566; OECD, *'Enhancing the Performance of the Service Sector'* (OECD Publishing 2005).
[560] Expert Group on Innovation in Services, 'Fostering Innovation in Services' (2007) <http://www.gencat.cat/diue/doc/doc_33636404_1.pdf> accessed 28 December 2013; Commission, 'Towards a European strategy in support of innovation in services Challenges and key issues for future actions' SEC(2007) 1059; PRO INNO Europe, 'Challenges for EU support to innovation in services – Fostering new markets and jobs through innovation', SEC(2009) 1195, 9.
[561] SEC(2009) 1195 , 64.
[562] Council, '2769th Competitiveness (Internal Market, Industry and Research) Council Meeting' (2006) point 8.
[563] Reneser Project, 'Research and Development Needs of Business Related Service Firms' (2007) http://www.europe-innova.eu/c/document_library/get_file?folderId=21454&name=DLFE-12859.pdf> accessed 8 April 2013.
[564] SEC(2007) 1059.
[565] Jari Kuusisto, 'R&D in Services – review and case studies, A paper submitted for the CREST R&D in Services Working Group' (February 2008) 30 <http://ec.europa.eu/invest-in-research/pdf/download_en/service_rd080129.pdf> accessed 8 April 2013.
[566] Kuusisto, (2008) 51.
[567] Kuusisto (2008) 52.
[568] SMEs are defined in article 2 of Bijlage I of General Block Exemption Regulation as businesses with maximum 250 employees and an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

public intervention. The Commission proposes to build up a better understanding of how innovation takes place in services, before policy tools are developed. [569]

This conclusion is also reflected in the policy approach to R&D subsidies to organizational and process innovation in the State aid area. The Framework for R&D&I imposes separate conditions to aid to process and organisational innovation in services, distinct from the conditions imposed to aid to R&D projects:

- the organizational innovation is related to the use and exploitation of ICT;

- both organisational and process innovation are conducted within a proper R&D project with an identified and qualified project manager and with identified project costs, and entails a clear degree of risk;

- the result of the innovation projects are new or substantially improved compared to the state of the art in its industry;

- the results are in the form of *'a standard, a business model, methodology or concept which can be systematically reproduced, possibly certified and possibly patented';*[570]

- the maximum aid intensity are lower than for traditional R&D technology projects[571] (15% of the cost of the project for large enterprises, 25% for medium enterprises and 35% for small enterprises).

According to the Framework, the separate treatment is justified by the fact that innovative activities in services do not always conform with the definition of R&D, but is *'typically less systematic and stems frequently from customer interaction, market demand, adoption of businesses and organisational models and practices from more innovative sectors or from other sources'*.[572]

In 2011, the European Commission set-up a new advisory group formed of high-profile economists to provide advice on policy options regarding R&D and innovation.[573] In December 2012, the policy recommendations point out to the importance of a supporting policy for innovative services, but at the same time to the gap in knowledge regarding the creation of innovations in services sectors.[574] The experts outline areas of research that need

[569] SEC(2009) 1195, 55, 68-70.
[570] Framework for State aid for R&D&I para 5.5.
[571] Framework for State aid for R&D&I had also extended the definition of R&D to experimental development, which corresponds to the testing phase of the PCP.
[572] Framework for State aid for R&D&I para 5.5.
[573] See http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=expert-groups
[574] Stare Metka & Falz Galluoj, 'Policy Brief N.7 Seizing the opportunities of service innovations' (1-2 December 2012) available at http://ec.europa.eu/research/innovation-union/pdf/expert-groups/i4g-reports/i4g_policy_brief_7_-

to be addressed in order to fill the above mentioned funding gap. They also argue among other, that a revision of public financial schemes in order to make them accommodate services innovations beyond e-services and the use of demand-side instruments such as public procurement are constitute necessary policy measures. It remains to be seen how these recommendations will be reflected into future policy actions undertaken by the European Commission in the area of service innovations.

In conclusion, EU's view on the need to support innovation in services is restrictive. This means that PCP is mainly relevant for technologically demanding solutions. But whenever the minimum conditions for the application of a PCP are fulfilled (particularly the condition that the project activities qualify as R&D services), services innovations could also form the aim of the PCP. The concept of R&D in the PCP area is not limited to activities encompassing (ICT) technologies as it is the case in the R&D policy area.[575] However, activities to develop innovative service solutions will more quickly qualify as R&D services when based on technologies.

2.3.6.2 Economic theories of innovation in services and related empirical studies

As already mentioned, the EU policy choice for limited support to innovation in services is currently based on the fact that theory regarding innovation in service firms is at an early stage.[576] In this section, I will shortly outline the economic literature on the innovation patterns in services.

Some economists consider that a 'one-size-fits-all' innovation cycle applies to all service sectors,[577] while others argue that innovation in services does not have a uniform pattern and that innovation intensity in specific service activities and in specific types of companies may actually be higher than the manufacturing average.[578]

For example, based on empirical data from Spain, Un and Montoro-Sanchez[579] conclude that small- and medium-sized companies (employing fewer than 200 workers) and start-ups have a greater tendency to innovate, both in products (whether in goods or services) and in processes. Moreover, the companies with a greater tendency to implement process

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service_innovation.pdf#view=fit&pagemode=none last accessed 10 October 2013.

[575] The Frascatti Manual remains the leading authority for interpreting the R&D concept.

[576] Services are difficult to define. According to Bryson et al. service functions/activities 'refer to tasks that are being carried out in connection with productive processes and consumption of both goods and services'. J. Bryson, P. Daniels and B. Warf, *'Service Worlds. People, Organisations, Technologies'* (Routledge2004).

[577] Barras concluded that service innovations are characterized by a reverse product cycle (RPC) made of three stages: (1) improved efficiency phase, which means an investment in new technology to increase the efficiency of delivery of existing services; (2) improved quality phase, in which technology is used to improve the quality of services; and, ending the cycle, the stage (3) new products phase, which consists, basically, of the generation of new services. See R. Barras, 'Towards a theory of innovation in services' 15 (1986) *Research Policy* 161-73.

[578] X. Vence and A. Trigo, 'Diversity of innovation patterns in services' 29 (2009) *The Service Industries Journal* 1635–57.

[579] C. Annique Un and Angeles Montoro-Sanchez, 'Public funding for product, process and organizational innovation in service industries' 30 (2010) *The Service Industries Journal* 137.

innovations are those in the financial sector.[580] In contrast, real estate and transport companies prefer not to innovate in services. This conclusion is confirmed by Hollenstein[581] based on the Swiss case. He identifies the causes of the low innovativeness of these services sectors in the weak demand prospects, strong price competition, low appropriability and innovation opportunities, and relatively poor human capital endowment.

Business services[582] more generally are identified by other economists as services which find themselves at the forefront of innovation.[583] Innovation in this sector appears to be the result of combinations of knowledge from different sources (mainly tacit knowledge).[584] Innovation in this sector is positively influenced by intense level of interaction and the high level of interface with clients. The banking, insurance, and other financial services are also sensitive to the innovation coming from suppliers of new technologies and ICT.[585]

The PRO-INNO study[586] came in 2009 to the conclusion that the innovation patterns of knowledge intensive service firms[587] in Europe – which present an R&D intensity above the average of manufacturing companies - are similar to those of manufacturing firms. However, innovation in other services than knowledge intensive ones, is more incremental rather than radical. Compared to the manufacturing sector, less service firms develop internal R&D activities and most new ideas in service companies come from employees and customers.

Other economists advocate that innovation in services should be treated as a completely different field from innovation in manufacturing, thus requiring new theories and instruments of analysis,[588] because the traditional indicators of innovation inputs (levels of R&D expenditures) and innovation outputs (the number of patents) do not reflect the *'hidden parts'* of innovation in services. Innovation in services is often not related to R&D activities and tangible results as defined in the context of technological innovation.[589] Innovation in services

[580] The most important are: online banking, telephone monitoring tools, new or enhanced software or computer networks, application of new methods of risk diversification, optical-electronic document filing, paper-free office management, improved points payment systems, introduction of point-of-sale marketing policy and introduction of new rating or scoring methods.
[581] H. Hollenstein, 'Innovation modes in the Swiss service sector: a cluster analysis based on firm-level data' 32 (2003) *Research Policy* 845-63.
[582] *'Business services cover a broad spectrum of services principally traded in business-to-business transactions. These intermediary services range from software development to temporary-labour agencies, from equipment rental to economic consultancy, and from translation services to accountancy'.* See SEC(2009)1195, 17.
[583] Vence and Trigo (2009).
[584] C. Hipp and H. Grupp, 'Innovation in the service sector: The demand for service-specific innovation measurement concepts and typologies' 34 (2005) *Research Policy* 517–35.
[585] Maria Abreua, Vadim Grinevich, Michael Kitson and Maria Savona, 'Policies to enhance the 'hidden innovation' in services: evidence and lessons from the UK' 30 (2010) *The Service Industries Journal* 115.
[586] SEC(2009)1195 (n275) 9.
[587] Examples of knowledge intensive service activities (KIS) include: research and development (R&D), management consulting, ICT services, human resource management and employment services, legal services (including those related to IPR) accounting, financing, and marketing-related service activities.
[588] Un and Montoro-Sanchez (2010); Barras (1986).
[589] Griliches, Z., 'The Search for R&D Spillovers' 94 (1992) *Scandinavian Journal of Economics* 29-47; Abreua et al (2010); Vence and Trigo (2009).

is instead often determined by users and tacit knowledge rather than by research. Therefore, different measurement indicators are necessary.[590]

Based on empirical data from the UK, Abreua et al[591] remark that organisational innovation is a substantial part of the *'hidden'* dimension of innovation in services, especially in three sectors: financial intermediation, computer services and research and development services. These sectors introduce more major changes in organisation and business structure than either manufacturing or other services. Abreua considers that although there are a number of key drivers of innovation in services, there is no one dominant pattern or model of innovation. The most efficient form of public intervention in support of innovation is to incentivize trainings for high-level skills. This is recommendable for two reasons. Firstly, labour skills are crucial for the innovative capacity of service firms. Secondly, service firms tend to underinvest in training and staff development due to the intensive movement of labour.

The ServPPin study[592] argues that the current prevailing theory for service innovation should be a synthesis between the technological and services theory of innovation, on the background of a converging trend in the manufacturing and services sector in terms of specialization and modularity. Unlike the innovation patterns defined by Schumpeter in which the entrepreneur or the internal R&D labs play a central role, the ServPPIN study remark a trend towards a neo-Schumpeterian innovative pattern in which the central role is occupied by networks of firms.

The Study also provides an overview of the reasons for active and direct public support of services innovation within the framework of public-private networks. The study argues that governments have *'a leading role in initiating and pulling through innovation processes'* in the services sector. This is driven by the privatization of numerous public tasks, the internationalization of economics and politics and the serious social challenges (such as social inequality and environmental threats) that put pressure on the public actor to collaborate with the private sector in finding innovative solutions. Moreover, the public body remains *'the largest service provider in most developed countries'* and most of these services have the characteristic of public goods. This entails that the private sector is not able to provide improvements unilaterally.

Some economists[593] divide the policy tools that may enhance the appropriate environment for innovation in the service sectors between: (i) regulatory-framework-related and (ii) complementary policies. The former group comprises more-normative-oriented policy

[590] SEC(2009)1195, 34-5.
[591] Abreua et al (2010) 99–118.
[592] Andreas Pyka, Benjamin Schön, Paul Windrum, Lars Fuglsang, Koen Frenken, 'Cooperation for Innovation in Services – An Economic Approach to the Theory of Innovation Networks in the Service Industries' (ServPPIN 2009).
[593] Rubalcaba et al (2010).

measures, which range from pro-competition policies to SMEs, support measures and transparency in markets mechanisms, from reinforcement of the appropriability system measures to supporting the creation of a European common market for services.

Among the complementary policy actions the authors recommend to promote service quality and brand recognition for service firms, to encourage results dissemination, to enable collaborative schemes (networks) between both research and industry and users and producers, to enhance access to venture capital and finance from outside the firm. The same authors advocate the important role of standardization in the field of services in order to reduce the asymmetry in information, for the benefit of both provider and user and in order to provide a guarantee of the quality being supplied. The authors see also a role for commercial public procurement of innovative services as a means to reduce uncertainty problems caused by asymmetry of information and to increase through competition the number of active service providers in a market.

In conclusion, most economic studies analysed in this subsection consider that innovation patterns and R&D intensities differ among the various service sectors. Amongst these, knowledge intensive service sectors perform better in terms of R&D intensities than the manufacturing sector. However, innovation activities in many service sectors, and particularly innovation activities in organizational processes, do not qualify as R&D in the traditional sense. This makes established R&D public policies less relevant.

Economists largely agree that the most important drivers of innovation in services are: quality of the human capital (including tacit knowledge), intense levels of interaction with clients and use of innovative (ICT) technologies. Moreover, economists agree that mainstream policies (such as incentives for training of high-level skills etc.) positively impact innovation in services, often more than those policies aimed directly at innovation in services. Among policy measures aimed directly at innovation in services, economists mention: increased access to external finance and commercial public procurement.

PCP as policy instrument is not mentioned in any of the reviewed literature. PCP may however be employed when the minimum conditions for its applicability are fulfilled. However, the condition that only R&D services may be funded through PCP limits the relevance of PCP for the services sector.

2.4 Conclusion

This chapter has described in the first part the policy process which led to the adoption of PCP and the political expectations which built around this instrument. Summarized, the EU

policy-makers expect PCP to incentivize private actors to invest in R&D projects that have the potential to provide ground-breaking solutions to important social problems. In addition, PCP is expected to enhance the innovation capabilities of EU businesses and to grant them a competitive advantage in (new) global markets.

The second part of this chapter tested 5 of the most important economic assumptions that lie at the foundation of PCP, against authoritative economic theories and studies encompassing but going beyond those embraced by the EU innovation policy-makers.

I concluded that there is broad support in economic theory for the first assumption that innovation leads to (social) welfare. Economists also broadly support the second assumption, that R&D investment is a necessary pre-condition of innovation, although it may not be the only or the most important one. Economists differ mostly on the role the government can play as investor in R&D. According to neo-classics, public R&D investments should be justified only in case of a demonstrated failure of the market to invest itself in R&D. According to systems of innovation theorists, public intervention should be approached in a more integrated manner, and should particularly be focused on facilitating interactions between the different public and private institutions that form the systems of innovation.

More recent complexity theories underline that due to the large number of factors that co-impact innovation processes and due to their complex and to a certain extent random patterns of interaction, public innovation policy should be designed as an evolutionary system, open to experimentation, learning and adaptation. In respect of R&D funding, such an evolutionary innovation policy should entail:

- stimulating the emergence of a variety of innovations to be subsequently exposed to the selection process in the marketplace;

- choosing for the most successful innovative trajectory when uncertainties are much lower;

- tolerating redundancy, overlap and excess capacity.

This chapter also tested the assumption that PCP is needed in the EU, due to insufficient investments by venture capitalists in risky R&D projects. Based on a comparative analysis of theories and studies dealing with the role of venture capital in the US and the EU, I concluded that this third assumption is correct. In the US, private venture capital mitigates to a certain extent the difficulties of new innovative firms to access finance for risky R&D projects. However, venture capital is insufficient in the US for potentially high value projects which involve high failure risks, large research and development costs, or long-term return on investment. The shortage of venture capital for risky R&D projects becomes more acute in

times of economic downturn. US public investments in early stage technology firms compensates to a large extent for the funding difficulties of new innovative firms. By 2003, the US government dedicated approximately two to eight times more funds to early stage technology firms than private venture capitalists.

In contrast to the US, EU copes with a far less developed private venture capital market and with low public investments in high risk R&D projects.

This chapter also showed that there is wide support among economists for the fourth assumption, that demand is a key determinant of innovation. Economists distinguish between social or collective needs and demand. Social or collective needs are social problems identified by the government or expressed by society collectively through the political process, while demand is the willingness and ability to buy and use an innovative solution. Based on several landmark economic studies, I concluded that:

- demand may motivate firms to invest in R&D;

- firms are not always able to perceive demand;

- the government has an important role to signal public demand for innovative solutions;

- involvement of the most experienced and leading-edge users (lead-users) in the product development process yields significant benefits to the innovative firm in terms of insight into future demand, testing inputs and even innovative ideas.

- early signaling of advanced and stringent needs together with early and sufficiently wide adoption of the resulting innovation strengthens the competitive position of firms on global markets.

This chapter has also tested the fifth assumption that PCP is a suitable instrument to stimulate technological, as well as services innovations. I pointed out that due to the increasing importance of services for economic growth in Europe and due to the important role of the government as service provider, the EU policy-maker has in recent years investigated the need to support innovation processes in services. Based on outcomes of commissioned studies and expert groups, the European Commission has so far concluded that due to the limited understanding of how innovation emerges in services, a specific public policy cannot be designed. This does not change the fact that whenever innovative activities related to services qualify as R&D, they may form the target of a PCP procedure. This will mainly be the case when the innovation is related to the use of technologies. Thus, PCP remains mainly

relevant for technologically demanding solutions and only to a limited extent for innovation in services.

On the basis of the analysed economic studies and theories, I can summarize the following economic preconditions for the effective implementation of PCP:

1. the public R&D funding targets the most experimental and riskiest R&D projects;

2. the public R&D funding targets small companies, that experience difficulties in obtaining (sufficient amounts of) private capital for experimental/risky R&D projects;

3. a high degree of experimentation and tolerance to failure are accepted;

4. competition is maintained throughout the whole innovation process;

5. the public purchaser is the technologically sophisticated end-user of the envisaged innovation;

6. the public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation;

7. when the public purchaser is not the end-user of the envisaged innovation, it is capable to convey the advanced needs of the private end-users to the innovator and it is capable to adopt additional policy measures to stimulate the early up-take of the developed innovations by the private end-users (the case of the so-called catalytic PCP);

8. the adaptation of the product to larger (foreign/global) markets is not cumbersome;

9. innovative technologies rather than innovative services are targeted;

10. a continuous scrutiny/measurement of the impact of PCP is performed and lessons learnt are codified in guidance.

This chapter sets the scene for the following outline of the differences between the US SBIR, and the PCP procedure and for the discussion on the significance of these differences for the successful deployment of PCP in Chapter 3.

CHAPTER 3. PCP- a poor imitation of the US SBIR ?

3.1 Introduction

As already mentioned in Chapter 1, the European Commission formulated the PCP Communication with the aim to emulate the success of the US Small Business Innovation Research (SBIR) program, by pulling valuable R&D projects into the commercialization phase and enhancing the competitive position of its suppliers on the global market. The US SBIR had been attributed the merit of creating a demanding environment for innovations and stimulating private investors to increase their share of R&D funding.[594] The content of the PCP procedure as presented in the PCP Communication shows that the US SBIR constituted the source of inspiration.

In this chapter, I will compare the EU PCP procedure with the US SBIR and I will investigate whether they comply with the efficiency indicators summarized in section 2.4 of Chapter 2. To this end, I will describe in section 3.2 the format of the US SBIR program and the rationale for its adoption. I will also summarize the conclusions of the different evaluations of the SBIR program. I will point out throughout the text the relevant differences between the EU PCP and the US SBIR. In section 3.3 I will sum-up the differences between the two programs and I will also highlight in how far the two programmes incorporate the conditions for efficient implementation identified in Chapter 2.

3.2 The US SBIR programme

3.2.1 Legislated set-asides

The US SBIR program was set-up in 1982 through the Small Business Innovation Development Act (Act).[595] The Act mandated Federal agencies with yearly extramural R&D budgets in excess of $100.000.000 to reserve certain percentages of these budgets for contracts and grants to small businesses.[596] The Act represented a codification of the practice first implemented at the National Science Foundation (NSF).[597] This type of federal institutions with large and stable R&D budgets cannot be found within the EU. Although some organisations were set-up in order to facilitate the collaboration of EU Member States in R&D projects (such as the European Defence Agency), they have an evident intergovernmental character. Decisions to proceed with an R&D project depend on the approval of national defence

[594] Commission, 'Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe' (PCP Communication) COM (2007) 799 final.
[595] Small Business Innovation Development Act of 1982 (P.L. 97-219) 15 U.S.C. 638.
[596] Small Business Act of 1958 (P.L. 85-536) section 9(f)(1).
[597] Arthur S. Obermayer, Senator Ted Kennedy's Role in the Birth of the Small Business Innovation Research Program' (2009) <http://www.zyn.com/sbir/Kennedy_&_SBIR.pdf> accessed 17 July 2014; Fred Patterson, 'Reflections on the Birth of the SBIR Program' (2009) http://sbircoach.blogspot.com/2009/09/reflections-on-birth-of-sbir-program.html accessed 17 July 2014; National Research Council, *'An Assessment of the SBIR Program'* (The National Academies Press 2008) (NRC (2008)) 16-7.

ministries of the EU Member States.[598] The different set-up of the EU as compared to the US is described in Chapter 5, section 5.2. A detailed institutional analysis remains however outside the scope of this research.

Since 1982, the SBIR program has been repeatedly reauthorized, and amended.[599] The mandatory set-aside percentage grew from 0,2 to 1,25 % between 1982 and 1988 and was established at 2,5% in 1992.[600]

In December 2011, the latest Reauthorization Act extended the SBIR program for a period of six (6) years up to September 30, 2017 and brought significant changes which implement most of the recommendations made in an extensive evaluation report of the National Research Council (NRC).[601] Among others, the Reauthorization Act of 2011 provided for a gradual increase in the minimum set-asides for the period 2012-2017: 2,6 % in 2012 and an increase by 0.1 percentage point each fiscal year until it reaches 3.2% for fiscal year 2017.[602]

These changes took effect on the 6th of August 2012.[603] On that date, the Small Business Administration (SBA), the central organization in charge of managing the SBIR programme, published guidelines regarding the implementation of the legislative changes (these are described in more detail in section 3.2.2.1).

Within the framework of the SBIR program over 4000 awards are made each year, for a total of around $2 billion annually.[604] By 2009, over 112.500 awards had been made since its inception, for a total amount of more than $26.9 billion.[605] 11 federal departments and agencies are currently mandated to conduct SBIR programs: Department of Agriculture, Department of Commerce, 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 (NASA), and National Science Foundation. The largest SBIR funding agencies are the Department of Defense and the National Institutes of Health. The

[598] European Defence Agency, 2012 Financial Report June 2013 <http://www.eda.europa.eu/docs/default-source/finance-documents/eda-2012-financial-report-audited.pdf> accessed 6 November 2013.
[599] Small Business Research and Development Enhancement Act of 1992 (P.L. 102-564), reauthorizing the SBIR program until September 30, 2000. The Small Business Reauthorization Act of 2000 (P.L. 106-554) reauthorized the program until September 30, 2008. Subsequently, Congress passed numerous extensions, before the latest SBIR/STTR Reauthorization Act of 2011 (P.L. 112–81).
[600] NRC (2008) 16-7. In 1992, a related program, the Small Business Technology Transfer program (STTR), was set-up for projects undertaken in collaboration with universities. This program benefited from additional set-asides from external R&D budgets. Discussion on this related program falls outside the scope of this chapter.
[601] SBIR/STTR Reauthorization Act of 2011, section 493.
[602] SBIR/STTR Reauthorization Act of 2011, section 5102 (a)(1).
[603] Small Business Administration, 'Small Business Innovation Research Program Policy Directive' (SBA Policy Directive) (8 August 2012) <https://www.federalregister.gov/articles/2012/08/06/2012-18119/small-business-innovation-research-program-policy-directive> accessed 18 December 2012.
[604] OECD, 'Public procurement programmes for small firms – SBIR-type programmes' (2010) 2 (OECD 2010) <http://www.oecd.org/innovation/policyplatform/48136807.pdf> accessed 2 February 2013.
[605] See SBA website <http://www.sbir.gov/about/about-sbir> accessed 18 December 2013.

Department of Defense, National Institutes of Health, NASA, National Science Foundation and the Department of Energy have each SBIR budgets of over $100 million.[606]

Other Federal agencies than the ones mentioned above may voluntarily participate in the SBIR Program, upon written approval of SBA.[607]

Unlike the US SBIR, PCP is a voluntary instrument. As shown in section 1.4 above, the EU does not have the competence to regulate such budgetary aspects of Member States. Moreover, the Lisbon Treaty does not offer a ground for legislative action in the field of research and development,[608] nor in the field of strengthening the competitiveness of EU industry. It rather allows the EU to adopt policy and coordinating action.[609] Mandatory set-asides are left to the discretion of each Member State.[610]

3.2.2 Goals and rationale

The idea for the set-up of the US SBIR program emerged at the end of the 1970s, when industrial competitiveness in the global market was increasingly acknowledged as the prerequisite for increased standards of living and for improved national defense. During the same period, concerns were growing that the US was losing its competitive position in emerging technologies against its main competitor, Japan.[611]

The US concluded that the cause of its poor performance was the inability to commercialize innovative technologies in global markets. At the same time, small businesses were identified as '*particularly capable of developing research and development results into new products*'. *Small businesses were also considered to be 'among the most cost effective performers of research and development'*.[612] Despite their important role in the innovation process, small businesses encountered difficulties in accessing finance, and particularly federal R&D finance, for risky R&D projects.[613] The difficulties to access finance appeared to be especially acute for small starting businesses, who lacked a record in innovative activities, who

[606] David Connell, 'Secrets' of the World's Largest Seed Capital Fund: How the United States Government Uses its Small Business Innovation Research (SBIR) Programme and Procurement Budgets to Support Small Technology Firms' (2006) (Connell 2006) 9 <http://www.cbr.cam.ac.uk/pdf/SBIR%20Full%20Report.pdf> accessed 5 February 2013.
[607] SBA Policy Directives 34.
[608] Consolidated version of the Treaty on the Functioning of the European Union (TFEU) [2008] OJ 115/47, art 4(3), 179(2), 181(2).
[609] Art 173(1) TFEU provides for example, that the EU shall ensure the proper conditions for the competitiveness of the Union's industry by 'fostering better exploitation of the industrial potential of policies of innovation, research and technological development'.
[610] Some states (such as the UK) have already adopted such minimum set-asides for their PCP-like programs. For details, see discussion in chapter 4.
[611] Mary Ellen Mogee, *'Technology Policy and Critical Technologies, A summary of Recent Reports'* (National Academy Press, Washington 1991) (mogee (1991)) 27.
[612] Small Business Innovation Development Act of 1982 section2(a).
[613] The SBIR agencies are currently required to find 'a portofolio balance between exploratory projects of high technological risk and those with greater likelihood of success'. See SBA Policy Directives 28. See also Technopolis Group, 'Eerste evaluatie Small Business Innovation Research (SBIR) programma's in Nederland' (4 March 2010) (Technopolis 2010) 114 http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CDsQFjAA&url=http%3A%2F%2Fwww.rijksoverheid.nl%2Fbestanden%2Fdocumenten-en-publicaties%2Frapporten%2F2010%2F03%2F04%2Feerste-evaluatie-small-business-innovation-research-sbir-programma-s-in-nederland%2F10143501-bijlage.pdf&ei=0fcMUbLUE8bR0QWH3ICYAw&usg=AFQjCNFcmSZhejL8GI8_8vit4TWHliZwvw&sig2=QG8FzAaOfPUZRhG10B2adA accessed 2 February 2013; Small Business Act, section 9(a).

performed small projects of limited interest to private investors, and who lacked information or means to come in contact with potentially interested investors.[614]

As a consequence, the SBIR program was established with the aim to '*strengthen the role of innovative small business concerns (SBCs) in Federally-funded research or research and development (R/R&D)'*.[615] More broadly, the following objectives were associated with the SBIR programme: 1) to stimulate technological innovation; 2) to increase the commercialisation of innovations; 3) to use the innovative capabilities of small businesses to meet federal research and development needs; and 4) to stimulate minorities and disadvantaged persons to participate in the creation of technological innovation.[616]

Since 1990, SBIR agencies were required to give priority to specific areas identified as critical to national security and economic prosperity.[617] On the basis of this obligation, various lists of National Critical Technologies were produced by the National Critical Technologies panel or by the Secretary of Defense.[618] Such technologies were identified as crucial in enhancing the competitive advantage of the US in the global competition, on the basis of such criteria as the importance/criticality of a technology for the national economy or the size of the commercialization market.[619] Many technologies (such as ICT, semiconductors, optoelectronics, artificial intelligence, manufacturing technologies, sensor technologies and high-density data storage) are repeatedly uptaken in different reports and there is considerable overlap between the critical defense technologies and critical commercial technologies.[620] Nevertheless, whenever contracts are awarded, the concrete and direct needs of the SBIR agency take lead in determining the subject-matter and area of an SBIR call.

The justification of the government intervention through SBIR was found in the economic theory of innovation ecosystems, which is similar to the 'systems of innovation' theory which became influential in the EU since the 1970s. The theory of innovation ecosystems is based on the idea that '*complex synergies among a variety of collective efforts [are needed to]*

[614] NRC (2008) 31-3.
[615] SBA Policy Directives 3.
[616] Small Business Innovation Development Act of 1982, Sec.2 (b).
[617] According to the United States Code, 1991 Edition, Title 42 The Public Health and Welfare (42 U.S.C. 6683) such reports should be issued biannually by the National Critical Technologies Panel and should include not more than 30 of the most economically important emerging civilian technologies for the next 10 years, including an estimation of the current and future size of the domestic and international markets for products derived from such technologies (section 6683(a)-(b)). National critical technologies are those technologies which have the potential 'to further long-term national security or economic prosperity of the United States' (section 6683(b)). The Secretary of Defense is mandated by the same legislation to identify technologies for the defense area. (10 U.S.C. 2522) Section on Armament retooling and manufacturing. See also Executive Order 13329 of February 24, 2004. Section 2 mandates the heads of SBIR agencies to give priority to manufacture-related R&D and to report to SBA and to the Office of Science and Technology Policy on the undertaken efforts to implement this executive order.
[618] The obligation to formulate SBIR solicitations is reiterated in SBIR/STTR Reauthorization Act of 2011, section 638 (g)(3).
[619] Mogee (1991) 20-3.
[620] Mogee (1991) 26.

bringing innovation to market'.[621] These are internal as well as collaborative efforts of numerous actors: large and small businesses, universities, and research institutes and laboratories, as well as venture capital firms and financial markets and government policy.[622] Moreover, multiple institutional variables influence the efficiency of an innovation process: e.g. rules that protect property (including intellectual property) and the regulations and incentives that structure capital, labor, and financial and consumer markets. Also the *'shared social norms and value systems — especially those concerning attitudes towards business failure, social mobility, and entrepreneurship'* impact the innovation ecosystem.[623]

Public policies were considered to improve innovation-led growth by strengthening links within the system and SBIR was in this regard seen as an intermediating institution between venture capitalists, entrepreneurs and other participants in the innovation eco-system. As intermediating institution, the SBIR brings these actors together in achieving desired national objectives, which, without the government intervention, would not come about on the private market.[624] The US SBIR is thus not viewed in terms of demand-side or supply-side approach, but as a measure to create the links between the relevant actors in the innovation eco-system. In section 3.2.3.7, I will point out that the US SBIR can be qualified as both a demand-side and a supply-side innovation policy instrument.

The goals of the US SBIR are similar to those invoked by the EU in regard of the PCP.[625] The public R&D support is meant to stimulate enhanced R&D efforts in areas of public importance that would otherwise not be addressed by private innovators. In addition, the public R&D support is meant to increase the global competitive advantage of national companies and trigger benefits for the national economy.

However, the two counterprograms differ in an important aspect. The US SBIR targets the most innovative small-businesses that may encounter difficulties in accessing funds for risky R&D projects.[626] This was confirmed in Chapter 2 as being a prerequisite for the effectiveness of the public intervention. Unlike in the US, in the EU the dominant view is that small and large businesses encounter equal funding difficulties in developing technological solutions for societal challenges and early customer feedback on new product developments can be

[621] NRC (2008); The idea of an innovation ecosystem builds on the concept of a National Innovation System (NIS), was popularized by Richard Nelson of Columbia University. According to Nelson, a NIS is 'a set of institutions whose interactions determine the innovative performance … of national firms'. See Richard R. Nelson and Nathan Rosenberg, 'Technical Innovation and National Systems' in *'National Innovation Systems: A Comparative Analysis'*, Richard R. Nelson eds (OUP 1993).
[622] Mogee (1991) 28.
[623] Interesting to note here is that Europeans seem to have, for example, a greater fear of entrepreneurial failure than Americans. See the NRC (2008) 29; Commission, "Entrepreneurship—Flash Eurobarometer Survey' (January 2004) http://europa.eu.int/comm/enterprise/enterprise_policy/survey/eurobarometer83.htm accessed 18 December 2012.
[624] *The Valley of the Death is* the period of transition when a developing technology is deemed promising, but too new to validate its commercial potential and thereby attract the capital necessary for its continued development.
[625] Discussed in section 1.2 above.
[626] Fred Patterson, 'The SBIR Game: How to Play it to Win' (June 2005) <http://www.sbircoach.com/files/The%20SBIR%20Game%20-%20How%20To%20Play%20It%20To%20Win.pdf> accessed 15 July 2014.

beneficial for companies of all sizes.[627] Moreover, the exclusion of large companies from participation in a PCP procedure would entail according to the European Commission discrimination on the basis of nationality against large companies from other Member States and would breach the TFEU.[628]

3.2.3 Organisational features

3.2.3.1Decentralised implementation

According to section 9(j) of the Small Business Act (Act), the Small Business Administration (SBA) is endowed with the coordination, monitoring, support and evaluation of the SBIR program.

SBA fulfills its coordinating role by formulating mandatory guidelines for the Federal agencies which operate SBIR programmes. As previously mentioned, the latest guidelines (SBA Policy Directives) came into effect upon their publication on the 6th of August 2012. These SBA Policy Directives enforce the latest amendments to the SBIR Program, introduced by the Re-authorization Act of 31th of December 2011. SBA's Policy Directives are meant to bring consistency in the implementation of the SBIR program within the different agencies, while leaving sufficient flexibility to the agencies to adapt the program to their specific needs. The Policy Directives establish for example the 3 phased structure of an SBIR procedure, but leave it to the agencies to formulate evaluation criteria. They also mandate the agencies to exclude applicants with more than 20 Phase I awards or 15 Phase II awards over the prior 5, 10 or 15 fiscal years, who do not achieve sufficient commercialization rates. Yet they allow the agencies to establish the applicable commercialization benchmarks.[629]

The SBIR agencies formulate goals in achieving certain performance areas, which are set by the SBA (for example, an agency will decide by how much it aims to reduce timelines for awards). Together they will agree on performance metrics to evaluate the achievement of the goals.[630] The SBIR agencies are also mandated to report yearly, as well as throughout the year on different aspects of their SBIR programme.[631] SBA will bundle these yearly reports and other information provided by the agencies throughout the year and will report back to the Congress on the overall performance of the SBIR program.[632] Evaluation of certain aspects of the SBIR program may be performed by the Interagency SBIR Policy Committee, an institution made of representatives from SBIR agencies and SBA. This Committee reviews certain aspects

[627] Commission, 'Policy related Frequently Asked Questions on Pre-Commercial Procurement (PCP) and the link with Public Procurement of Innovative Solutions (PPI)' (FAQ PCP) <http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf> accessed 30 January 2013.
[628] PCP Communication 7. This point is not largely supported by literature or case-law. Max V. Kidalov, 'Small Business Contracting in the United States and Europe: A Comparative Assessment' 40 Pub. Cont. L.J. (2011) 453.
[629] SBA Policy Directives 9-11.
[630] SBA Policy Directives section 10(i) and 11(d)(5).
[631] SBA Policy Directives 33, 38, 46-8, 50.
[632] SBA Policy Directives section 10(g).

of the program (such as commercialization assistance best practices, flexibility in Phase I and II award sizes, etc.) and makes policy recommendations for the improvement of the program's effectiveness and efficiency.[633] Moreover, every four (4) years, studies of the functioning of the SBIR should be performed by the National Academy of Sciences (NAS) in accordance with the parameters set by the Interagency SBIR Policy Committee.[634]

In its coordinating role, SBA acts as an information hub for the SBIR competitions of all participating agencies. It publishes before August 1 of each year the schedule of up-coming SBIR competitions and manages a searchable database with the upcoming SBIR calls for proposals from all the involved agencies (topics and closing dates).[635] SBA also coordinates the release schedules, in order to spread the SBIR competitions throughout the whole year. This allows small businesses sufficient time to submit proposals for more than one topic.[636]

However, the granting agencies drive the SBIR process. It is the responsibility of each SBIR agency to formulate the SBIR calls in line with its needs and its mission. It is also the responsibility of each SBIR agency to carefully consider the priority sectors, when formulating the SBIR calls.[637] The SBIR agencies are responsible for receiving and evaluating SBIR proposals, for signing funding agreements and for the publication of award announcements, and for managing the funding agreements.[638]

SBA fulfills its monitoring tasks by reviewing the compliance of policies, rules, regulations, interpretations and procedures generated by the agencies with its own Policy Directives,[639] and by supervising the correct use of discretion, granted to the SBIR agencies and individual program managers. SBA monitors, for example, the correct calculation of the extramural R&D budgets,[640] the implementation of the recommendations of the Interagency Policy Committee to improve the effectiveness and efficiency of the program,[641] the existence of conflicts of interest when making multiple awards to the same company or awarding an agreement for which only one proposal had been received,[642], the consideration of the critical technologies when defining the SBIR topics,[643] compliance with the maximum

[633] SBA Policy Directives 37.
[634] SBA Policy Directives 37-8.
[635] Ecorys, 'Study on pre-commercial procurement in the field of security' (November 2011) 47 <http://ec.europa.eu/enterprise/policies/security/files/doc/pcp_sec_finalreport_en.pdf> accessed 29 January 2013. Small Business Act of 1958, section 9(b) and (j) SBA Policy Directives 41.
[636] SBA Policy Directives 15.
[637] Such as the National Critical Technologies as discussed in the previous section.
[638] Small Business Act of 1958, section 9(g). SBA Policy Directives 28-9, 50.
[639] SBA Policy Directives 52.
[640] SBA Policy Directives 4, 49.
[641] SBA Policy Directives 50.
[642] Small Business Act of 1958, section 9(l).
[643] According to section 9(g)(3) of the Small Business Act of 1958, each Federal agency is required when formulating SBIR solicitations to give special consideration to research topics which further one or more critical technologies, as defined by the National Critical Technologies Panel or the Secretary of Defense.

thresholds for awards to venture capital (VC), hedge funds or private equity owned small business[644] etc.

Besides assessments and recommendations, SBA has various corrective mechanisms, such as appealing the decision of a project officer with the head of the SBIR agency, or receiving back the funds unrightfully awarded to companies that do not meet the SBIR eligibility criteria from agency's non-SBIR funds.[645] Against the companies that make false declarations during the SBIR competitive procedure, SBA (or the SBIR agency) may pursue criminal, civil or administrative remedies.[646] The False Claims Act is attributed an important role in this context. According to the False Claims Act, a penalty of up to three times the value of the SBIR funding may be applied for false certification.[647]

On the support side, SBA establishes and maintains several databases related to the SBIR program, such as a database with information on ownership and affiliation of SBIR applicants (information submitted and updated by businesses which intend to apply for SBIR awards), including VC, hedge funds or private equity owned small businesses; a database with information on the number of Phase I and II awardees and a database with calculation of Phase I-II transition rates for Phase I awardees and commercialization rates for all Phase II awardees).[648]

SBA is also responsible for tackling the problem of lower participation of small businesses from certain states within the SBIR program. The Small Business Act creates the possibility for the respective states to provide matching funds from non-federal sources to small businesses located within their territory in order to stimulate their participation in the program. To the same end, the Small Business Act mandates the SBA to provide additional assistance in programs and activities employed within these states.[649]

The US SBIR program is thus a program set up by Federal legislation, with organizational responsibilities shared between SBA and the participating Federal agencies. Moreover, in the US a continuous assessment of the impact of the SBIR programme is performed by different institutions and recommendations are implemented in practice. This was identified in Chapter 2 as an important prerequisite for the effective deployment of public R&D funding.

[644] SBA Policy Directives 18.
[645] SBA Policy Directives 18.
[646] SBA Policy Directives 60.
[647] David P. Metzeger, 'SBA's Final SBIR/STTR Eligibility Rule: A Safer Harbor for SBIR Financing', available at http://www.arnoldporter.com/resources/documents/SBAs%20Final%20SBIR-STTR%20Eligibility%20Rule_%20CIT.pdf, last accessed 12 July 2014.
[648] SBA Policy Directives 4, 12, 39-45.
[649] Small Business Act of 1958, section 9(s).

Unlike in the US, PCP has not been set-up as a mandatory program to be executed by certain EU-wide agencies. PCP has a recommendation status and relies on the will of national contracting authorities to find common needs and engage in the perils of cross-border collaborations. Moreover, in the EU there is no agency endowed with the task to coordinate, monitor or assess the application of PCP. The European Commission has partially assumed such a role. Besides having initiated the drafting of the PCP Communication, the European Commission has commissioned regular evaluations of the status of application of PCP in the EU and has financed dissemination of knowledge and best practice on PCP through the set-up of networks of contracting authorities from different Member States. Recently, the European Commission adopted a more hands-on approach, meant to encourage the creation of best practices in the application of PCP. It funds all the organisational costs of a collaborative cross-border PCP procedure and part of the subsequent R&D costs. It also monitors the execution of these funded projects.[650] However, the subsidiarity principle and the strong national interests in the EU have impeded so far the adoption of a mandatory and PCP programme coordinated at EU level (these aspects are discussed also in Chapter 5, section 5.2).

3.2.3.2 Eligibility criteria

The US SBIR sets eligibility requirements regarding the ownership of the company, type and location of the work performed and past performance of SBIR applicants.

Firstly, only 'for-profit' US companies may participate, which are at least 51% owned by US citizens (or legally admitted permanent resident aliens), or at least 51% owned by another "for profit" business, that is itself at least 51% owned and controlled by one or more US citizens. Moreover, the company or its parent company may not have more than 500 employees.[651] These eligibility criteria need to be complied with at the time of the award, not the proposal, which allows individuals to set-up a company in-between.[652] The latest Reauthorization Act of 2011 has introduced a major change, by allowing the award of maximum 25 % of the SBIR funds of the NIH and National Science Institute, and 15 % of the SBIR budget of the other agencies to firms that are owned in majority by (multiple) venture capitals (VC), hedge funds or private equity companies. In order to make use of this possibility, each agency needs to obtain prior authorization from the SBA. To this end, each SBIR agency needs to show that awards to such companies would not undermine the objectives of SBIR, and would complement rather than substitute the financial means of the VC, hedge fund or equity capital owned company.[653]

[650] For an overview of the current PCP projects funded by the EU, see <http://cordis.europa.eu/fp7/ict/pcp/projects_en.html>.
[651] 13 CFR Ch. I (1-1-01 Edition), section 121.702.
[652] SBA Policy Directives 17; 13 CFR Ch. I (1-1-01), section 121.704.
[653] Section 5107(a)(dd) of SBA's Policy Directives provides that the head of the Federal agency will explain in written why the award to firms

Secondly, all the R&D activities funded by SBIR program must take place in the United States, while up to 1/3 of Phase I and 1/2 of Phase II may be performed outside the company concerned. The project leader of an SBIR project must be for at least 51% of his/her time employed by the company.[654] This allows researchers from universities or from research institutions to progress towards a commercial business.[655]

Thirdly, only novel work may be funded within the SBIR program. The same application (or 'essentially equivalent work') may not be funded twice within different SBIR competitions[656] and only work meant to create and/or apply new knowledge may be funded, such as: '*(A) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (B) a systematic study directed specifically toward applying new knowledge to meet a recognized need; or (C) a systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements*'. [657]

Fourthly, the SBIR applicants who have received more than a certain number of Phase I or Phase II awards during the previous 5, 10 and 15 years, from any of the SBIR agencies, must meet certain benchmarks for progress towards commercialization, as well as actual commercialization rates of products resulting from previous SBIR funded projects.[658] Moreover, SBIR applicants who have received in previous 5, 10 or 15 years a certain number of Phase I awards, must meets certain benchmarks regarding the rate of winning Phase II agreements.[659] An applicant who does not meet the commercialization threshold when submitting the application could be excluded from SBIR competitions for one year starting from the date the application was submitted.[660] These newly introduced eligibility criteria seek to reward applicants which have a good record in proceeding to Phase II and to commercialization.[661] For example, an SBIR agency may decide that an SBIR applicant who received in the last 10 years more than 4 Phase II awards should prove commercialization of at least one of the products developed under one of these SBIR Phase II contracts. In case the SBIR participant is not capable to bring this proof, he may be excluded for one year from participation in SBIR competitions advertised by the agency.

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funded in majority by venture capital/hedge fund/private equity firms, will: "(A) induce additional venture capital, hedge fund, or private equity firm funding of small business innovations; (B) substantially contribute to the mission of the Federal agency; (C) demonstrate a need for public research; and (D) otherwise fulfill the capital needs of small business concerns for additional financing for SBIR projects." See also section 5107(c), SBA Policy Directives.

[654] SBA Policy Directives 18-9.

[655] SBA Policy Directives 18-9. Connell (2006) 8.

[656] SBA Policy Directives 22.

[657] Small Business Act of 1958, section 9(5).

[658] SBA Policy Directives 10.

[659] SBA Policy Directives 11.

[660] SBA Policy Directives 10.

[661] SBA Policy Directives 9.

As already mentioned in section 1.3, the European Commission chose to adopt a more open approach to the eligibility criteria for PCP. The Commission recommends in its 2007 Communication that participation in PCP should not be restricted to participation by EU-based or EU-owned companies, but should be left open to participation of businesses from all parties to the Government Procurement Agreement (GPA), provided they locate their research activities within the EU. The approach of the EU PCP is based on the premise that stimulating technological solutions for societal challenges in international competition (but on the EU territory) will bring the desired growth and welfare and will indirectly contribute to enhancing the innovative capabilities of European businesses.[662] However, EU procurers may decide on a case-by-case basis whether competition within a PCP should be limited to EU service providers.[663]

The EU PCP does not define any further requirements regarding ownership of the companies allowed to participate in a PCP. Within the US SBIR, companies owned by private equity funds, venture capitals or hedge funds may be entitled to compete for the R&D funds. This is in line with the conclusion in Chapter 2 that venture capital does not fund the riskiest but most promising R&D projects.

3.2.3.3 Phases

The SBIR program is a phased program, which awards funds in competition and based on merit.[664] No limitation is imposed on the number of SBIR agreements individual firms may acquire, unless it does not justify the efficient use of the funds through minimum commercialization rates.[665]

The first two of the following three phases outlined below are funded under SBIR:[666]

- Phase I, the feasibility study, can be funded with maximum USD 150 000. Small firms can test during six (6) months the scientific and technical value and the feasibility of their R&D effort.

- Phase II, the R/R&D effort, takes place during two years and involves a funding of maximum USD 1.000.000 for a full R&D effort. However, it is not necessary to exhaust the whole R&D effort needed for commercialization. This means that the

- Phase III, when the firm pursues the commercialisation objectives resulting from Phases I and II.

[662] PCP Communication 6..
[663] When procurers are concerned with aspects related to national security, they may limit competition to European businesses. See PCP Communication 6.
[664] NRC (2008) 65; SBA Policy Directives 9.
[665] NRC (2008) 65.
[666] Small Business Reauthorization Act of 2011, section 5103(a)-(c); SBA Policy Directives 24.

Phase III does not receive funds from the SBIR program. This phase may though be funded from other budgetary sources. Studies indicate that about 10% of projects are supported by other federal research funding.[667] SBIR Phase III awards may be made without competition and there is no limit on the number, duration or amount of Phase III awards and the limitation on the size of the business ceases to apply.[668]

Before the latest Reauthorization Act of 2011, all Phase II recipients must have received first a Phase I award. This requirement was meant to ensure that more advanced research is not favoured to the detriment of Phase I projects.[669] The Reauthorization Act of 2011 introduced the possibility to deviate from this requirement under certain circumstances: when awarding a SBIR Phase II to an STTR Phase I awardee,[670] provided the awardee meets the other eligibility criteria; upon written motivation by the heads of the National Institutes of Health (NIH), DoD and the Department of Education.[671] Moreover, multiple Phase II funding may be provided to continue the initial R&D effort.[672] This approach highlights the high level of flexibility in experimenting with uncertain research projects and the high level of tolerance to early failure embedded in the programme. These features were identified in Chapter 2 as prerequisites for successful implementation of a public innovation policy.

Companies that completed a Phase II successfully, can obtain a Phase III status. This entails that they benefit of a preference in case of future purchases of products such as those developed within SBIR projects. A government agency will be able to sole source (purchase without competition) the product from this company. This preference extends to the case when a sub-contractor is involved in the supply or when the business is taken over by a larger company.[673]

However, in practice, it appears difficult to get purchasers to buy SBIR products. They often consider the obligation to buy SBIR products as a burden on their budgets and tend to avoid the risks associated with new products. Besides being encouraged by top management to purchase SBIR products, the procurement officers are regularly informed about the available products.[674] The latest Reauthorization Act of 2011 underlines the need to prioritize the purchase of products developed through SBIR. Section 9(r) has been amended to include the following: "*(4) Phase III Awards – To the greatest extent practicable, Federal agencies*

[667] NRC (2008).
[668] SBA Policy Directives 14.
[669] NRC (2008) 82.
[670] The Small Business Technology Transfer (STTR) programme is another federal programme that funds R&D performed by small businesses and nonprofit institutions in collaboration with a public research institute.
[671] SBA Policy Directives 12.
[672] SBA Policy Directives 13.
[673] NRC (2008) 12.
[674] Technopolis (2010) 85.

and Federal prime contractors shall issue Phase III awards relating to technology, including sole source awards, to the SBIR and STTR award recipients that developed the technology."[675]

Moreover, SBA has been mandated by the same Reauthorization Act to monitor and report to Congress all the instances in which an agency pursues the same R&D or production of a technology with another business than the SBIR awardee.[676] In order to implement this obligation, SBA requires SBIR agencies to notify and motivate their decisions to engage with other businesses than SBIR awardees for the same type of R&D or production. SBA may appeal these decisions, but is not endowed to coerce a different course of action.[677]

The structure of the US SBIR and PCP is similar. As mentioned in section 1.3, PCP proposes to divide the contract into three phases: feasibility, development and testing, while the US SBIR limits to feasibility and the full R&D effort (which may involve a testing phase as well). There is however, a major difference between the US SBIR and the PCP in terms of post-PCP possibilities: PCP does not provide for a 'Phase III' status and an EU contracting authority is not allowed to purchase directly a product resulting from the PCP procedure.[678] Moreover, the PCP guidance does not mention the need for the contracting authority to commit or guarantee to subsequently purchase the targeted innovative solution. The early uptake of the developed innovation has been identified in Chapter 2 as an important prerequisite for the successful implementation of a demand-side R&D policy. In this sense, the EU PCP lacks an important efficiency prerequisite.

3.2.3.4 Percentage of funded R&D costs

In the US, there is no requirement of cost-sharing between the Federal agency and the small business, although such a course may be stimulated by certain agencies (however, not allowed as an evaluation factor of the proposal).[679] Most SBIR agreements (whether contracts or grants) fund the full costs of the R&D project, according to cost principles and procedures approved by each agency, plus a 'reasonable fee or profit'.[680] Moreover, agencies have the freedom to make SBIR awards as fixed price contracts or cost type contracts.[681]

PCP on the other side, requires contracting authorities to pay a market price for the contracted R&D services, which should reflect the sharing of benefits and risks with the supplier. This entails that the contracting authority should not pay 100% of the R&D costs. This distinction was considered necessary to ensure compliance with the EU State aid rules, which do not allow EU contracting authorities to fund the total costs of an R&D project. As I will

[675] SBIR/STTR Reauthorization Act of 2011, section 5109.
[676] SBA Policy Directives 15.
[677] Ibid.
[678] PCP Communication 10.
[679] SBA Policy Directives 22.
[680] SBA Policy Directives 23.
[681] Ibid.

explain more in detail in Chapter 5, only the costs of basic research may be fully funded with public money, while applied and experimental research (which form the target of PCP) may only partially be funded.

3.2.3.5 Confidentiality and IPR

The SBIR Re-Authorization Act of 2011 and SBA's Policy Directives provide for confidential treatment of any proprietary information submitted in an SBIR proposal or generated during the performance of an SBIR agreement. The Small Business Act provides for *'retention by a [small business] of the rights to data generated by the concern in the performance of an SBIR award'* (copyrighted material) and the SBIR agency is mandated to protect such data from disclosure and non-governmental use for a period of at least 4 years from delivery of last deliverable in any (subsequent) SBIR funding agreement, unless express permission for disclosure is granted by the owner.[682] Data in the sense of these clauses covers 'recorded information', meaning something that can be read (e.g. SBIR Phases I and II final reports, computer code, computer programs, computer documentation, drawings, equations etc.)[683] The Government obtains a royalty-free license *'to use and to authorize others to use on its behalf, these data for Government purposes (…)'*.[684]

The US government also retains a royalty-free license for Federal use of patented inventions, while the small business may retain the principal worldwide patent rights. The US government may also require under certain circumstances the patent holder to license others and may require that inventions be manufactured in the US. The invention will not be disclosed for a period of 4 years, in order to allow sufficient time for obtaining patent protection.[685]

These provisions are mandatory for all SBIR agencies and may not be subject to negotiations with applicants in SBIR competitions.[686] According to the Bayh-Dole Act, which governs the division of rights to inventions made by small businesses under government funded grants, contracts or cooperative agreements, and is the framework legislation applicable to SBIR contracts, the public agency may deviate from this standard arrangement for reasons of national security. The decision to deviate from this standard needs to be motivated and can be appealed by the contractor.[687]

The intellectual property conditions of the SBIR and PCP are similar. However, unlike in the EU, the division of intellectual property rights ('IPR') between the contracting authority and the

[682] SBA Policy Directives 25-6.
[683] David P. Metzger and Kristen O. Riemenschneider, 'SBIR Data: What They Are, What They Are Not, and How to Mark Them' 10 *Transition* (2013) 9.
[684] SBA Policy Directives 75.
[685] Ibid.
[686] SBA Policy Directives 26.
[687] 37 CFR Part 401, art 14.

supplier is in the US mandated by legislation and is also legislated in detail.[688] The ownership of the innovation developed during the project goes by default to the company, while no royalty or repayment in case of successful commercialisation is due to the government.[689] The Bayh-Dole Act, also provides detailed control and enforcement mechanisms for SBIR contracts, such as time-limits for disclosure of the invention, consequences related to non-disclosure, reporting on the application of the invention after the SBIR contract etc.[690]

3.2.3.6 Flexibility

As already mentioned, the SBA's Policy Directives provide mandatory guidelines to federal agencies on the operation of their SBIR programs and SBA supervises the proper implementation of these guidelines and the exercise of the discretion allowed by the Policy Directives. Within this context, the SBIR agencies retain substantial flexibility in conducting their own SBIR programs.[691]

For example, SBA's Policy Directives indicate which evaluation criteria an SBIR agency must minimally use:[692] (i) technical approach and expected benefits; (ii) adequacy of the proposed effort to achieve the desired solution and the intensity of the relationship to the fulfillment of the solution; (iii) soundness and technical merit of the proposal; (iv) qualifications of the main researchers and other participants; (v) commercialisation potential (based on the following sub-criteria: commercialization record in previous SBIR projects or other research, existence of third parties funding commitments, existence of Phase III commitments, other indicators of the commercial potential). An SBIR agency is however allowed to further specify these criteria or add others.

Moreover, the Policy Directives allow deviation from certain rules, upon written motivation and approval from SBA or the head of the SBIR agency. Rules from which deviation is possible regard, for example: the obligation to perform the 1/3 of Phase I activities and ½ of the Phase II activities within the organization of the awardee; obligation for the principal investigator (researcher) to be employed for more than half of his working time by the awardee; the obligation to perform the R&D work within the US territory for both Phase I and II;[693] the obligation to extend the contract period,[694] or the value of the awards.[695] The new Reauthorization Act increases flexibility in funding Phase II agreements from another agency

[688] Bayh-Dole Act (P.L. 96-517); SBA Policy Directives.
[689] 37 CFR Part 401, art 14.
[690] For a more detailed discussion on the Bayh-Dole Act see section 1.5.1.2(b) above.
[691] SBA Policy Directives 3.
[692] SBA Policy Directives 72-3.
[693] SBA Policy Directives 18-9.
[694] SBA Policy Directives 24.
[695] SBIR/STTR Reauthorization Act of 2011, section 5103(d)(aa).An agency may increase the award guidelines for Phase I and II up to 50% upon SBA approval. See also SBA Policy Directives 24.

than the Phase I awardee or following an STTR Phase I award.[696] Moreover, a pilot between 2012-2017 allows the National Institutes of Health, the Department of Defense and the Department of Education to provide Phase II awards to a small business which has not previously received a Phase I award regarding the same project.[697]

The allowed flexibility leads to differences between the precise approach to SBIR among the different federal agencies and among the different departments of the same agency (such as among the different departments of DoD), in terms of procedure, amount of funding, degree of innovativeness required, number of calls, broadness or specificity of the topics etc.

Hereunder, I provide a summary of the SBIR procedures within the DoD and National Institutes of Health (NIH), the two most important agencies in terms of SBIR program size and with the most diverging approaches.

DoD awards annually around 2000 Phase I and 1000 Phase II contracts,[698] defines its topics in detail, steers the research during the execution of the R&D contract and uses procurement and other mechanisms to stimulate the subsequent commercialization of the resulting products.[699] DoD's SBIR department is organized in a flexible manner, with few overheads and high quality programme managers appointed for short periods of four to six years.[700] A DoD programme manager is mandated to prepare in advance a Technology Development Strategy that assesses the needs which can be met through new SBIR procedures, and outlines support measures for the commercialization of technologies developed during previous SBIR contracts.[701] For each topic a Technical Point of Contact (TPOC) is appointed, which can be contacted for questions and clarifications on the technical aspects of the call for proposals up to the deadline for submission of the proposals.[702]

DoD focuses thus within the framework of the SBIR, on developing technologies meant to fulfill its operational needs and hires high-quality managers to identify these needs and the most suitable support measures for the commercialisation of the developed technologies. DoD managers closely interact with the SBIR participant and steer the R&D contract during the execution of the project. Moreover, SBIR liason officers ensure communication between the

[696] SBIR/STTR Reauthorization Act of 2011, section 5104.
[697] SBIR/STTR Reauthorization Act of 2011, section 5106.
[698] Deputy under Secretary of Defense, 'Memorandum for Secretaries of the Military Departments Directors of Defense Agencies' (8 December 2008) (Memorandum (2008)) <http://www.acq.osd.mil/osbp/docs/memorandum_sbir_phase_III_guidance.pdf accessed 2 February 2013> accessed 2 February 2013. See also SBIR annual reports <http://www.acq.osd.mil/osbp/sbir/about/sbirAnnualReport.shtml#fy11> accessed 18 December 2012.
[699] SBA, 'The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program – Program Overview', slide 12 (SBA Program Overview) <http://www.sbir.gov/about/about-sbir> accessed 18 December 2012.
[700] Marianna Mazzucato, 'The Entrepreneurial State' (Demos 2013) 76 (Mazzucato (2013)).
[701] The needs assessment and needs definition phase involves an integrated and collaborative process between different internal stakeholders, who advice and assist in identifying the needed capabilities and in formulating 'broad, time-phased, operational goals'. The needs assessment is the basis for identifying concrete needed material solutions. See DoD Instructions 5000.02 'User Needs and Technology Opportunities' (8 December 2008) <https://acc.dau.mil/CommunityBrowser.aspx?id=332529> accessed 2 February 2013.
[702] DoD 2004.3 SBIR solicitation <http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20043/index.shtml> accessed 18 December 2012.

SBIR contractor and the end-customers within the agency.[703] These are important features for effective R&D demand-side public policies, as identified in Chapter 2.

Within the DoD, the Defence Advanced Research Projects Agency (DARPA) is endowed with the mission to promote the most radical, high risk projects with long-term return expectations.[704] In line with its focus on highly innovative solutions, DARPA has more flexibility than other Department of Defense agencies in conducting the SBIR programme.[705] This flexibility allows DARPA to experiment with new strategies, such as increasing the exchange of knowledge across competing research groups, bringing in contact university researchers and entrepreneurs interested to start a new company, small businesses and venture capitalists, SBIR awardees and large companies able to commercialize the developed technology etc.[706] DARPA's approach to fund the most radical, high risk projects, to allow experimentation and to tolerate early R&D failure are characteristics that pay-off on the long-term. Some of the most successful technologies in the market place have been funded by DARPA at very early stages in the R&D trajectory.[707] These features are confirmed by the economic studies analysed in Chapter 2, as being crucial for an effective employment of public R&D funding from the demand-side.

Within the DoD, there are three main criteria for evaluating proposals:

• Soundness, technical merit and the level of innovation of the proposed approach, and its incremental progress towards the topic or subtopic solution;

• Qualifications of the firm and team to perform the R&D and commercialize results;

• Potential for commercialisation. This includes evaluation on the basis of past performance of the company with the commercialisation of the results of previous SBIR projects (as indicated by the Commercialisation Achievement Index (CAI), a centralized database at federal level).[708]

Following the evaluation, price negotiations are performed with the best ranked applicants. The Federal Acquisition Regulation provides in article 15.404-1(b)(2) a list of techniques to perform price analysis.

[703] NRC (2008) 71-2.
[704] NRC (2008) 21.
[705] Ibid.
[706] Mazzucato (2013) 79.
[707] V. Ruttan, 'Is War Necessary for Economic Growth?: Military procurement and technology development' (OUP 2006).
[708] Each company must submit with any DoD Phase II SBIR proposal a Commercialisation Report which describes the commercialization of the products developed in a previous Phase II project. The content of these reports is automatically computed into the CAI, when four or more projects have completed Phase II. Firms with a CAI in the bottom 10% may not receive more than half of the evaluation point for the commercialisation criteria. See NRC (2008) 16.

Although for most of the SBIR projects 100% funding is provided, DoD operates a so-called "Fast Track" policy for some SBIR and STTR projects. This entails that better chances of proceeding to Phase II are given if some matching cash is found by the participating company from outside investors, customers or sponsors. The proportion of projects receiving this treatment is though small (for example, only about 2% of Army Phase II awards).[709] DoD provides multiple Phase II awards to promising SBIR projects which necessitate additional development, test and evaluation (Phase II Enhancement program).[710]

Since 2006, support is also provided for commercialisation at Phase III. DoD signs, for example, Technology Transition Agreements with SBIR awardees during Phase II, with the objective of increasing the commercialization chances of an SBIR technology and minimizing the risks of uptake of such technologies into the DoD organisation. The Technology Transition Agreements identify the stakeholders (acquisition officers within DoD (including the end-customer), SBIR manager and SBIR awardee) and attribute responsibilities and commitments in the process of developing, delivering and integrating an SBIR technology into commercially ready products. The agreements identify for example, funding sources beyond Phase II, as well as strategies regarding integration and testing.[711]

DoD departments are moreover allowed to set up a Commercialisation Pilot Program (CPP) and provide subsidies for the commercialization phase and encourage subsequent commercial procurements of the developed products. The Reauthorization Act of 2011 has renamed it the Commercialisation Readiness Program. Within this program, the Secretary of each DoD department is authorized to identify research programs funded under SBIR which meet high-priority needs and are close to commercialisaiton and use incentives to encourage the SBIR program managers to fund follow-on awards.[712] The Navy, for example, sets aside around 20% of its SBIR funds for the CPP and by 2009, had supported 129 projects.[713]

Within the context of the CPP, the Navy has for example, set up a Transition Assistance Programme (TAP), which consists concretely in a series of workshops, trainings and briefing meetings which are organized over a 10 month period, to help companies develop their commercialisation plans and present their technology to both DoD and private undertakings. At the end of the TAP, the annual Navy Opportunities Forum gives companies that have

[709] NRC (2008) 15.
[710] Office of the Under Secretary of Defense, 'Report on Department of Defense Small Business Innovation Research Program Commercialization Pilot Program - Report for Fiscal Year 2009' 3 (CPP Report) <http://www.acq.osd.mil/osbp/sbir/docs/FY09-SBIR-Commercialization-Pilot-Program-Report-to-Congress.pdf> accessed 2 February 2013.
[711] See <http://www.acq.osd.mil/osbp/sbir/gov/transition-guidance.shtml> accessed 18 December 2012.
[712] SBA Policy Directives 54-5.
[713] CPP Report 3-4.

successfully completed the TAP programme the opportunity to present their products to a broad audience of around 400-500 representatives of DoD and of the private sector.[714]

In addition, DoD must give preference, including sole-source awards to the SBIR awardees and whenever R&D contracts or production contracts are pursued with another company than the business which developed the SBIR-technology, report and justification is due to the SBA.[715]

Unlike DoD, NIH focuses on innovative drugs and medical devices for the private end-user and awards in 95% of the cases grants instead of contracts. As opposed to the DoD approach, it defines less specified SBIR topics and allows unsolicited proposals as well.[716] During the performance of the project, no substantial involvement with the recipient of the grant occurs.[717] Overall size of grants is the same as within DoD ($100k Phase I and $750k Phase II), but in practice individual grants vary widely in amount.

The key evaluation criteria are[718]:

(i) Significance (does the project address an important problem/critical barrier in the field and does the envisaged solution have a high probability of commercialization?);

(ii) The proposed approach (are the proposed strategy, methodology and analyses suitable to lead to the achievement of the envisaged solution?);

(iii)Level of innovation (are novel theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?);

(iv)Experience and expertise of the "principal investigator" (main researcher) and research team;

(v) Adequacy of the facilities and resources of the project.

In addition, evaluation of Phase II proposals take into consideration the progress towards meeting the objectives set in the Phase I proposal. Moreover, NIH operates a so-called "Fast Track" policy for SBIR projects, which entails that both Phase I and Phase II applications are reviewed at the same time in order to eliminate the funding gap between the two SBIR phases. In this case, better scores are given if commercialization plans are submitted and letters of support from potential commercialisation partners and/or Phase III funders are

[714] NRC (2008) 20.
[715] Memorandum (2008).
[716] SBA Program Overview slide 12.
[717] <http://grants.nih.gov/grants/policy/nihgps_2012/nihgps_ch1.htm#definitions_of_terms> accessed 2 February 2013.
[718] <http://grants.nih.gov/grants/funding/sbirsttr_ReviewCriteria.htm> accessed 2 February 2013.

provided.[719] Moreover, starting in 2014, a database regarding the transition rate to Phase II and commercialization rates of recipients of a certain amount of SBIR awards is expected to be operative and the transition rate and commercialization rate will be taken into consideration in the evaluation of the SBIR applications.

NIH also supports commercialisation of the products developed within SBIR programs and the Phase III financial support is more substantial than within DoD in terms of amount of funding and available coaching on commercialization strategies. This difference is justified by the fact that developing promising drug compounds and medical devices takes much more money and time than is available under the SBIR phases. Thus, within the framework of NIH's Commercialization Assistance Program (CAP), Renewal Applications may be submitted by Phase II awardees. Within the CAP, funds may be provided for subsequent development work, for preclinical studies of drugs or devices, for regulatory approval, etc. These awards generally amount to $1m per year for up to three years.[720]

Supplementary consulting programs are made available, to assist SBIR awardees with commercialization. At Phase I, NIH provides consulting support related to the potential of the innovation to be commercialised and related to the aspects that need to be taken into consideration, such as competitors, applicable regulation, potential clients and price; at phase II it provides one-on-one consulting (from an advisor/industry expert) for a period of 18 months, related to concrete steps towards commercialization, such as finding investors, partnerships, applying for IPR etc.[721]

In conclusion, unlike the EU PCP, the US SBIR programme is a large, established programme, with experienced personnel that is allowed sufficient flexibility to tailor the support to each project and to adopt a large array of support measures up to the commercialization phase. As already mentioned, a high degree of experimentation and tolerance to failure have been identified in Chapter 2 as key prerequisite for the success of demand-side R&D policies.

3.2.3.7 Contracts and grants

The EU has identified SBIR as a demand-side policy instrument (or a public procurement instrument) used by the US in pulling R&D projects into the commercialization phase. However, the SBIR program covers both demand- and supply-side instruments. According to the Small Business Development Act of 1982, the SBIR program covers '*contracts, grants or cooperative agreements entered into between any Federal agency and any small business*

[719] <http://grants.nih.gov/grants/funding/sbir_faqs.htm> accessed 2 February 2013.
[720] <http://grants.nih.gov/grants/policy/nihgps_2012/nihgps_ch18.htm#_Toc271265315> accessed 2 February 2013.
[721] <http://grants.nih.gov/grants/funding/cap/> accessed 2 February 2013.

for the performance of experimental, developmental, or research work funded in whole or in part by the Federal Government'.[722]

Agencies such as DoD and NASA mainly focus on topics related to their specific needs and award contracts, while the National Institute of Health (hereafter: NIH) accepts (unsolicited) applications, that are not directly linked to a specific need of NIH (or to a specific call) and awards grants.[723]

The grants correspond to what one calls 'subsidies' in the EU, while contracts correspond to public contracts subject to the EU public procurement rules. The distinction in the US between grants and contracts lies in the purpose of the R&D contract. According to the Federal Acquisition Regulation (FAR), contracts are used '*only when the principal purpose is the acquisition of supplies or services for the direct benefit or use of the Federal Government'* and grants are used '*when the principal purpose of the transaction is to stimulate or support research and development for another public purpose'*.[724] SBIR contract awards are more specific than grants and are defined in detail. The SBIR agency awarding contracts gets involved closely in the execution of the SBIR project and is capable of sole-sourcing (purchasing without competition) at a later stage the developed solution.

An SBIR contract is thus awarded when the Federal agency needs a product which is not available commercially on the private market, for accomplishing its own tasks. Such an example constitutes the SBIR call launched by NASA, to fulfill its need for a much lighter, energy efficient laser system than available on the market, to be used for a new NASA science mission that would take continuous measurements of CO2 (carbon dioxide) and O2 (oxygen) data from space. The data collected by the satellite would form the basis of better-informed policy decisions related to climate change.

Such collection of data would be for the first time achieved by using a satellite rotating around the globe. The laser transmitter module was the crucial component in sensing which areas of the globe are emitting O2 and/or CO2. The small company EM4 received an SBIR award to develop this module. They came up with a module 7 times lighter, 3 times more energy efficient and with improved functionalities, which was subsequently used by NASA for its mission.[725]

In conclusion, the US SBIR distinguishes between grants (or subsidies) for the development of solutions whose end-customer finds itself on the private market and R&D contracts for the

[722] Small Business Innovation Development Act of 1982, section 121.701(c).
[723] NRC (2008) 82.
[724] Federal Acquisition Regulation (FAR) art 35.003 (a).
[725] <http://decadal.gsfc.nasa.gov/documents/10_ASCENDS.pdf> accessed 2 February 2013.

direct benefit and use by the SBIR agency. PCP covers as well both types of instruments, but has been labeled in its entirety as a demand-side instrument.

3.2.4 Evaluation of the US SBIR

3.2.4.1 Impact of US SBIR

Since the inception of the US SBIR, economists have interpreted in different ways the results of the programme, without reaching general consensus on its positive impact on innovation. Qualitative assessments (on the bases of success stories), as well as quantitative assessments (how many patents are or how much money is generated from the SBIR funds, after exiting the program) have been performed. Both approaches present difficulties in depicting the real economic impact of the program. The first approach can be criticised for not taking into account the tendency of government agencies to choose advanced technologies with a good chance for success. The second approach presents three main difficulties: 1) finding comparable firms that did not benefit of SBIR funds; 2) quantifying profits from the commercialisation of products developed with SBIR funds; 3) reflecting social value which is not captured by patents or profit.[726]

An example of a quantitative assessment of the US SBIR is that performed by Joshua Lerner in 1999. He compared 500 companies that had received SBIR contracts with 900 matched companies which hadn't. He came to the conclusion that firms who had received SBIR funds created within 10 years five times and in some regions even 17 times more jobs and attracted more venture capital than firms who hadn't received an SBIR contract.[727]

In a more recent analysis, Furman et al[728] expresses doubts about the positive impact of the public investment in defence-related R&D on the national innovation performance. He found that the R&D spending in industry and universities – which are not linked to investments in defence-related R&D - have a heavy impact. He also found indications that the level of investment in defence-related R&D may influence negatively the level of industry investment in R&D. To reach these conclusions, he used a quantitative indicator of innovative outcomes, namely the number of patents.

Mowery[729] presents a more nuanced conclusion. He notices that, on the one side, defence-related investments in innovation have created bodies of scientific or engineering knowledge, have stimulated the development of new technologies with both civilian and

[726] *'The Department of Defense for instance is using the company commercialisation report (which requires firms that submit bids for phases I or II to report commercialisation for all previous awards). However, this dataset does not include further growth by award-winners that are ineligible for (or do not apply to) further awards'.* OECD (2010) 5.
[727] J. Lerner, 'The Government as Venture Capitalist: The Long-run Impact of the SBIR Program' (1999) Journal of Business 72.
[728] J. Furman, M.E. Porter, & S. Stern, 'The determinants of national innovative capacity' (2002) 31 Research Policy 899–933.
[729] David C. Mowery, 'National security and national innovation systems' (2009) 34 J Technol Transf 455–473.

defence-related applications (the spin-off effect) and have determined the creation of a market for early versions of new technologies. He considers that defence-related procurement had especially a positive impact on the information technology sector in the US and that technologies such as the jet engine, swept-wing airframe or light-water nuclear reactors are 'spinoffs' from defence-related R&D spending. On the other side, the author underlines that defense-related procurement had a detrimental impact on some products and industries, such as the numerically controlled machine tools.

Mowery also notices that in the '80s and '90s public R&D support for small firms specialized in defence applications in the semiconductors and information technology sectors attracted numerous critics.[730] A general line of criticism referred to the low social return of investments in defence-related R&D and to the risk that defence-related R&D would be a disincentive to private finance for R&D in civilian technologies. Mowery remarks that criticism weakened since late '90s, when a surge in productivity marked the beginning of the so-called 'new economy'. In the case of many new technologies, the US defence agencies acted as lead customers and paid premium prices for the early use of these new technologies. They supported in this manner the further development of groundbreaking technologies up to the point when they became commercially competitive.[731]

As part of the re-authorization of the SBIR program, the Congress mandated in 2000, a comprehensive evaluation of the effectiveness of the program in stimulating commercialization of innovation and in providing additional economic and non-economic benefits. The SBIR programs of the 5 agencies which account for more than 90% of the total value of the program (the Department of Defence, the National Institutes of Health, the National Aeronautics and Space Administration, the Department of Energy, and the National Science Foundation) formed the subject of evaluation. The study was conducted by the National Research Council (NRC) on the basis of surveys, case studies, data and document analyses, as well as on the basis of interviews of program staff and agency officials. It resulted in a series of reports between 2005-2009.

NRC recognized from the beginning the difficulties in evaluating a program such as SBIR. In setting metrics for SBIR projects, NRC considers that it is important to have realistic expectations of success rates for new firms and for unproven but promising technologies.[732] On the one hand, SBIR pursues highly novel, risky and difficult research, which inevitably

[730] Some authors argued that, due to technological specialization and increased reliance on incremental improvements (rather than radical developments) and substantial costs involved in transferring technology to different uses, the spin-off model weakened. See for example, John A. Alic, Lewis Branscomb, Harvey Brooks, Ashton B. Carter, and Gerald L. Epstein, *'Beyond Spinoff: Military and Commercial Technologies in a Changing World'* (Harvard Business School Press 1992) 4-5 (Alic et al (1992)).
[731] Rajeev K. Goel, Rajeev, James E. Payne, and Rati Ram, 'R&D expenditures and U.S. economic growth: A disaggregated approach' (2008) 30 Journal of Policy Modeling 237-250.
[732] NRC (2008) 47.

involves failed projects.[733] On the other hand, even when successfully developed to meet intrinsic needs of the contracting Federal agency, such technologies may still not reach commercial maturity due to various obstacles, such as cancelled programs and missions or the perception of risk, which prevents them from being up-taken in the acquisition process. However, such project failures should not necessarily be seen as programme failure.[734]

Many of the surveyed participating companies confirmed that they would not have undertaken the R&D without public support because the private return that they perceived they would earn would be less than the minimum accepted rate of return required for private financing of projects (private hurdle). The NRC Study estimates that up to two-thirds of the SBIR projects constitute such projects and that in these cases the SBIR support helps to reach the appropriate rates on return of R&D.[735] Moreover, 20% of the respondents to the surveys indicated that the SBIR award was entirely or partially the triggering factor to found a company.

The 2009 Study of NRC underlines that approximately 30-40% of the products developed through SBIR reach the commercialization stage.[736] On average, the respondent firms grew from the time of the Phase II award until the time of the survey, with 29,9 of full-time employees. Out of these, the interviewed firms estimated that, as a direct effect of the SBIR award, they were able to employ 2,4 employees and to retain 2,1 more. However, the number may lie much lower, due to the fact that most firms which went out of business are not taken into account.

The general conclusion of NRC is that the SBIR programme is *'sound in concept and effective in practice'*.[737] The SBIR programme achieves important goals: 1) it leads to the creation of new scientific and technical knowledge; 2) it facilitates private investment by signaling quality and thus reducing the information asymmetries between innovators and private investors; 3) it supports the growth of a diverse array of small businesses; and 4) it encourages the commercialisation of the products developed with public R&D funds; 5) it stimulates the development of technologies which can meet the specific needs of public agencies in health, transport, the environment, and defense.[738] This is particularly relevant to DoD, which faces new challenges in an era of new threats, constrained budgets and stretched manpower.[739]

[733] NRC (2008) 65.
[734] NRC (2008) 65.
[735] NRC (2008) 55.
[736] National Research Council, '21st Century Innovation Systems for Japan and the United States: Lessons from a Decade of Change: Report of a Symposium' (2009) (NRC 2009) <www.nap.edu/openbook.php?record_id=12194&page=92> accessed 18 December 2013.
[737] NRC (2008) 54-5.
[738] NRC (2008) 57.
[739] NRC (2008) 36.

Another study on the effects of the NIH SBIR program concluded that the average employment and sales growth of Phase I and/or Phase II firms, over three, five and eight years following the first year after the SBIR award, was higher than that of firms whose applications for SBIR funding were rejected.[740] The interviewed firms confirmed that a large share of this growth was due to the SBIR awards.[741] Other studies have focused on the impact of the SBIR funds in certain areas or on the success of certain companies.[742] These studies stress the particular importance of the SBIR program in funding R&D in the so-called 'enabling platform technologies' (such as biotechnology or ICT), which have multiple applications in different areas, and can trigger potentially broad societal benefits.[743] They stress the importance of the initial boost provided by military demand, which eventually diminishes once private applications are up-taken.[744]

3.2.4.2 Strengths, weaknesses and points of improvement

The NRC studies concludes that flexibility, 3 Phased structure and possibility for multiple awards to individual firms are the key features to the effectiveness of the SBIR programme. According to NRC data, most companies with multiple awards are high performers in meeting the agency's needs and in reaching large amounts of commercial sales. The 2008 NRC Study dismisses the concerns that allowing venture capital (VC) funded firms to participate in the SBIR would crowd out private funding in high-risk projects.[745] Based on various economic studies,[746] the Study concludes that the SBIR funding does not exclude, but complements the VC funding and allows companies to pursue high risk research in addition to the projects typically funded by VC investors.[747] Moreover, the NRC Study considers unjustified the obligation adopted during the reauthorization of the programme in 2000, to

[740] M. Ege, *'How do grants influence firm performance? An econometric evaluation of the SBIR programmes at NIH'* (PhD thesis, State University of New Jersey 2009).
[741] 6.82% greater sales growth, and 6.90% greater employment growth. In 44% of cases SBIR awards were credited with over 50% of company growth.
[742] Audretsch, for example, argues that the SBIR program has been beneficial to highly innovative American companies, such as Apple Computer, Chiron, Compaq and Intel, which received funding at an early stage in their innovation processes. See David B. Audretsch, 'Standing on the Shoulders of Midgets: The U.S. Small Business Innovation Research Program (SBIR)' 20 (2003) Small Business Economics 133. See also John Tirman, 'The Militarization of high technology' (Ballinger Pub. Co. 1984); Robert B. Archibald and David H. Finifter, 'Evaluation of the Department of Defense Small Business Innovation Research Program and Fast Track Initiative: A Balanced Approach' in Wessner Charles W. (ed) '*The Small Business Innovation Research Program: An Assessment of the Department of Defense Fast Track Initiative*' (National Academy Press 2000); Alic et al (1992).
[743] Maryann P. Feldman, 'Role of the Department of Defense in Building Biotech Expertise', in Charles Wessner (ed) '*The Small Business Innovation Research Program (SBIR): An Assessment of the Department of Defense Fast Track Initiative*' (National Academy Press 2001) 251-74.
[744] Microelectronics, semiconductors, where advances were initially driven by military demand, which eventually diminished to less than 1% by 2002, in favour of civil applications . See Enelle Guichard, 'Dual-use policies in the French and European perspectives' (October 2003) 4 <http://www.sussex.ac.uk/Units/spru/events/KP_Conf_03/documents/Guichard.pdf> accessed 18 December 2012.
[745] NRC (2008) 71.
[746] Joshua S. Gans and Scott Stern, 'When Does Funding Research by Smaller Firms Bear Fruit ?: Evidence from the SBIR Program' (September 2000) <http://www.nber.org/papers/w7877> accessed 2 February 2013.
[747] NRC (2008) 72.

restrict SBIR participation to companies which are 51% owned or controlled by US citizens or permanent residents.[748]

As already mentioned, the Reauthorization Act of 2011 introduces the possibility for SBIR agencies to allow VC, hedge funds or private equity owned small businesses to participate in SBIR competitions and win up to a certain percentage of the SBIR budget.[749] However, the second NRC recommendation regarding the ownership eligibility criteria, has not been up-taken.

NRC also underlines the importance of allowing flexibility to adapt the structure of the SBIR award procedure. Program managers need to be given room to adapt the program to the needs of specific technologies and unique mission needs (such as waivers on funding size or on amount of support for commercialization, possibility to change the specifications of the call during the R&D project).[750] This is considered the only way to encourage program managers to make a balance between high-risk technologies with important long-term benefits against less radical technologies with promising commercialisation perspectives and immediate benefits.

However, allowing such flexibility entails the risk that choices may be influenced by lobbying. NRC suggests that regular assessments of the performance of the programme can act as a guarantee against abuses.[751] The new Reauthorization Act of 2011 has picked up on these recommendations. As already mentioned, deviations from funding amounts, award of multiple Phase II awards and increased commercialization support is made possible, while the possibilities for reporting fraud and for measuring the results of the program are strengthened.

The NRC study underlines the following weaknesses in the implementation of the SBIR programme: 1) long evaluation times of the SBIR proposals, particularly before Phase II, which creates a funding gap for small high-tech companies with limited own resources; 2) tendency to award to more proven technologies; 3) complex rules and procedures to be followed by bidding firms;[752] 4) high overhead costs for the SBIR agencies, mainly due to the focus of the SBIR on a large number of small projects (this increases the time and effort to prepare the calls, to evaluate the offers and to monitor the progress after the award).[753] As already described in the previous sections, the Reauthorization Act of 2011 took heed of the recommendation to shorten the evaluation times. SBIR agencies other than the National Institutes of Health or National Science Foundation (to which the term of 1 year is applicable)

[748] NRC (2008) 70.
[749] SBA Policy Directives 17; 13 CFR Ch. I (1-1-01), section 121.704.
[750] NRC (2008) 66.
[751] NRC (2008) 55.
[752] NRC (2008) 38.
[753] NRC (2008) 36.

are required to adopt measures to reduce the evaluation time to 90 days from the application deadline.[754]

The NRC Study makes other concrete suggestions for improvements: 1) adoption within more agencies of Fast Track program such as the one of DoD;[755] 2) adoption of Phase III support, particularly when the agency does not acquire the products of the firms receiving the SBIR award; 3) strengthening the evaluation methodologies and practices in order to ensure that any changes in the programme result in positive effects; 4) increase Phase I awards to $150.000 and Phase II awards to $1.000.000, with the flexibility to deviate from these standard amounts.[756] The Reauthorization Act of 2011 responds to these recommendations by raising the financial thresholds to the proposed amounts and allowing SBIR managers to increase them by a maximum of 50%, upon motivation submitted to SBA. Moreover, reporting is strengthened in order to make measurement of the success of the program possible (in terms of commercialization rates)[757] and to signal and prevent fraud, waste or abuses.[758] In addition, each agency is mandated to develop metrics for measuring the effectiveness and the social benefits of the SBIR,[759] and a comprehensively evaluation of the working of the SBIR program, is already planned not later than 4 years after the enactment of the Reauthorization Act of 2011.[760]

An OECD Report on national SBIR initiatives named in 2010 some of the same weaknesses identified by NRC and added some more recent concerns. Firstly, it reiterated the concern that public funding through SBIR may crowd out the investments by the firm in R&D and may transfer the costs of innovation from the firm to the government.[761] Secondly, it highlighted concerns related to the weak implementation of the programme: the sensitivity of awards to lobbying; the insufficient effort put into choosing the right performer or into follow-up action after the project exits the SBIR program; the long evaluation times before the funds are received.[762] Additional criticism regarded the tendency of the government agencies to select projects which find themselves in an advanced phase of the innovation cycle, in search for success stories.[763] On the other hand, the SBIR program was praised for acting as a

[754] SBIR/STTR Reauthorization Act of 2011, section 5126.
[755] This program requires matching funds for Phase II. Wessner found that the Fast Track Program increases the efficiency of the Department of Defense SBIR program by encouraging the commercialization of new technologies and the entry of new firms to the program. Charles Wessner (ed) *'The Small Business Innovation Research Program (SBIR): An Assessment of the Department of Defense Fast Track Initiative'* (National Academy Press 2001)
[756] NRC (2008) 84-5.
[757] Such as excluding a firm from participation in SBIR calls for a period of 1 year from the time of the decision, if winning subsequent Phase II awards or commercialization of SBIR products has not been satisfactory, according to the rules developed by each agency. See Section 5165.
[758] SBIR/STTR Reauthorization Act of 2011, section 5131 – 5132, 5134-5135, 5143.
[759] SBIR/STTR Reauthorization Act of 2011, section 5161.
[760] SBIR/STTR Reauthorization Act of 2011, section 5137.
[761] Wallsten, S. (2000), The Effects of Government-Industry R&D Programmes on Private R&D: The Case of the Small Business Innovation Research Program. Rand Journal of Economics, Vol. 31, N°1 (Spring 2000) (Wallsten (2010)).
[762] OECD (2010) 5.
[763] Wallsten (2000).

certification of a firm/technology quality, which enhances the chances to attract private investments, for enhancing collaboration between industry and academia and for triggering employment and sales growth within the award-winning firms.[764]

3.3 Conclusions

By drafting guidance on how to conduct a PCP procedure and by encouraging its deployment within the EU, the European Commission attempts to emulate the perceived success of the US in bringing R&D projects into the commercialization phase and increasing the competitive advantages of its firms in the global market. The US SBIR program was attributed by the Commission the merit for these successes and was used as a source of inspiration for PCP.

However, the European Commission drafted the PCP in compliance with the particular legal conditions imposed on the EU by the GPA and the legal rules governing EU's legal order. As a consequence, PCP embodies major differences from its US counterprogram. Some of these differences relate to SBIR characteristics which were identified in Chapter 2 as prerequisites for successful demand-side R&D policies. Some of these features were also identified by the above summarized evaluation studies as key to the success of the SBIR programme. The EU did not perform an in-depth analysis on whether these differences would affect the effectiveness of the PCP.

Hereunder I enumerate the most important differences between the US SBIR and the EU approach to PCP:

1. The mandatory contribution to the SBIR budget is legislated. The SBIR program is, as a consequence, independent of an yearly budget approval process. In the EU, on the other side, PCP has been introduced through a soft-law instrument (interpretative communication). The EU does not have the competence to legislate such budgetary aspects and mandatory set-asides have only recently been imposed at national level in some Member States that are leaders in innovation policies. This is discussed in Chapter 4.

2. The US SBIR programme provides funds to small businesses for risky or uncertain R&D projects that present long-term prospects to yield substantial benefits, but may not easily attract private venture capital. This was identified in Chapter 2 as being a prerequisite for the effectiveness of the public intervention. The EU PCP, on the other hand, is based on the assumption that small and large businesses encounter equal funding difficulties in developing technological solutions for societal challenges.

[764] OECD (2010) 3-4.

3. The US SBIR program is deployed by eleven Federal agencies in order to address their most advanced needs. Flexibility characterizes the organisation of the US SBIR program. Programme managers with state-of-the-art knowledge of the technological aspects of the project and with short-term appointments run the SBIRs. They are allowed to tailor the size and timeline of awards to the concrete needs of the project as well as to adopt various support measures up to the commercialization stage. The specifications of the project may also be changed during the execution of the contracts. This encourages a high degree of experimentation in high risk and uncertain R&D projects, which has been identified in Chapter 2 as important for the success of policy instruments such as SBIR or PCP. In the EU, procedural flexibility is limited. Moreover, no specific agencies are designated to perform PCPs. It is believed that any contracting authority is/should be able to define advanced needs and forward innovations.

4. Coordination, supervision and support of the US SBIR is provided by a centralized independent agency (SBA). Periodic assessments are performed by the SBA and lessons are regularly implemented into the programme. This has been identified in Chapter 2 as important features for the success of R&D policy programmes. In the EU, PCP- or SBIR-like programs have only been set-up at national level, with no EU-wide coordination or supervision. The EU has only recently started to steer through funding the deployment of cross-border PCP procedures in conformity with the 2007 PCP Communication.

5. In the US, SBIR awards provide 100% funding of a project, plus a small profit. PCP only covers R&D services contracts whose IPR and funding are shared between the contracting authority and the private service provider. Moreover, PCP recommends the payment of a market price which reflects the division of risks and benefits. This means that less than 100% of the R&D costs may be funded within the framework of a PCP contract.

6. A successful SBIR participant may obtain a 'sole-source' contract for the subsequent development of the technology and product derived from the SBIR award,[765] while in the EU, the results of the R&D performed during the PCP procedure may not be purchased through direct negotiations with one of the PCP finalists. Early involvement of the end-user in the R&D process and early uptake of the developed innovation have been identified in Chapter 2 as crucial conditions for bringing the funded R&D projects into the commercialization phase.

Having identified the main differences between PCP and the US SBIR, I will turn in the next Chapter to the analysis of practical implementations of PCP- or SBIR-like initiatives in three front-runner EU Member States. This analysis will highlight in how far these initiatives are in line with their US source of inspiration or with the PCP approach recommended by the European

[765] NRC (2008) 38.

Commission. In addition, I will underline whether these initiatives present the prerequisites identified in Chapter 2 as being key to the success of demand-side R&D policies. Finally, the analysis of evaluation studies of these initiatives will reveal which PCP features are considered by contracting authorities within the EU as barriers to its wide deployment.

Chapter 5 will close in on some of the above summarized differences which have been identified in different EU funded reports as the reasons for which PCP has not been embraced by EU public procurers and for which PCP may not work as effective as the US SBIR. Chapter 5 will subsequently investigate whether legal constraints made the adoption of the different features necessary and how these legal constraints can be tackled.

CHAPTER 4. Implementation of PCP or PCP-like schemes in the EU – the current *'state of play'*

4.1. Introduction

By 2011, there were no known examples of PCP procedures in the form proposed by the European Commission in its 2007 PCP Communication.[766] By that time, only national initiatives inspired by the US SBIR were being piloted in three Member States: the Netherlands, UK and Belgium. These initiatives were all implemented by centralised innovation agencies and closely resembled subsidies – more than public contracts. These programmes involved no or only sporadic interaction with the end-customer and did not attract EU-wide competition.

The European Commission became aware that contracting authorities with operational needs that positioned them as potential end-customers of innovation needed additional incentives to engage in PCPs. To this end, the European Commission fosters since 2009 collaborations and exchanges of best practices between EU contracting authorities, by funding the set-up of networks. Since 2011, the European Commission moreover began funding all of the organisational costs, and part of the contractual costs, of concrete cross-border collaborative PCPs.

This chapter outlines the general state of implementation of PCP(-like) initiatives in the EU. Based on available reviews and studies, I describe in section 4.2 the state of implementation of PCPs throughout the EU by 2011. I also summarize the barriers to widespread implementation, felt by EU contracting authorities.

In sections 4.3-4.5, I describe the set-up and practical implementation of the most established PCP/SBIR-like initiatives in the Netherlands, in the UK and in Belgium. In this context, I compare the features of the three national initiatives with their US source of inspiration. I subsequently establish whether or not the national initiatives incorporate the prerequisites for an effective implementation of a PCP, as identified in Chapter 2.

In the following section 4.6, I outline the efforts of the European Commission to create better PCP practices within the EU. Finally, in section 4.7 I draw conclusions on the remaining barriers to a wide and effective implementation of PCP within the EU.

4.2 PCP's *'state of play'* in the EU

Already during the preparation of the PCP Communication, the European Commission

[766] Commission, Compilation of Results of the EC Survey on the Status of Implementation of Pre-Commercial procurement Across Europe (April 2011) (PCP Survey (2011)) < http://cordis.europa.eu/fp7/ict/pcp/pcp-survey.pdf> accessed 12 November 2012.

investigated whether there were known practices in the EU, in line with the envisaged PCP procedure. An early report of 2007 indicated there were no known PCP procedures being tested in the EU.[767] Based on interviews with contracting authorities and suppliers involved in innovation-oriented procurements coming close to PCP, the report pointed out several barriers to the up-take of PCP procedures. These are: lack of technical knowledge of the contracting authority, organisational difficulties in cross-border projects, difficulty to agree on shared demand requirements, difficulty to argument the benefits for supplier to participate in a PCP when subsequent commercialisation is not guaranteed.

Three years after the release of the PCP Communication, the European Commission performed another review of the state of implementation of PCP in Europe. The survey revealed that no examples of cross-border collaborative PCP procedures, as envisaged by the 2007 PCP Communication, were known. The Commission's efforts had thus not helped to bring about the expected practice.

PCP-like initiatives had however been set-up in a handful of Member States by national or regional innovation agencies that were driven by national innovation policy motivations rather than concrete procurement needs. Most importantly, these PCP-like initiatives did not promote EU-wide competition.[768] The initiatives in the UK and the Netherlands were the most established, followed by the ones in Belgium, Finland,[769] Sweden,[770] Spain,[771] the Czech Republic[772] and Italy[773].

The Commission's PCP Survey concluded that EU contracting authorities expected a greater effort on the part of the EU to stimulate the implementation of PCPs (through sharing of practices as well as through funding) in broad areas.[774] The survey further confirmed that concerns on compliance with the EU state aid rules constituted a reason for contracting

[767] Rambøll Management A/S, 'Opportunities for Public Technology Procurement in the ICT-related sectors in Europe' (June 2008) (Rambøll Report (2008)) <ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/pcp-final-ramboll-report-js2_en.pdf> accessed 29 January 2013.

[769] See <http://cordis.europa.eu/fp7/ict/pcp/docs/pcp-case-finland-v3.pdf> accessed 8 November 2013.
[770] In Sweden, VINNOVA launched a pilot measure in May 2010 that co-finances the acquisition of R&D services, up to a maximum of 50% of the total cost. See Nina Widmark, 'State of play of public innovation procurement in Sweden' (8 December 2011) <http://www.slideshare.net/NordicInnovation/public-procurement-and-innovation-nina-widmark-vinnova> accessed 2 February 2013.
[771] http://cordis.europa.eu/fp7/ict/pcp/docs/spain_pcp_v3.pdf> accessed 8 November 2013.
[772] In the Czech Republic, a programme called BETA will run during the period 2012- 2016 to procure research, experimental development and innovation at the demand of public administration bodies (nine ministries or other state bodies). The first call of the BETA programme was launched in February 2011. Technopolis Group, 'Eerste evaluatie Small Business Innovation Research (SBIR) programma's in Nederland' (4 March 2010) 23 (Technopolis (2010)) <http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CDsQFjAA&url=http%3A%2F%2Fwww.rijksoverheid.nl%2Fbestanden%2Fdocumenten-en-publicaties%2Frapporten%2F2010%2F03%2F04%2Feerste-evaluatie-small-business-innovation-research-sbir-programma-s-in-nederland%2F10143501-bijlage.pdf&ei=0fcMUbLUE8bR0QWH3ICYAw&usg=AFQjCNFcmSZhejL8GI8_8vit4TWHliZwvw&sig2=QG8FzAaOfPUZRhG10B2adA> accessed 2 February 2013.
[773] See <http://cordis.europa.eu/fp7/ict/pcp/docs/italy-pcp-v4.pdf> accessed 2 February 2013.
[774] PCP Survey (2011) 5.

authorities not to implement PCPs.[775]

A study of 2011[776] confirmed that PCP is growing in popularity in the EU Member States. Based on interviews with contracting authorities, the study concluded that this was partly due to the success of the US scheme (which was replicated in the Netherlands and in the UK), and partly due to the European Commission's efforts to promote this instrument. However, the study confirmed the conclusion of the previous EU review, that individual contracting authorities that had the concrete needs and had the potential to act as end-customers were rarely involved in the available PCP-like schemes.[777]

Another study, on the demand-side innovation policies of OECD countries, confirmed in the same year that EU contracting authorities tend to favour already proven, low-risk solutions and that they lack knowledge and capabilities as well as incentives to adopt a different attitude.[778]

In conclusion, PCP conducted in collaboration between contracting authorities from different Member States with the aim to find innovative solutions to shared needs, did not occur by 2011.

The reviews and studies analysed in this section identify the following barriers to the uptake of PCP:

- lack of technical knowledge;
- aversion to risk;
- organisational difficulties in cross-border projects;
- difficulty to agree on shared demand requirements;
- difficulty to convince suppliers of the benefits to participate in PCP when subsequent commercialisation is not guaranteed;
- concerns regarding compliance with EU State aid.

In the next sections, I will outline which type of PCP-like programmes were being implemented in the Netherlands, UK and Belgium by 2011 and beyond.

[775] Ibid. Already in 2003, the same concern that EU State Aid legislative provisions constitute a barrier to the funding of R&D project in advanced development stages was expressed by the Dutch Social Economic Council in an advice to the Dutch government before the introduction of the SBIR-like initiative. Sociaal Economische Raad, 'Advies Interactie voor innovatie' (19 december 2003) 30 http://www.ser.nl/~/media/DB_Adviezen/2000_2009/2003/b22254%20pdf.ashx accessed 4 September 2012.
[776] Kincsö Izsak & Jakob Edler, 'Trends and Challenges in Demand-Side Innovation Policies in Europe Thematic Report 2011 under Specific Contract for the Integration of INNO Policy Trend Chart with ERAWATCH (2011-2012)' (26 October 2011) 22-3 (Izsak&Edler (2011) <http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=7011> accessed 2 February 2013.
[777] Izsak&Edler (2011) 22-3.
[778] Eva Camerer and Henriette van Eijl, 'Demand-side innovation policies in the European Union', in '*Demand-side innovation policies'* (OECD 2011) 179 (Camerer&vanEijl (2011)).

4.3 The Dutch SBIR

4.3.1 Background to adoption

In the Netherlands, a Small Business Innovation Research (SBIR) programme was started in 2004. Initially, the scheme was not considered to be a procurement instrument, but a form of subsidy.[779] SBIR was considered to give more effective support than the existent subsidy schemes, due to its competitive element and due to the envisaged presence of a demanding customer.[780] Later, the legal justification of the scheme became article 16(f) of Directive 2004/18 and SBIR became a public procurement instrument.[781]

Its declared objectives were (1) to identify innovative solutions to societal challenges and (2) to support innovative SMEs.[782] The justification for the intervention of the government through the SBIR scheme was found in the difficulties that SMEs encounter when looking for private financing of the first phases of innovative projects. It was also submitted that the private market provided insufficient stimuli for the creation of innovative solutions for societal challenges.[783]

The particular focus on support for SMEs was in line with the rationale of the US SBIR. Following a review by the European Commission though, the Dutch SBIR was modified to allow both small and large companies to participate. In addition, the eligibility condition for the company to reside on the territory of the Netherlands was dropped.[784] Yet, in practice, the scheme proved to be particularly attractive to small and medium sized, mainly Dutch businesses.[785] Statistics show that between 2004-2010, less than 10% of the 252 contracts at phase 1 (Fig.1) and 89 at Phase 2 (Fig.2)) were awarded to large companies.[786]

[779] Minister-president, 'Reactie op het rapport "Vitalisering van de Kenniseconomie"' (8 February 2004) (Reactie op het Rapport "Vitalisering van de Kenniseconomie (2004)) <http://media.europa-nu.nl/9353000/1/j9vvhjsfpncqnhs/vi3anawcbqzu> accessed 2 February 2013.
[780] It was also proposed to complement the SBIR with financial support to private investors of risk capital. Sociaal Economische Raad, 'Advies Interactie voor innovatie' (19 december 2003) 76 <http://www.ser.nl/~/media/DB_Adviezen/2000_2009/2003/b22254%20pdf.ashx> accessed 1 February 2013.
[781] NL Agency, 'SBIR - The power of public procurement: innovative solutions to societal challenges' (January 2011) (NL Agency (2011)) <http://www.agentschapnl.nl/sites/default/files/bijlagen/SBIR%20brochure%20The%20power%20of%20public%20procurement.pdf> accessed 18 December 2012.
[782] NL Agency (2011) 3.
[783] Technopolis (2010) 23-4.
[784] Technopolis (2010) 21.
[785] The SBIR scheme is labeled as supportive to Dutch SMEs. NL Agency (2011).
[786] Technopolis (2010) 27.

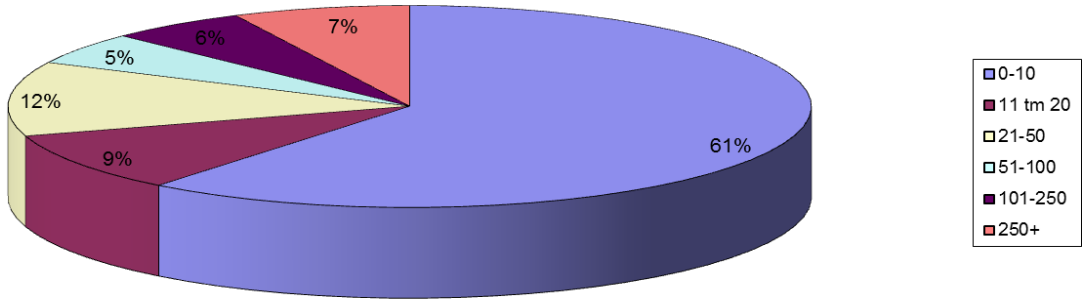

Fig. 1 Source: NL Agency

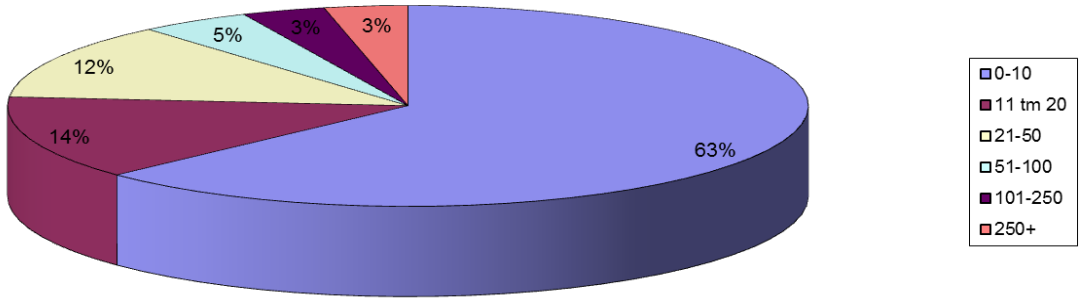

Fig. 2 Source: NL Agency

The SBIR scheme was from the beginning divided into two parts: one departmental SBIR run by the NL Agency (Agentschap NL), an innovation agency of the Ministry of Economic Affairs and one run by the Dutch Organisation for Applied Sciences (TNO). The second SBIR scheme is mainly intended to fund companies that are willing to commercialise product ideas of TNO.[787] Only the departmental SBIR forms the subject of the analysis in this section as only this

[787] Ernst&Young and Centre for European Policy, 'Next generation innovation policy, The future of EU innovation policy to support market growth' (2011) 14 (Ernst&Young (2011)) <http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=3&ved=0CEMQFjAC&url=http%3A%2F%2Fwww.siliconrepublic

is identified as pre-commercial procurement.[788]

The departmental SBIR scheme was set-up as a centralised scheme. NL Agency was put in charge of running it for different government departments (ministries). It was not set-up through legislation and there is no official document introducing the SBIR programme, besides guidance on the possibility to conduct the SBIR within the existing legal framework.[789] This scheme started in 2004 with a first pilot project run by the Ministry of Economic Affairs.[790] In 2005, after the positive assessment of the pilot, the broad application of the SBIR scheme throughout all government departments was given green light. At the end of 2008, NL Agency set up an SBIR programme office. In the same year, the scheme was taken outside of the Ministry of Economic Affairs and brought under the responsibility of an interdepartmental entity, named Knowledge and Innovation (Kennis en Innovatie). It continued to be centrally run by the NL Agency, however.

Thus, the SBIR instrument was integrated into the innovation policy of the Dutch government and was included by the different government departments (ministries) into their Societal Innovation Agenda (MIA)[791] budgets. This enables them to regularly employ SBIR projects.[792] In 2010 there were six departments employing the SBIR instrument and the number of SBIR calls for proposals were on a rising curve.[793]

In February 2010 the Dutch SBIR scheme was evaluated. Out of the total of 28 projects awarded by then, only the first pilot project (of 2004) was finalised. By that time, the Dutch SBIR had spent €71,5 million.[794]

4.3.2 Features of the NL SBIR initiative

a) Non-mandatory participation

Unlike in the US, the implementation of SBIR projects by contracting authorities in the Netherlands is not expressed in legislation. The Societal Innovation Agendas of several Dutch ministries include now references to the SBIR instrument. This provides justification for funding SBIR contracts, but does not mandate them to participate in the SBIR programme and to

.com%2Fdownload%2Ffs%2Fdoc%2Freports%2Finnovation-20report-lr.pdf&ei=uj4NUb7ECcHs0gXftIDABw&usg=AFQjCNE20kBwzEgEf_ryTG90zL4vBk6ODA&sig2=j0Xz_TvF_v3KJFyUYCvWyw> accessed 2 February 2013.

[788] Technopolis (2010) 27, 89.
[789] Technopolis (2010) 21.
[790] Reactie op het rapport "Vitalisering van de Kenniseconomie" (2004) 4.
[791] Maatschappelijke Innovatie Agenda's.
[792] Technopolis (2010) 42.
[793] Technopolis (2010) 32.
[794] Technopolis (2010) ix.

reserve budgets therefore. The evaluation performed by Technopolis in 2010 shows that some ministries had not deployed the SBIR instrument.[795]

b) Centralised implementation

The participating ministries are, moreover, only marginally involved in the SBIR projects they decide to fund. Unlike in the US SBIR, the funding agencies only dictate the broad topic, while the NL Agency runs the SBIR competition, signs and subsequently monitors the contract execution. NL Agency may also propose a topic to a specific ministry. In both cases, NL Agency provides the ministry extensive support in defining the concrete call requirements.[796]

Another difference with the US SBIR constitutes the coordination of the SBIR competition by NL Agency project officers who do not possess in-depth technical expertise on the respective topic.[797]

c) Eligibility criteria

Unlike the US SBIR, but in line with EU guidance, both large and small companies are allowed to submit offers in NL SBIR calls.[798] Moreover, eligibility is not conditioned as in the US upon ownership or control by EU citizens. Only performance of the R&D within an EU Member State is required. This means that non-EU owned companies may win NL SBIR contracts. Moreover, as ownership is not checked, companies majority-owned by venture capital or hedge funds or companies controlled by equity funds may participate in the NL SBIR competitions.[799]

In addition, only proposals for R&D activities are eligible within a NL SBIR project. According to the SBIR Guide of 2011,[800] the following R&D activities are eligible for funding under the SBIR scheme:

- Experimental or theoretical activities which are conducted in order to accumulate new knowledge;
- Planned or critical research which is intended to accumulate new knowledge and capabilities which are necessary for developing new products, processes or services, or to improve substantially existing products, processes or services;
- Acquiring, combining, designing and using existing scientific, technical, business or

[795] Technopolis (2010) 30-1.
[796] Technopolis (2010) 34.
[797] None of the 7 employees of the SBIR office of NL Agency has strong technical background. Moreover, they are not full-time engaged in deploying the SBIR programme. See Technopolis (2010) 33.
[798] Also institutes, corporations are currently allowed to participate if they can convincingly demonstrate that they are capable to commercialize the products. SBIR programmabureau van Agentschap NL, 'SBIR handleiding voor ondernemers' (SBIR Guide (2011)) (7 July 2011) 10 <http://www.agentschapnl.nl/sites/default/files/bijlagen/SBIR%20handleiding%202011-1.pdf> accessed 18 December 2013.
[799] This type of companies is only recently allowed to participate in the US SBIR competitions.
[800] SBIR Guide (2011) 5.

other relevant knowledge and capabilities for plans, schemes or design of new, modified or improved products, processes or services;
- Making designs, drawings, plans and other documentation, provided that these are not intended for commercial use;
- Developing commercially useful prototypes and pilots, if the prototype is the commercial end-product and the production of such a prototype is too expensive to use it just for demonstration and validation purposes;
- The experimental development and testing of products, processes and services, for so far as these cannot be used or be adjusted for industrial use or for commercial exploitation;
- The production of a limited 0-serie: limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for mass production or supply to acceptable quality standards;

The following activities do not, according to the SBIR guide, fall under the concept of R&D:

- Routine or periodical modification of existing products, production lines, manufacturing processes, services and other normal activities, even if these modifications may regard improvements;
- Prototypes whose commercial readiness has already been tested;
- Commercial development such as serial production, delivery intended to achieve commercial viability or to recover R&D costs, integration, customization, incremental modifications and improvements of existing products or processes.

The NL SBIR follows the definitions of R&D in the Frascati Manual and of R&D in the US SBIR context. It is difficult to establish how the R&D definitions work in practice by studying the general description of the NL SBIR awarded projects.[801] There may, however, be serious gaps between the law in the book and the law in action here.

It appears, for instance, that no market consultation or market analysis is undertaken preceding a NL SBIR call. It also appears that no attention is paid to whether the contract can be qualified as an R&D service contract, or otherwise an R&D works (e.g. construction of prototypes) or R&D supplies contract (e.g. prototypes). The R&D service condition was included in the EU procurement legislation in order to discourage funding of innovative products that are very close to commercialization.

[801] For a description of 25 SBIR awarded projects see NL Agency (2011).

As a consequence, it may happen that the desired functionality is available on the market or that the contract involves marginal innovation and cannot be qualified as an R&D service contract.

d) Phases

Following the US model, the Dutch SBIR scheme provides funding at two stages, namely the feasibility stage, which investigates the viability of the idea, and the development stage, which covers the full R&D effort and the development of a prototype or proof-of-concept/demonstration. Phase 1 is funded with €20.000 - €50.000 and may take up to 6 months. Phase 2 is funded with €150.000 - €500.000 and may take up to 2 years.[802] It is not expressly allowed to deviate from the maximum amounts or from the maximum time-limits.

The Dutch scheme provides considerably lower amounts of funding than its US counterpart.[803] Moreover, the timeline for Phase 2 is limited compared to both the US SBIR (which does not specify maximum timelines for Phase 2) and to the EU guidance (4-5,5 years for a whole PCP procedure).[804] In addition, no explicit possibility is granted to award multiple sequential Phase 2 contracts to the same company for continuing the R&D effort in case the first PCP does not reach commercialisation. This indicates that tolerance to early failure is not embedded in the programme and that closer to market projects will be favoured.

Subsequent commercialisation (after Phase 2) is not financially supported as part of the Dutch SBIR, but the NL Agency makes efforts to spread information on the project, to organize visits from ministries to the project and to organize workshops in which companies present their developed products.[805] Contrary to the US SBIR, the NL SBIR does not allow direct purchase of the developed innovations by the funding agency. Instead, a separate procurement procedure needs to be organized. This has been identified as a barrier to participation in SBIRs by contracting authorities with concrete needs for innovative solutions, particularly by the Dutch Department of Defence).[806]

e) Percentage of funded R&D costs

Initially, the NL SBIR followed the US model and funded 100% of the R&D costs.[807] After being brought in line with the EU PCP approach and the EU state aid rules, the Dutch SBIR requires bidders to offer a discount for retaining the ownership of the developed innovative

[802] SBIR Guide 2011).
[803] The EU PCP does not prescribe specific amounts of funding.
[804] Phase 2 of the NL SBIR covers the activities of both Phase 2 and 3 of a PCP as described in the PCP Communication.
[805] Ibid 35.
[806] Technopolis (2010) 30-1.
[807] Nelleke Corbett, 'Juridisch kader voor SBIR' (17 January 2006) slide 2.

product.[808] This is in line with the PCP Communication requirement to ensure that a market price is paid and no State aid is granted. At the same time, this deviates from the practice within the US SBIR programme, where 100% of the R&D costs and a small profit are covered.

In practice though, compliance with the market price requirement within the NL SBIR competitions is not enforced.[809] Thus, offers are not evaluated on price. The available budget per Phase is pre-set in each individual NL SBIR call as fixed ceiling price.[810] This turns the whole market price requirement into a formality and leaves room for non-compliance with the EU State aid rules. The perception of the participating companies that they receive 100% of the R&D costs constitutes an additional proof that the market price criterion is nothing more than a formality.[811] Further discussion of this issue can be found in Chapter 5.

f) IPR arrangements

The IPR arrangements within the Dutch SBIR for both Phase 1 and 2 are in line with the recommendations of the European Commission in its 2007 Communication, as well as with the US SBIR. IP ownership remains with the SBIR participant, while the government retains a royalty-free license to use the results. It also obtains the following rights: to disseminate the results, to make the knowledge public when justified by the public interest, and to mandate the supplier to provide licenses to third parties under reasonable conditions.[812] Unlike in the US, however, the provisions are drafted in very general terms and no enforcing mechanisms are specified.[813]

g) Award criteria

The bids are evaluated against the following general criteria[814], which may be further specified on a case-by-case basis:[815]

- Potential of solving the societal problem which is the subject of the NL SBIR call, against a reasonable cost;
- Entrepreneurship (whether the company (and its project partners) is/(are) capable of bringing the product to the market: vision, ambition, experience etc.);
- Degree of innovativeness (originality and inventiveness of the proposed solution);
- Economic perspective (the chances that the product will be commercialised);

[808] SBIR Guide (2011).
[809] The guidance for implementation of SBIR does not mention any obligation for the award commission to check whether the reduction indicated in the SBIR bids corresponds to market realities.
[810] SBIR Guide (2011) 6.
[811] Technopolis (2010) 89.
[812] SBIR Guide (2011) 8.
[813] Ibid.
[814] SBIR Guide (2011) 7.
[815] Technopolis (2010) 33-4.

- Environmental and social aspects (whether the developed product constitutes by itself a polluting or resource intensive solution);
- Quality of the proposal and of the project (is the proposal clearly drafted and does it have the potential to achieve the proposed solution).

Three of the award criteria lay a strong accent on the commercial potential of the proposed R&D project, compared to two criteria related to the innovativeness and quality of the proposal. This reveals a potential bias towards closer to market solutions. In contrast, the first four award criteria in the US SBIR (described in section 3.2.2.7) focus on the (technical) quality of the proposal, while commercialization potential is listed as the fifth award criterion.

4.3.3 Evaluation

In March 2010, Technopolis performed an early evaluation of the Dutch SBIR scheme.[816] Because the Dutch SBIR finds itself at an early stage, the evaluation does not cover an impact assessment, but only input and process aspects. The evaluation is based on the analysis of the SBIR calls, literature, interviews and surveys.[817] In this section, I summarize its findings.

According to Technopolis, the SBIR programme provides the participating departments relatively quickly with multiple innovative solutions.[818] Participating companies are also found positive regarding the functioning of the scheme. They consider that the SBIR awards accelerate their access to the market by enhancing the trust of public and private clients in their innovative products. The same companies also submit that participation in the SBIR programme enables them to get valuable insights into the technical feasibility of the developed product as well as into the competitive strengths of their innovative ideas/solution compared to competitive ideas/solutions on the market.[819]

In addition, the participating companies indicate that the provision of 100% funding of the phases[820] were the key reasons to participate in the SBIR competitions.[821] The SBIR awards were considered crucial for stimulating the development of the products, which would otherwise not be funded by the company itself or by external private investors. The participating companies expect that the received SBIR awards will positively impact the turnover and growth of their companies in the future.[822]

[816] Ibid.
[817] Technopolis (2010) viii.
[818] Technopolis (2010) viii.
[819] Technopolis (2010) 26.
[820] In the evaluation this phrase is understood as meaning that no external funding is required. At Phase 2, the availability of external funds is considered a plus for the award of the contract.
[821] Technopolis (2010) 26.
[822] Technopolis (2010) 41.

Participating companies are less positive on (the information they got on) the role of the participating government agencies in purchasing the product and in providing financial support at the commercialization phase.[823] They express dissatisfaction regarding the disconnection between the ministry department employing the SBIR and the purchasing department that has the potential to act as launching customer. According to them, the SBIR call does not correspond to actual purchasing needs of the government agencies.[824]

Among the participating government agencies, particularly the Dutch Department of Defence (DoD) experiences the friction between PCP and the commercial procurement regulation. The Dutch DoD considers that the design of the SBIR programme does not accommodate its normal procurement practices, because it requires a separate procurement procedure for the purchase of the developed innovations.[825] DoD uses R&D procurement to fulfill its proper needs instead of promoting entrepreneurship and innovation in areas of societal interest. As a consequence, it is especially interested to directly buy the product developed during the SBIR project.[826]

The evaluation report remarks that since 2008, there has been political awareness on the need to ensure the link between public R&D funding through SBIR contracts and commercial uptake of the developed innovations. Participating government agencies have since 2010 been stimulated to act as launching customer (or first customer of newly developed products).[827] Moreover, the government has contemplated support by regulation, certification, standardization or the requirement to pay back the funding of Phase 2 in case of commercial success.[828] These initiatives are still being discussed.

The evaluation also summarizes the reasons invoked by Dutch ministries for not engaging in SBIR projects: the difficulty to re-assign R&D funds from previous programmes to SBIR competitions; the inadequate marketing of SBIR as innovation instrument of the Ministry of Economic Affairs; the lack of understanding of this instrument; the lack of incentives (such as practical support, mandatory set-asides, enthusiast ambassadors etc.) to engage in using this instrument.[829]

Regarding the organizational make-up of the Dutch SBIR, Technopolis concludes that its centralized deployment by the NL Agency presents both advantages and disadvantages. On the one side, experience is gathered and easily spread. On the other side, NL SBIR remains

[823] Technopolis (2010) 39.
[824] Technopolis (2010) 38.
[825] Technopolis (2010) x.
[826] Technopolis (2010) 31.
[827] Technopolis (2010) 27.
[828] Technopolis (2010) xi, 27.
[829] Technopolis (2010) 30-1.

disconnected from the needs and strategic policy agendas of the different participating departments.[830]

Unfortunately, the evaluation does not provide information on the compliance of the SBIR programme with the legal provisions (such as the presence of R&D activities) or on the degree of innovativeness of the selected projects. As already mentioned it does not cover an impact assessment, due to the early stage of implementation of the Dutch SBIR programme. Another more general study evaluating the result of the overall innovation policy of the Dutch government (of which the NL SBIR forms part) indicates that up to 2008, no positive results had been booked in enhancing the innovative capabilities of Dutch companies. SMEs in the Netherlands have become less innovative between 1998-2008, and the percentage of innovative SMEs is considerably lower than the EU average.[831] Although this research does not specifically assess the NL SBIR, it indicates though that no major impact was achieved by 2008.

The subsequent survey performed by the European Commission in 2010 and the study performed by Izsak and Edler in 2011 confirm that the NL SBIR has been driven by national innovation policy motivations and has not favoured EU-wide competition. Furthermore, the centralized organization by the national innovation agency went hand in hand with limited involvement of end-users. This approach hinders commercial roll-out of the developed products.[832]

In conclusion, the NL SBIR programme has been positively received by the participating companies for providing access to needed funding and for providing insights into the technical feasibility of the developed product as well as into the competitive strengths of their envisaged innovations compared to those available on the market. The NL SBIR is mainly criticized for the limited involvement of the end-users and for the lack of support at the commercialisation phase. Participating government agencies with concrete needs (such as the Department of Defence) have expressed discontent with the impossibility to directly acquire the developed innovations for use in their organisation.

4.3.4 Projects

This section provides an overview of the main characteristics of NL SBIR funded projects. It is based on a documentary analysis of all the 37 SBIR calls for proposals which have been published by NL Agency by January 2014 as well as on a documentary analysis of the available summaries of phase 2 projects in 8 of the 37 SBIR competitions. I have analysed these documents on several effectiveness criteria, as identified in Chapter 2: (1) the existence

[830] Technopolis (2010) 38.
[831] Erik Stam, 'Entrepreneurship and Innovation Policy' (Jena Economic Research Papers, 2008) 40-1, 340.
[832] PCP Survey (2011) 4; Izsak & Edler (2011) 22-3.

of a public end-customer, (2) targeting technological innovations, (3) targeting high-risk or uncertain R&D. I have chosen these 3 criteria from the list of criteria in Chapter 2, based on their relevance for the type of information available in the SBIR calls.

Due to the fact that I have only had access to the calls for proposals, but not to the evaluation of the submitted proposals or to the monitoring of the winning projects, my research is to some extent interpretative. In order to verify some of the conclusions I have conducted individual interviews with two of the NL Agency employees who had been involved in the set-up and implementation of the NL SBIR initiative.[833]

My first and most important observation is that the majority of the NL SBIR calls are catalytic forms of pre-commercial procurement. This entails that the novel products developed within the frame of the NL SBIR competitions are not intended for public end-customers. Only 5 of the 37 NL SBIR calls analysed have been conducted for a specific public end-user and another 6 may have both a public and a private end-customer.[834]

My second observation is that the SBIR calls not only cover technical solutions, but also the development of non-technological solutions to societal problems. 21 out of the 37 calls for proposals also target service innovations. Such are: the call for new services to ensure longer independent and healthy living for the elderly; the call for solutions to make travelling by train more attractive; the call for solutions to develop and increase landscape quality and to stimulate a sustainable and profitable recreation sector; the call for solutions to reduce the number of kilometers in transporting agricultural products etc.[835] Based on the analysis of the calls, it is not possible for me to research and expose how the projects were evaluated against the R&D *services* minimum requirements.

My third observation, is that the NL SBIR does not pursue groundbreaking, but merely incremental innovation (e.g. new applications of existing technologies). This observation is based on the analysis of the available descriptions of phase 2 SBIR projects. Illustrative examples are the two phase 2 projects performed as part of the 2009 SBIR call titled 'Innovatie voor recreatie en ruimte' (Development and conservation of landscape quality together with the development of a sustainable and profitable recreation sector). The first project regards the construction of a forest hut exclusively of sustainable materials, while the second regards placing labels on several prohibition signs in natural habitats and linking them to a webpage that contains the reasons for the adoption of the respective prohibitive measure.[836] Another illustrative example is the outcome of the 2009 SBIR call titled

[833] The individual interviews were loosely structured, and consisted exclusively of open-ended questions.
[834] See <http://www.agentschapnl.nl/onderwerp/aanbesteden-van-innovaties> accessed 2 February 2013.
[835] See <http://www.agentschapnl.nl/onderwerp/aanbesteden-van-innovaties> accessed 2 February 2013.
[836] See <http://www.rvo.nl/subsidies-regelingen/projecten-sbir-innovatie-voor-recreatie-en-ruimte> accessed 15 January 2014.

'Bevorderen en behouden biodiversiteit' (Foster and maintain biodiversity). The innovative solution to avoid destruction of biodiversity when mowing wet grassland, regarded in this case a mowing machine equipped with caterpillars instead of wheels.[837]

4.3.5 Conclusions

In the previous sections 4.3.2-4.3.3, I have outlined the major differences between the NL SBIR scheme and its US counterpart. I have pointed out whether these differences are a consequence of European Commission's guidance on compliance of PCP initiatives with the EU legal rules. The existence of some of these differences was confirmed by the analysis of the SBIR calls in section 4.3.4. By reference the prerequisites identified in Chapter 2, I draw conclusions regarding the consequence of these differences for the effective implementation of the Dutch SBIR.

1. Public R&D funding targets the most experimental and riskiest R&D projects (see Chapter 2).

Some features of the Dutch SBIR programme indicate that the riskiest/most uncertain R&D projects are not the primary target.

First, NL SBIR is not financed from a separate budget, but from the existing R&D budgets of the different governmental departments. These departments do not have the obligation to dedicate a certain percentage of their R&D budgets to NL SBIR projects. The implementation of SBIR projects depends on the efforts of the NL Agency to promote the SBIR scheme within the different government departments.[838] This creates the risk that SBIR officers take less risks and favour closer-to-market technologies. That this is the case, has been confirmed by the analysis of the SBIR calls in section 4.3.4.

Second, the Dutch SBIR programme does not require an analysis of the market dynamics in the field that each SBIR call is aiming to advance. Moreover, the award criteria in the NL SBIR lay a stronger accent on the commercialization potential of the proposed solution than its US counterprogramme. This entails the risk that close-to-commercialisation projects are funded instead of early-stage R&D projects. In addition, this raises questions of compliance with the minimum requirement for the legitimate use of PCP, regarding the R&S service character of the contract.

2. Public R&D funding targets small companies, that experience difficulties in obtaining (sufficient amounts of) private capital for experimental/risky R&D projects (see Chapter 2).

[837] See http://supplymanagementcongress.nl/ accessed 12 August 2012.
[838] Technopolis (2010) 43.

The Dutch SBIR programme targets both large and small companies, that are in principle equally entitled to participate in SBIR competitions. In practice though, the SBIR contracts prove particularly attractive to small and medium sized firms (as shown in section 4.3.1).

In line with the PCP guidance, the Dutch SBIR programme does not aim to cover the full cost of the R&D.[839] This may constitute a disincentive for small companies to participate in SBIR competitions with their riskiest/most uncertain R&D projects. However, in practice the Dutch SBIR programme does not properly enforce the requirement of cost sharing. Although firms are required to offer a discount on the R&D costs in return for retaining the IP ownership, compliance with this requirement is not checked.

3. A high degree of experimentation and tolerance to failure are accepted. (see Chapter 2)

The Dutch SBIR programme in its current set-up does not present the incentives for the NL SBIR officers to adopt such highly experimental and tolerant attitudes. Lower maximum amounts of funding per stage and shorter timelines for the R&D effort are available than within the US SBIR, while no flexibility is provided to deviate from the maximum values. Moreover, the possibility to award an additional, sequential Phase 2 award to the same company for continuing research initiated in the first phase 2 award is not available.

4. Competition is maintained throughout the whole innovation process (see Chapter 2).

The condition of EU-wide competition is officially embedded into the Dutch SBIR. Following alignment with the EU legal rules, the eligibility criterion of Dutch ownership has been replaced by the requirement to conduct the targeted R&D within a EU Member State. In practice, however, the requirement of using the Dutch language during the whole SBIR process functions as a powerful de facto barrier to the participation of firms from other EU countries. In addition, the Dutch SBIR does not embed a serious investigation of whether the envisaged projects significantly advance international state-of-the-art. These factors entail the risk that national companies are protected from European and international competition instead of being challenged to developed advanced innovation that can subsequently compete with success on global markets.

[839] The PCP Communication indicates that in order to exclude the applicability of EU State aid rules, the contracting authority should share the R&D costs with the participating company, in accordance with the predefined sharing of IPR.

5. The public purchaser is the technologically sophisticated end-user of the envisaged innovation (see Chapter 2).

> The deployment of the Dutch SBIR is centrally organized by NL Agency, in the name of different ministries. Most often neither NL Agency nor a ministry is the end-user of the developed innovation, and no action is taken to involve end-users into the SBIR project. Moreover, the NL Agency's officers in charge of formulating each SBIR call are not required to be in command of the relevant technical expertise. The consequence is that the NL SBIR grants subsidies that need to comply with the EU State aid rules. This not only challenges the effectiveness of the NL SBIR scheme, but also raises questions of compliance with EU State aid rules (the latter aspect is further discussed in Chapter 5).

6. The public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation (see Chapter 2).

> In line with the PCP guidance, the Dutch SBIR does not allow the direct procurement of the developed innovative products or services. Instead, a separate competitive award must be organized in compliance with the applicable Procurement Directive. Moreover, no alternative support for reaching the commercialization stage is available. This is experienced as a disincentive to engage in NL SBIR competitions, by both public agencies (that want to use NL SBIR competitions to develop innovative solutions for their own operational needs) and by participating suppliers.

7. Innovative technologies rather than innovative services are targeted (see Chapter 2).

> The NL SBIR funds SBIR competitions for the development of innovative services, without any relation to technologies. Funding R&D in services within the framework of the NL SBIR raises questions on the effectiveness of the public spending, particularly when the minimum requirement that exclusively R&D service contracts be funded is neither assessed nor monitored.

8. A continuous scrutiny/measurement of the impact of PCP is performed and lessons learnt are codified in guidance (see Chapter 2).

> The Dutch SBIR has went through an early qualitative assessment. However, this assessment has not led to any major change in the implementation guidance or in the practice.

In conclusion, the Dutch SBIR programme is grounded into an innovation policy mindset which is subsidy-like and national in scope. Partly due to the need to comply with EU rules, partly due to an insufficient understanding of the fundaments of an effective R&D procurement, the Dutch SBIR fails to provide the link with the real needs of public end-users and it fails to challenge national companies to advance their innovations beyond global state-of-the-art. Instead it funds close-to-market solutions without prospective public or private end-customers and without a prospective competitive advantage on the European or global market.

4.4 The UK SBRI

4.4.1 Background and evaluation of SBRI (2001-2009)

In 2001, the UK set up the first European scheme for strengthening the demand-side of its public innovation policy, aiming to emulate SBIR's success in the US.[840] The UK scheme was called the Small Business Research Initiative ('SBRI'). It encouraged public bodies to invest 2,5% of their external R&D budgets in small and early stage UK technology companies that encountered difficulties in accessing private funding.[841]

Similar to the US SBIR, the SBRI scheme provides for two staged-funding of R&D, for the feasibility study at Phase 1 and for product development at Phase 2. The SBRI scheme covered 100% of the R&D costs with a maximum of £200k per project. However, contrary to the US SBIR, a participating company needed to be able to fund itself 65% of the total costs before any work could start. Grants for multiple projects were excluded.[842]

The SBRI had a very slow start. Until 2005, it had only advertised contracts of around £2m[843] per year instead of more than £100m.[844]

In 2005, in an effort to boost the SBRI programme, the contribution of 2,5% of the external R&D budgets of all government departments was made mandatory by legislation. Despite this measure, Lord Sainsbury's report revealed two years later that the attitude change needed to make the SBRI programme a success had not occurred.[845] Due to the unclear formulation of the legislation, government departments continued to include into the mandatory 2,5%

[840] Lord Sainsbury of Turville, 'The Race to the Top, A review of the Government's Science and Innovation Policies' (October 2007) 129 (Lord Sainsbury (2007)) <http://www.hm-treasury.gov.uk/d/sainsbury_review051007.pdf> accessed 2 February 2013.
[841] David Connell, 'Secrets' of the World's Largest Seed Capital Fund: How the United States Government Uses its Small Business Innovation Research (SBIR) Programme and Procurement Budgets to Support Small Technology Firms' (2006) (Connell (2006)) 4.
[842] Connell (2006) 3.
[843] Kirsten Bound and Ruth Puttick, 'Buying Power? Is the Small Business Research Initiative for procuring R&D driving innovation in the UK?' (June 2010) 3 (Bound & Puttick (2010) <http://www.nesta.org.uk/library/documents/Buying_Power_150610.pdf> accessed 2 February 2013; Connell (2006) 5.
[844] Lord Sainsbury's report shows that between 2001-2005, 2,5% of the UK government's R&D budget constituted more than £100m. See Lord Sainsbury (2007) 120.
[845] Lord Sainsbury (2007) 135.

contribution, investments in policy development research (besides scientific and technical research). As a consequence, only 1% of the 200 funded projects placed before 2008 were in line with the definition of R&D as defined by the UK Treasury.[846]

The reluctant attitude of the government departments to participate in the SBRI scheme was attributed to two main reasons.

> *Firstly*, the SBRI scheme was imposed top-down without clarification of its objectives and functioning.[847] The Department of Trade and Industry inappropriately underscored the aim to stimulate the innovativeness of companies, without highlighting the opportunity offered by the SBRI to help achieve each department's public objectives. As a consequence, the individual government departments did not feel incentivised to identify needs for innovative technologies (solutions) and did not initiate SBRI competitions.[848]
>
> *Secondly*, R&D projects did not pass the mandatory value-for-money assessment.[849]

Lord Sainsbury's report provided concrete recommendations to bring the SBRI programme more in line with the US SBIR counterpart. The improved SBRI was launched in 2009 and was followed by two early evaluations in 2010, performed by Nesta and Pro-Inno Europe. In the following sections, I will outline these developments.

4.4.2 SBRI – features of the latest version (2009 and later)

a) Introduction

Lord Sainsbury's 2007 report recommended to bring SBRI more in line with the US SBIR scheme and to direct it towards fulfilling the objectives of the departments involved.[850] Lord Sainsbury submitted concrete proposals to this end. Departments should publicize up front and on a regular basis the technological areas in which SBRI competitions would be conducted. The SBRI competitions should be strictly limited to funding R&D activities and should exclude projects falling within the field of humanities and social sciences. The SBRI awards should be in the form of contracts, not equity loans or grants, in order to ensure that the governmental

[846] Bound and Puttick (2010) 7.
[847] Technopolis (2010) 32.
[848] Technopolis (2010); Ernst &Young (2011); Connell (2006) 2.
[849] See Connell (2006) 35. The value-for-money assessment should be applied to all procurements, before taking a decision to start the procedure. In summary, the value-for-money assessment entails a check on the viability of the project (whether efficiency, accountability or equity arguments oppose the envisaged procurement), desirability (assessment of the relative benefits compared to other routes which may achieve better outcomes) and achievability (analysis of market interest and availability of market solutions, assessment of the capacity of the contracting authority to manage the envisaged process). In addition, the value-for-money assessment entails factors such as an optimum allocation of risks and calculation of whole life costs which cannot always be complied with in pre-commercial procurements. See also: HM Treasury, 'Value-for-money Assessment Guidance' (November 2006) <http://www.hm-treasury.gov.uk/d/vfm_assessmentguidance061006opt.pdf> accessed 30 June 2012.
[850] Lord Sainsbury (2007) 12.

departments clearly define the objectives of the awarded projects and check whether these have been fulfilled. In this manner, the completion of an SBRI project would become a quality label for SBRI participants to show to future investors and customers.[851]

Regarding the organisational structure of the SBRI scheme, the report suggested to grant a central administrative role to the Technology Strategy Board (TSB), which is an agency of the UK's Trade Ministry similar to the Small Business Administration in the US. TSB would be made responsible for publicizing twice a year a list of up-coming SBRI calls and their technological areas. TSB would also be responsible for the administration of the award procedure, while the evaluation of the SBRI proposals would be performed jointly with the awarding department(s).[852] Finally, Lord Sainsbury recommended to decrease the percentage of the extramural R&D funds to be invested in SBRI competitions to 1,5% and to progressively increase it to 2% and 2,5% in the subsequent two years.[853]

b) Non-mandatory participation

Based on these recommendations an adapted SBRI scheme was implemented in April 2009, following an initial pilot in 2008.[854] There are currently 6 to 8 government departments that participate in the SBRI scheme coordinated by TSB. Each department defines its innovation challenges in Innovation Procurement Plans. The declared aim is to define the challenges in a manner that attracts sufficient bidders and that leaves room for the most innovative proposals.[855]

Participation in the SBRI and budget set-asides are currently voluntary. TSB regularly organises workshops to encourage the implementation of SBRI competitions by explaining its functioning and benefits for the policy objectives of the different departments. In 2011, £20m were set aside by the Department of Health for SBRI competitions. TSB reserved in its turn £10m for co-funding participation by 7 other public bodies such as the Welsh Government, WRAP (working together for a world without waste), NHS London, NHS Midlands and East, the National Centre for the Refinement, Reduction and Replacement of Animals in Health (NC3Rs), the Ministry of Defence and the Department for Environment, Food and Rural Affairs.[856] The co-financing is meant to incentivise these departments to employ their own R&D funds in SBRI competitions.

[851] Lord Sainsbury (2007) 131.
[852] Lord Sainsbury (2007) 131.
[853] Ibid.
[854] Bound & Puttick (2010) 3.
[855] Christiaan Holland,'Peer Review of Small Business Research Initiative (SBRI) – UK' (9 June 2010) 8 (Holland (2010)) <http://www.proinno-europe.eu/sites/default/files/repository_files/11/06/D%202%202%20INNO-Partnering%20Forum%20Pilot%20Peer%20Review%20Report%20SBRI%20UK%20delivered.pdf > accessed 2 February 2013.
[856] Technology Strategy Board, 'Delivery Plan Financial year 2012-13' (2012) 20 (TSB Delivery Plan (2012))

c) Decentralised implementation

In line with the US example, TSB was attributed coordination and support roles similar to those of the US Small Business Administration. TSB provides operational support in, for example, defining calls and finding expert evaluators for SBRI bids.[857] It is not clear whether technically advanced project officers are in charge of defining the calls. Nor is it clear whether project officers are allowed flexibility to adapt the topic or amount and time of funding to the needs of each project, as is the case within the framework of the US SBIR. Yet, the more decentralized set-up of the UK SBRI scheme, allows closer involvement of the public end-customers into the R&D process when compared to the NL SBIR scheme.

Independent from the SBRI scheme coordinated by TSB, other PCP-like initiatives have been implemented since 2006 by the Department of Health's National Innovation Centre (NHS) and the Energy Technologies Institute (set up in 2006 as a private company by global energy companies and the UK Government). They follow the same approach as TSB, but independently implement the whole SBRI process. Interesting to remark is the requirement that the NHS introduced for applicants from other Member States than UK, namely to present proof that the developed products would (also) be commercialized on the UK market.[858]

d) Eligibility criteria

Analogous to the situation in the Netherlands, the UK scheme remains open to small and large businesses. In practice, more than 75% of the funding is awarded to small businesses.[859] Besides small and emerging businesses, academia and charities are eligible for participation, provided they demonstrate access to a route to market for the developed solutions.[860]

It is not clear how compliance with the minimum requirement that only R&D service contracts are eligible for funding through the SBIR is ensured. No market consultation in relation to each SBRI competition is organized. However, the TSB regularly sets up Innovation Platforms ('IPs') to identify the range of technologies that can provide solutions to societal challenges in various areas. These IPs are also used to identify the range of policies and regulatory actions needed to bring the novel technologies to the (global) market. Herefore, thorough market research and economic/business research studies are performed.

<http://www.innovateuk.org/_assets/delivery_plan_2012.pdf> accessed 2 February 2013.

[857] Technopolis (2010) 32.

[858] My research does not separately investigate this initiative, due to the fact that the same approach is followed as the SBRI as well as due to the limited amount of information available.. FAQ Department of Health, available at: http://www.london.nhs.uk/webfiles/Innovation%20documents/SBRI_DH_100_005%20FAQ.pdf .

[859] TSB Delivery Plan (2012) 13.

[860] TSB, 'SBRI - – Government challenges. Ideas from business. Innovative solutions.' (September 2011) 2 (TSB Government Challenges (2011)) <http://www.innovateuk.org/_assets/sbri_brochure_2011.pdf> accessed 2 January 2013.

The market research engages relevant stakeholders (such as businesses, academics, government agencies) in an effort to identify the available technologies and the relevant ongoing R&D projects (a technology roadmap). The commissioned studies are meant to outline which (combination of) policies and legislations can ensure the large-scale deployment of the novel products and which changes in the system (for example in the health care system) are required by the new solutions. Moreover, studies may be commissioned to identify the expectations of the end-users and their perception of the novel solutions (for example the openness of end-users to acquire the new skills to use the new technologies; the privacy objections etc).[861] However, as already mentioned, the IPs do not cover all the areas in which SBRI competitions are organized and do not seem to be directly linked to the SBRI competitions.[862] In addition, the market research is performed at the national level.[863]

e) Phases

In line with the US SBIR, the amount of funding per call has been increased to between £50k and £100k for Phase 1, and between £250k and £1m for Phase 2. However, the timeline for Phase 2 is considerably shorter than the EU PCP prescriptions (up to two years). No express possibility is provided to deviate from the maximum time-limits or from the maximum amounts per Phase. In addition, and similar to the NL SBIR, no explicit opportunity is granted to award multiple sequential Phase 2 contracts to the same company. This entails that tolerance to early failure is not expressly embedded in the programme and that closer to market projects may be favoured.

Commercialization following the completion of Phase 2 is up to the SBRI finalist company. The government does not guarantee the purchase of the developed novel products.[864] The UK SBRI follows in this respect the PCP guidance and presents thus the same diversion from the US SBIR as the NL SBIR.

f) Percentage of funded R&D costs

Following the US SBIR approach, both Phase 1 and Phase 2 of the SBRI provide 100% of the feasibility and prototyping costs.[865] As already mentioned in the overview of the NL SBIR, this

[861] More information can be found at <http://www.innovateuk.org/ourstrategy/innovationplatforms/assistedliving/assisted-living-innovation-platform.ashx> accessed at 4 September 2012.
[862] There are currently six innovation platforms: low carbon vehicles – established 2007; assisted living – established 2007; low impact buildings – established 2008; detection and identification of infectious agents – established 2008; sustainable agriculture and food – established 2009; stratified medicine – established 2010. See TSB Delivery Plan (2012) 21.
[863] See for example the Assissted Living Roadmap exercise of 8 January 2007: https://connect.innovateuk.org/c/document_library/get_file?p_l_id=145400&folderId=609151&name=DLFE-4588.pdf
[864] TSB Government Challenges (2011) 3.
[865] TSB Government Challenges (2011) 4.

approach disregards the PCP guidance and raises questions of compliance with EU State aid rules.

g) IPR arrangements and award criteria

IPR arrangements are described in very broad terms (the R&D service provider retains the Intellectual property),[866] while generic award criteria on this issue are not published.

4.4.3 SBRI – 2010 evaluation

There is no impact evaluation of the UK SBRI scheme so far, as it only recently began to run in its current form.[867] Two reports by Pro Inno Europe and Nesta have evaluated the intermediate results of the programme.[868]

The report by Pro Inno Europe shows that both the participating departments and the participating businesses are positive about the functioning and the results of the new programme. Government departments consider that the programme grants them access to innovative ideas and to new suppliers. Participating companies list several incentives to participate in the SBRI. First, the programme offers them the opportunity to closely collaborate with a future customer. Second, the programme ensures funding that could not be acquired from the private market, and does not require matching funding. Third, the programme operates as a quality certification mechanism supporting the future acquisition of venture capital.[869]

The Pro Inno report further lists as strengths of the scheme: flexibility in the support level provided by TSB during the set-up and management of the SBRI competition; short evaluation times and simple procedures; broad involvement of the funding agency with the innovation project compared to subsidies.[870]

The report mentions a few downsides of the scheme. These include: a low number of participating funding agencies; relative high costs of conducting the scheme; the lack of a market consultation that precedes the definition of the SBRI challenge; the support gap at Phase III (the functionaries running the SBRI should encourage the procurement functionaries more to purchase the results of SBRI projects); the lack of budget continuity (no central budget for SBRI is available, while the R&D budgets of the individual departments may suffer cuts due to the recent economic crisis).[871]

[866] TSB Government Challenges (2011) 3.
[867] TSB Delivery Plan (2012) 32.
[868] Holland (2010); Bound and Puttick (2010).
[869] Holland (2010) 10.
[870] Holland (2010) 12.
[871] Holland (2010) 13.

The Pro Inno Europe Report thus submits that increased political support is needed for the wider implementation of the programme. It also advocates improving the knowledge on the potential benefits and risks of the scheme. Interestingly, the Pro Inno Europe Report points out that there is moderate support among stakeholders for addressing shared European needs through the set-up of a similar programme by the EU (as funding agency). According to the report, such a programme would have the advantage of avoiding the criticism that national public funds are spent without immediate visible results. [872]

Nesta's Report finds early indications of success of the SBRI in its new form, based on interviews with SBRI participants and on the analysis of 10 of the 28 SBRI competitions launched between 2008 and 2010,. The report reaches conclusions, similar to the InnoPro report's. SBRI provides much needed funding in a challenging financial climate. In addition, by acting as a 'lead demonstrator', the government enhances the credibility of the awarded companies in the face of potential private investors.[873] Moreover, the programme creates and boosts market opportunities (such as in the home-retrofitting sector), when deployed on a sufficiently large scale.[874]

Nesta's Report expresses the same view as the Pro Inno report, that the decentralized implementation and the procedural flexibility (allowing the adaptation of the SBRI make-up to the needs of individual participating public agencies) constitute strengths of the programme.[875] According to the Nesta report, the main shortcomings of the SBRI are the missing uptake of developed solutions by public purchasers and the lack of follow-up up to the commercialization stage. Unlike the Pro Inno report, Nesta's Report concludes that voluntary participation supported by (financial) incentives from TSB may potentially be more effective than mandatory participation. According to Nesta, thus the risk will be eliminated that contracting authorities will fund unsuitable competitions, just to comply with mandatory spending thresholds as it happened until 2009.

Finally, Nesta's Report mentions the need to collect relevant data and to regularly assess the impact of the programme. It also suggests to collect success stories and experiences, and to share them among public bodies.[876]

4.4.4 Projects

By 2010, 28 SBRI calls were published and 1,030 offers were received. A total of 373 contracts were subsequently awarded. 283 of these were Phase 1 contracts and 90 were Phase 2 contracts. The 373 contracts were concluded with 283 suppliers, which indicates that some

[872] Ibid.
[873] Bound and Puttick (2010) 15-7.
[874] Bound & Puttick (2010) 15.
[875] Bound & Puttick (2010) 15-7, 20.
[876] Bound & Puttick (2010)-20.

suppliers won contracts in more than one SBRI competition. The value of the contracts amounted to a total of £ 24 million. Of that amount, 74% went to SMEs, the remainder to large companies.[877]

Since 2010, a surge in the number of SBRI competitions can be observed. The total number of published calls by August 2012 was close to one hundred.[878] In this section, I discuss some characteristics of the SBRI programme, based on a documentary analysis of 27 SBRI calls published on TSB's website between October 2012 and December 2013. I analyse the calls against the same criteria as I used with the Dutch SBIR: (1) the existence of a public end-customer, (2) targeting technological innovations, (3) targeting high-risk or uncertain R&D.

Based on this analysis, I can summarize the following observations.

My first observation is that unlike in the Netherlands, most SBRI calls regard the development of innovative solutions for concrete operational needs of the participating public agencies. 19 of the 27 analysed calls were funded by a public agency who could potentially act as end-customer of the targeted innovation. Also interesting to mention is that 13 of these 19 direct PCPs were funded by research agencies of the Ministry of Defense ('MoD').

My second observation is that the SBRI programme focuses predominantly on technological innovations. 21 of the 27 calls target exclusively the development of technological innovations. In 5 other calls it appears that services innovations are also accepted. Only 1 calls targets exclusively service innovations.

My third observation is that a large share of the calls expressly target high-risk innovations. Thus, 11 of the 13 calls published by MoD stress that submitted proposals should target high-risk R&D and should aim to develop disruptive innovations. Only 2 calls provide indication that late stage technologies are preferred: one requires the delivery of a prototype within one year;[879] another call requires new applications of existing technologies[880].

4.4.5 Conclusions

Since 2008, the UK SBRI has been brought more in line with the philosophy and operational make-up of the US SBIR. In this form, the UK SBRI comes closer to the US SBIR than the Dutch initiative. Hereunder, I summarise the differences and highlight whether they bear relevance

[877] Holland (2010) 10.
[878] See <http://www.innovateuk.org/deliveringinnovation/smallbusinessresearchinitiative/competitions.ashx> accessed 4 September 2012.
[879] See 'Innovation design for future climate resilience in the infrastructure and built environment sectors', available at https://www.innovateuk.org/competition-display-page/-/asset_publisher/RqEt2AKmEBhi/content/innovative-design-for-future-climate-resilience-in-the-infrastructure-and-built-environment-sectors?p_p_auth=KwurO9n8 accessed 14 January 2014.
[880] See 'land vehicles exercise', available at https://www.innovateuk.org/competition-display-page/-/asset_publisher/RqEt2AKmEBhi/content/land-vehicle-exercise-lvex-2013?p_p_auth=KwurO9n8> accessed 14 January 2014.

for the potential impact of the programme according to the prerequisites identified in Chapter 2.

1. The public R&D funding targets the most experimental and riskiest R&D projects (see Chapter 2).

Participation in the UK SBRI is not mandatory. Neither is it mandatory for public bodies to set aside dedicated SBRI budgets. Participation in the SBRI is encouraged through advocacy and co-funding by TSB. This approach was considered suitable for the UK framework, considering the previous experience with mandatory set-asides that did not lead to the expected mind-set change. However, lack of a clear obligation to engage in SBRI projects may inhibit the risk-taking attitude of the public authorities, particularly in times of budgetary crunch.

The documentary analysis of the SBRI calls provided indications that high risk R&D is targeted, particularly by MoD. It is however unclear whether choice of SBRI projects is preceded by a thorough scrutiny of the technologies already available on the market. TSB regularly performs extended analyses of the stage of development of alternative technologies, market structure and end-users' preferences. However, they are not performed in direct relation with the SBRI scheme and are not performed in all areas where SBRI projects are published. This entails the risk that close-to-market technologies are funded instead of early stage R&D.

2. The public R&D funding targets small companies, that experience difficulties in obtaining (sufficient amounts of) private capital for experimental/risky R&D projects (see Chapter 2).

Similar to the Dutch SBIR, the UK SBRI programme targets both large and small companies. But the UK SBRI was also set-up initially to attract small and medium sized firms. Moreover, within the UK SBRI, 100% of the R&D costs are covered. Although, unlike in the US, no profit is covered, this feature shows that the UK SBRI is more aligned with the rationale that small firms have difficulties in finding matching funds for risky or uncertain R&D projects. Full coverage of R&D costs within the UK SBRI provides an additional incentive to small companies to participate in SBRI competitions with their riskiest/most uncertain R&D projects.

3. A high degree of experimentation and tolerance to failure are accepted (see Chapter 2).

The UK SBRI provides insufficient incentives for the project officers to adopt highly experimental and failure tolerant attitudes. Although the amount of funding per Phase is at the same levels as in the US, the possibility to deviate from the maximum values is

not provided. Neither is the possibility to award multiple sequential Phase 2 awards to promising projects that have not successfully accomplished the prototyping phase in the first SBRI call.

4. Competition is maintained throughout the whole innovation process (see Chapter 2).

Although EU-wide competition is foreseen in the UK SBRI, restricted access to the procurement documentation sheds some doubts regarding compliance with this requirement. In addition, the market scrutiny performed by TSB under the name of Innovation Platforms does not seem to be directly linked to the SBRI competitions and are national in scope. These aspects entail the risk that the SBRI competitions tend to protect national companies from EU and international competition instead of driving them to advance the international state-of-the-art and gain competitive advantages on global markets.

5. The public purchaser is the technologically sophisticated end-user of the envisaged innovation (see Chapter 2).

Implementation of the SBRI programme is more decentralized than the Dutch SBIR and approaches the US SBIR in this respect. TSB provides different degrees of support, but SBRI award and contract management is generally performed by the funding agency. These public bodies are most often also the end-customers of the developed solutions.

6. The public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation (see Chapter 2).

Similar to the Dutch SBIR and conform the PCP guidance, the UK SBRI does not ensure purchase of the developed solutions. Although in the UK there is experience with the Forward Commitment Procurement ('FCP', see Chapter 1, section 1.5.4 above), which can guarantee an end-customer of the developed products, FCP has so far been piloted without any link to SBRI or TSB.[881]

7. A continuous scrutiny/measurement of the impact of PCP is performed and lessons learnt are codified in guidance.

[881] FCP entails a competitive award under the scope of the Procurement Directives and does not guarantee the purchase of the products developed during the SBRI project. See Department for Business Innovation & Skills, 'Case Study: Forward Commitment Procurement' (2011) <http://www.bis.gov.uk/assets/BISCore/corporate/MigratedD/publications/C/cs01_fcp.pdf> accessed 2 February 2013.

The UK SBRI has regularly been assessed and as a consequence thereof, important changes have been included into the progrmme.

The UK SBRI embeds more prerequisites for effectiveness than the Dutch SBIR. However, it supports to a lesser extent than the US SBIR participating (national) companies to create globally competitive innovations and gain global market shares.

4.5 The Flemish Procurement of Innovation

4.5.1 Description and initiation background

The UK SBRI and the NL SBIR are the first and most established PCP-like initiatives in the EU. In 2006, IWT (Agentschap voor Innovatie door Wetenschap en Technologie, the Flemish innovation agency) followed suit. IWT explored (in the context of a thematic working group of the Innovation Platform on Environmental Issues and Energy) the possibilities to use *Flemish* Procurement of Innovation (PoI) as a tool to develop the technological base of the Flemish region, to find cost-efficient solutions to important socio-economic problems and to improve public services.[882] Because explicit discrimination in favour of Flemish businesses is not allowed by EU competition rules, IWT directed the deployment of PoI towards areas wherein Flemish companies already possess core competencies.[883]

PoI was defined as procurement of products/services *'that do(es) not exist, but which could (probably) be developed within a reasonable period of time, based on additional or new innovative work by the organization(s) undertaking to produce, supply, and sell the product being purchased' (my translation)*.[884]

IWT pointed out that the following elements were considered crucial for the successful deployment of PoI:

- political support for the PoI;
- dialogue between the contracting authorities and suppliers;
- sharing of risks and benefits;
- use of foresight techniques;

[882] C.Veys, P. Thevissen, H. Bodewes, S. Hargeskog, L. Müller, M. Ottolander, N. Widmark, 'Exploring Public Procurement of Innovation as a Strategic Innovation Policy Mix Instrument' (March 2009) 37 (Veys et al (2009)) <http://www.innovatiefaanbesteden.be/files/409> accessed 2 February 2013

[883] IWT, 'Vlaams Actieplan Innovatief Aanbesteden (2008-2010)' 3, 5 (IWT Actieplan (2008-2010)) <http://www.iwt.be/sites/default/files/IA_Vlaams_actieplan.pdf> accessed 2 February 2013.

[884] IWT, 'Innovatief Aanbesteden door de Vlaamse Overheid' (17 November 2006) slide 8. Inspired by Charles Edquist and Leif Hommen 'Public technology procurement and innovation theory' in Edquist et al (eds), *'Public Technology Procurement and Innovation*' (Kluwer 2000) 22-23.

- use of the risk management expertise by the public buyer.[885]

Subsequently, IWT refined the methodology, partially based on the lessons learnt with the framework of the European OMC-PTP project. [886]

PoI as refined by IWT consists of the following steps.

- The impetus for initiating a procurement of innovation must originate in the political ambitions of each participating ministry.

- Each ministry is required to supervise the drafting of a master plan by a contracting authority, in line with the above mentioned political ambitions. The contracting authority should justify in the master plan why it needs a new solution and how this can enhance the effective and efficient execution of its public tasks.[887]

- At this stage, a list of requirements for the desired innovations and a list of Key Performance Indicators are also defined.[888]

Besides defining the business-case for deploying a PoI, the role of a master plan is to signal political commitment for the development of new technologies to the market. The master plan is also expected to raise visibility for the PoI and as a consequence to encourage other contracting authorities to get involved.

- Following the formulation of the master plan, the market is consulted in order to find out whether the desired solutions are available. This is done though a so-called Innovation Platform, established for a period of 6 months.[889]

The function of the Innovation Platform is both to consult the market on the existence of the desired solution and to receive concrete input on defining the procurement specifications. It facilitates an exchange of information between several stakeholders (e.g., procurers, knowledge centres, firms), with the aim to align the private strategies with the public ones. The Innovation Platform is also meant to identify other innovation policy instruments besides or

[885] Idem.
[886] The OMC-PTP project was a project funded by the European Commission under FP6 and had the objective to set up pilot programmes involving various forms of procurement of new technology and innovation in the participating countries and provide a platform for exchanges of experiences and feedback. See <http://cordis.europa.eu/search/index.cfm?fuseaction=result.document&RS_LANG=EN&RS_RCN=12564029&q> accessed 4 September 2012.
[887] IWT Actieplan (2008-2010) 7.
[888] Veys et al (2009).
[889] IWT Actieplan (2008-2010) 10.

instead of public procurement, which would be (more) suitable to stimulate the development of the desired solution.[890]

- The information obtained through the Innovation Platform is processed into an Innovation Matrix: one of the axis will indicate the type of involvement of the government in the procurement of the technology: direct procurement, co-operative or catalytic procurement; the other axis will indicate the stage of development of the required technology: feasibility study, prototype, field tests, commercially available. [891]

	Explorative				Integration/Adaptation	Diffusion
	Feasibility	Concept	Prototype	Pilot		
direct procurement						
cooperative procurement						
catalytic procurement						

Fig.3 The structure of a PoI innovation matrix[892]

Lack of explorative trajectories in the Innovation Matrix is considered an indication that insufficient attention has been paid by the government agency to future socio-economic needs.[893] The filled-out Innovation Matrix provides support for the choice of the most suitable procurement instrument.[894] If the technology already exists (e.g. finds itself at the integration/adaptation or diffusion phase on the Matrix) but it is not yet broadly commercialised, commercial procurement should be chosen. When the technology finds itself at an R&D stage (e.g. concept, feasibility, prototype, pilot), PCP should be chosen.[895] The entire approach can be visualised as follows:

[890] Veys et al (2009) 37.
[891] IWT Actieplan (2008-2010) 4. The Matrix was inspired by Hommen's Matrix. See Hommen, Leif & Rolfstam, Max, 'Classifying Public Procurement of Innovation: A Taxonomy' (2006) Oct Issue *Tijdschrift Aanbestedingsrecht* 112.
[892] Source: Presentation of Peter Thevissen en Stephan Corvers, Brussels, January 2007
[893] Concept van Innovatief aanbesteden voor Vlaanderen 11. IWT Actieplan (2008-2010) 8.
[894] IWT Actieplan (2008-2010) 7.
[895] Ibid.

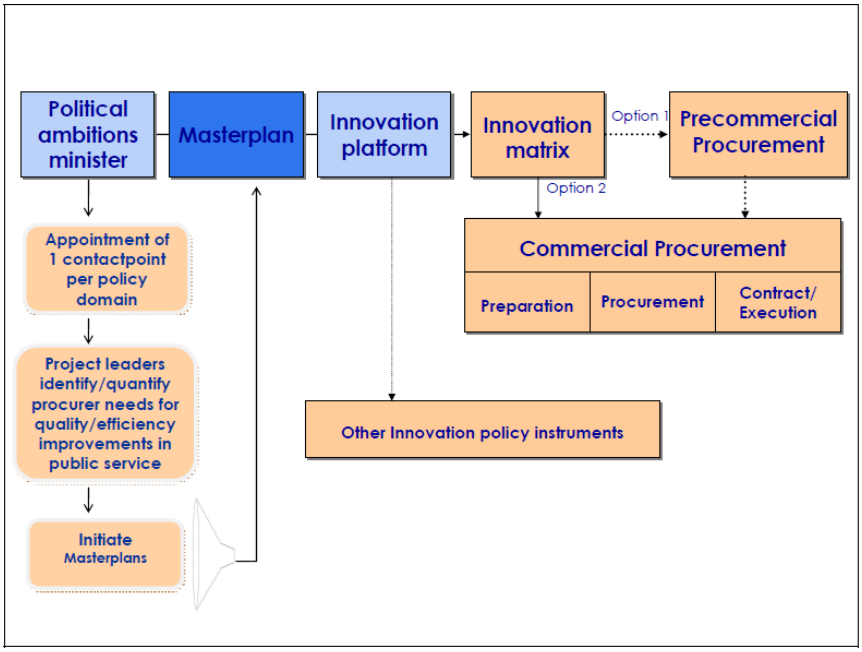

Fig.4 PoI model[896]

4.5.2 Features of the Flemish PoI

In this section I summarise the PoI in terms of what I consider its defining features:

a) Non-mandatory participation

The policy described in the previous section was approved by the Flemish government in July 2008. Within this context, an Action Plan was drafted that focused specifically on the procurement of R&D. IWT was appointed to pilot pre-commercial procurement calls between 2009 - 2014. IWT received a budget of EUR 10m for realizing this in the period 2008-2010.[897]

The Flemish PoI finds itself at the piloting stage and it is not clear whether the programme may afterwards become mandatory for certain contracting authorities. It is currently voluntary.

b) Centralised implementation

The Flemish PoI is centrally driven by IWT. The centralized set-up of the programme bears a strong resemblance to the NL SBIR. IWT is in charge of organizing Innovation Platforms and of subsequently conducting PCP procedures, in the name of the

[896] Source: The Flemish model for Procurement of Innovation, IWT Actieplan (2008-2010)
[897] Hilde Vermeulen, 'Demand-side innovation policies in Flanders, in Demand/side Innovation Policies' (OECD 2011)115-22 (Vermeulen (2011)).

commissioning ministry. The ministry decides whether an Innovation Platform needs to be set-up on a certain topic. It subsequently approaches IWT with the request to draft a master plan, to run an Innovation Platform and to run the subsequent pre-commercial procurements.[898] It appears that a contracting authority with concrete needs not necessarily involved in initiating the process but will be invited to participate in the Innovation Platform.[899] Each Innovation Platform is advertised on a EU-wide forum and is open to any relevant stakeholder for participation.[900] Yet, the required use of the Flemish language[901] will discourage companies from other Member States to participate.[902]

More in line with the US SBIR, IWT employs personnel with relevant technical expertise depending on the needs of each project. Such technical expertise is particularly used during the Innovation Platforms to determine the degree of technical innovation needed for the development of the desired solutions.[903]

c) Eligibility criteria

The activities that may be eligible for award are not defined. It is therefore not possible for me to conclude whether these are in line with the definition of R&D, as outlined in the Frascati Manual or as used within the US SBIR. IWT is, however, in charge of supervising compliance with the minimum legal requirements governing PCP throughout the whole process.[904]

d) Phases

The Flemish PCP procedure is divided into 3 phases: feasibility study, prototype and pilot project. For each phase, IWT will make the following budgets available: up to 80.000 euro for the feasibility study, up to 500.000 euro for prototyping and between 750.000 euro and 1.5 million euro for the pilot. Each client ministry may provide additional budgets.[905] These amounts are in line with the US SBIR approach.

[898] IWT Actieplan (2008-2010) 10-1.
[899] IWT Actieplan (2008-2010)10.
[900] Chapter 5.1, http://www.innovatiefaanbesteden.be/juridisch> accessed 10 November 2013.
[901] And the long timeline of an Innovation Platform combined with non-reimbursement of participation costs may discourage companies from other Member States to participate. See also: Chapter 5.2, http://www.innovatiefaanbesteden.be/juridisch> accessed 10 November 2013.

[903] IWT Actieplan (2008-2010) 9.
[904] Vermeulen (2011).
[905] IWT Actieplan (2008-2010) 12.

No regulatory guidance is provided on the time constraints for the different Phases, and neither is such guidance available on the possibility to fund multiple sequential Phase 2 awards to the same contestant.

Similar to the NL SBIR and the UK SBRI, the Flemish programme does not offer the possibility for a contracting authority to directly purchase the results of the pre-commercial procurement. No alternative support is provided for the commercialization phase. However, IWT requires the involved contracting authorities to sign a letter of engagement by which they commit to organize a commercial procurement in order to purchase a solution such as the one targeted by the PCP.[906] It is not clear in how far this commitment is enforceable.

d) Sharing arrangements for IPR and R&D costs

The Flemish programme does not define a pre-set manner to share IP rights or other benefits. This is decided on a case-by-case basis. Depending on the type of project, the government may also choose to share with the R&D service provider the profits made at later commercialization stages. It is also not pre-defined how the government shares R&D costs with the R&D service provider. The guidance for conducting pre-commercial procurement indicates that a market price will be paid by the government, in accordance with the division of IP rights. No specific mechanism to ensure compliance with this requirement is provided.[907] The programme guidance does not exclude that state aid is granted additionally. Ensuring compliance with EU State aid rules is decided on a case-by-case basis as well.[908]

The PoI scheme has not yet been officially notified to the European Commission and has thus not been checked for compliance with the EU legal rules. IWT plans to do that after the pilot is closed in 2014.[909]

4.5.3 Projects

By 2011, the 13 government agencies involved in the PoI had proposed 48 PoI calls, out of which 15 were selected.[910] By January 2014, 12 of these 15 projects had been deployed by IWT. I performed a documentary analysis of the information available on the IWT website regarding these 12 projects. A preliminary observation was that 6 of the 12 projects had been

[906] See <http://www.innovatiefaanbesteden.be/juridisch> accessed 10 November 2013.
[907] See <http://www.innovatiefaanbesteden.be/juridisch> accessed 10 November 2013.
[908] Chapter 6, http://www.innovatiefaanbesteden.be/juridisch> accessed 10 November 2013.
[909] Ibid.
[910] See <http://www.innovatiefaanbesteden.be/lopende_projecten> accessed 4 September 2012..

either stopped due to lack of funding or had proceeded as a commercial procurement following the conclusion of the innovation platform that desired solutions were already available on the market.

I analysed the remaining 6 projects that were chosen for a PCP trajectory against the same criteria as I used for the Dutch SBIR and UK SBRI: (1) the existence of a public end-customer, (2) technological innovations as target, (3) high-risk or uncertain R&D as target. Based on this analysis, I outline the following observations.

My first observation is that the majority of the PCP calls (4 out of 6) target solutions for a potential public end-customers. However, in 3 of the 4 cases in which a public end-user is conceivable, the PCP is not conducted by the end-user, but by a ministry together with IWT.

My second observation is that the majority of the PCP calls (4 out of 6) target exclusively technological innovation.

My third observation is that the calls do not target high-risk innovations. To illustrate this, I will describe 3 of the 6 PCP projects.

The first project within the pilot programme was proposed by the governmental agency of Socio-Cultural Work. The project regards the development of a prototype for an e-book platform, which should provide a permanent and secure inventory of digital editions of Flemish books. This e-book platform is intended for exploitation by editors, book traders, libraries and content collectors etc. The project was financed with EUR 500.000 by the Ministry of Innovation and Culture.[911]

The innovative element of this project regarded integrating functions of import, inventory, exploitation of text with security issues regarding the content and the need to ensure a full text search facility. The platform envisages in addition *´an archiving function for a future cultural heritage centre and a coding module to produce different formats´*.[912] I find it very difficult to read anything beyond standard and well-established technology in this project. The market failure that the government invoked in this case regards the lack of private funding for digitalizing Flemish literature, which entails the danger of loss of diversity for the readers.[913]

A second project finds itself at the market scouting stage and presents already difficulties in receiving the needed input from relevant stakeholders regarding the (technological) areas

[911] See <http://www.innovatiefaanbesteden.be/project/vlaams_e-boek_platform_(vep)> accessed 4 February 2013.
[912] Vermeulen (2011) 115-122.
[913] Vlaams E-boek platform: Informatievergadering (22 December 2011) slide 5 <http://www.innovatiefaanbesteden.be/files/2047> accessed 4 February 2013.

that may be advanced beyond state-of-the-art through a PCP.[914] The aim of the project is to develop a website that can catalyse the development and commercialization of environmentally-friendly products and services. Although the innovation platform was set-up at the end of 2012, this project has one and a half year later not moved beyond this stage, which suggests that it may be discontinued in the near future.

The third project that presents indications that no high-risk technological innovation is targeted, regards the construction of energy-neutral buildings.[915] This project explores 4 sub-topics:[916] (1) testing the scale-effects on costs, by building 6 (almost) energy-neutral prototype houses with existing technologies; (2) technological solutions for energy-saving windows, doors and walls in monuments, in which the focus is on existing innovations and quick-wins; (3) development of a life-cycle cost ('LCC') method to calculate the cost of a construction project; (4) exploring the potential cost savings resulting from the application of a cooperative investment model ('ESCO-model') in a school renovation.

None of the envisaged sub-projects describes the technological area that should be advanced beyond state-of-the-art. They target application of existing technologies in already planned renovation projects. The third sub-project has already been stopped following the conclusion that no R&D services were involved.[917] Moreover, there is no recent information on the status of implementation of the other 3 sub-projects.[918]

In conclusion, the Flemish PoI scores poorly in deploying PCPs. Of the 3 remaining projects one still finds itself at the market consultation phase.[919] It remains to be seen whether this project will continue as a PCP. This leaves the Flemish PoI with only 2 PCPs initiated since 2008. These 2 projects are at an early stage: the PCP contracts have been awarded in the second half of 2013. The first one project targets the development of an innovative software capable to support the sub-titling of Dutch speaking television programmes,[920] while the other one targets innovative technologies for greenhouses.[921]

[914] See http://www.innovatiefaanbesteden.be/project/katalytisch_eco-aankopen> accessed 15 January 2014.
[915] See <http://www.innovatiefaanbesteden.be/project/energieneutraal_bouwen_zonder_meerkost/documents> accessed 15 January 2014.
[916] Dany Robberecht – Verhaert, 'Innovatief Aanbesteden – Energieneutraal Bouwen, Masterplan Innovatie' (21 May 2012) 20, 24, 28 <http://www.innovatiefaanbesteden.be/files/2408> accessed 15 January 2014.
[917] See <http://www.innovatiefaanbesteden.be/project/energieneutraal_bouwen_zonder_meerkost> accessed 15 January 2014.
[918] The latest document dates 21 May 2012. It is unclear whether PCP calls for proposals have been published or whether continuation of these projects is under discussion.
[919] See <http://www.innovatiefaanbesteden.be/project/hydrografische_peilingen_in_ondiep_water_over_grote_gebieden> accessed 15 January 2014.
[920] See <http://www.innovatiefaanbesteden.be/project/spraak-_en_taaltechnologisch_ondertitelen_in_het_nederlands> accessed 15 January 2014.
[921] See <http://www.innovatiefaanbesteden.be/project/op_weg_naar_een_duurzamere_glastuinbouw_in_vlaanderen> accessed 15 January 2014.

4.5.3 Conclusions

The Flemish PoI scheme finds itself at an incipient stage. In its current form there are shortcomings that may affect the potential impact of the program, according to the parameters identified in Chapter 2. I hereunder outline these shortcomings.

1. The public R&D funding targets the most experimental and riskiest R&D projects (see Chapter 2).

The Flemish programme has so far been deployed as a pilot. In 2014 a decision should be taken regarding the continuation of the programme. As a consequence, the deploying entity, IWT was divided between the need to comply with the EU legal constrains regarding open competition and value of funded R&D services, on the one side, and the need to attract participation of government agencies that are more interested in supporting local companies than advancing the EU Lisbon agenda, on the other side. This made it difficult for IWT to develop effective, transparent and objective PoI practices.

The result is a muddled programme which is biased towards closer to market projects. That this is the case was confirmed by the analysis in the previous section.

2. A high degree of experimentation and tolerance to failure are accepted (see Chapter 2).

The Flemish programme is divided into three phases (feasibility, prototyping and pilot). The amounts of funding per stage are flexible, but depend on the financial commitments of the commissioning ministries. In addition, similar to the other two national programmes analysed in this chapter, no possibility to award multiple Phase 2 contracts is provided. This points out the limited degree of experimentation and tolerance to failure embedded into the Flemish program. And in practice, not a single high-risk innovation project could be found among the 12 projects investigated.

3. Competition is maintained throughout the whole innovation process (see Chapter 2).

The Flemish programme embeds a market consultation, related to each PCP competition (the so-called Innovation Platform). The market consultation is advertised through EU-wide means and participation is open to foreign companies. This could be an important strength of the programme. However, the strong national policy interests of the participating funding agencies induce to require the use of the Flemish

language and to discourage in practice foreign companies from participating. This entails the risk that instead of driving national companies to compete with the international state-of-the-art practices and to thus gain global competitive advantages, it will merely protect national companies from foreign competition and waste public funds on solutions that already have been made available elsewhere.

4. The public purchaser is the technologically sophisticated end-user of the envisaged innovation (see Chapter 2).

The Flemish programme is centrally run by a national innovation agency that is not an end-user of the developed innovations. The (private) end-users are not involved in the PCP procedure, they participate in the Innovation Platforms. As a consequence, the programme resembles more of a supply-side subsidy scheme than a demand-side instrument.

5. The public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation (see Chapter 2).

Similar to the Dutch SBIR and the UK SBRI and in line with the PCP guidance, the Flemish programme does not allow the direct purchase of the developed innovations by the participating public authorities. Moreover, no additional support is provided for the commercialization phase. But letters of engagement to purchase solutions with the performance levels and functionalities of those developed through PCP are signed by the involved contracting authorities. However, the fact that many solutions are not developed for a public end-customer weakens the value of this feature.

In conclusion, the Flemish PoI programme lacks important prerequisites for an effective implementation. The fundaments of the programme are vested in national interests to provide funding to national companies, leading to what I called a muddled PoI. Due to insufficient political clarity and backing, the future of the programme depends on an opaque political evaluation of the initial piloting phase. As a consequence the pilot has turned towards closer to market R&D projects and has achieved poor results in deploying R&D procurement.

4.6 EU support for PCP

4.6.1 Basis for European Commission's action

By drafting the PCP, the European Commission expected to stimulate contracting authorities to contribute to the European innovation agenda from the demand-side. Moreover, the European Commission intended to ensure that this demand-side policy instrument supports and exploits the benefits of EU-wide competition and of EU-wide markets.

In contract with these expectations, PCP-like initiatives have exclusively been implemented as national or regional programmes, and in a very limited number of Member States. Although some of the challenges issued in different programmes are functionally related or even almost identical,[922] none of them resulted in trans-national cooperation and neither did they result in EU-wide competition. On the contrary, where effective, procedures are conducted in the national languages of the funding agencies. This approach constitutes, particularly in the Netherlands and Flanders, a strong and legitimate barrier against participation by companies from other EU Member States.

Moreover, the PCP-like schemes under consideration present features that are not in line with the requirements for an effective demand-side instrument such as identified in Chapter 2. Things are complicated by the consideration that these schemes are potentially in breach of EU State aid legal rules.

PCP in its cross-border form as envisaged by the PCP Communication remained by 2011, largely unknown among individual contracting authorities in most EU Member States.[923]

In the study preceding the adoption of the PCP Communication in 2007, it was anticipated that conducting a PCP procedure entails (legal, technical and organisational) risks that contracting authorities are not willing to take. The study warned that the EU would need to incentivize the contracting authorities to apply PCP procedures, particularly in areas of common European interest, where cross-border collaboration is desirable in order to ensure interoperability and create economies of scale.[924]

4.6.2 European Commission incentivizing actions

Arguably, there are multiple reasons for the reticence of individual contracting authorities to engage in cross-border PCP procedures. Some of these have been discussed in section 4.2.

[922] For example, the call for assisted living and protective equipment for military combat in urban environments is practically identical within the Dutch SBIR and the UK SBRI. See <www.innovateuk.org/deliveringinnovation/smallbusinessresearchinitiative.ashx> accessed 4 September 2012.
[923] PCP Survey (2011).
[924] National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation, 'Pre-commercial Procurement of Innovation: A Missing Link in the European Innovation Cycle (PCP Expert Group)' (March 2006) 29 <ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/precommercial-procurement-of-innovation_en.pdf>, accessed 12 November 2012.

They cover: lack of technical knowledge; contracting authorities' aversion to risk (particularly when PCP-like initiatives are not institutionalized and are not mandated); lack of clarity around the distinction between PCP and regular subsidies and the accompanying concerns regarding compliance with EU State aid rules; the irrelevance for regular contracting authorities when subsequent direct purchase of the developed innovation is not allowed; the complexity of the procedure itself (to find matching partners in other Member States, to define common requirements and to coordinate common procedures etc.).

The Commission has since 2009 acted upon some of the difficulties encountered by contracting authorities when deciding to conduct PCP. Initially, the Commission financially supported the formation of procurer groups and of networking activities related to PCP, under the FP7 and RFEC programmes.[925] This appeared soon to be insufficient, as the support did not lead to the emergence of the good practices expected.

Funding PCPs

As a consequence, the European Commission took the initiative to fund, under the FP7 programme, all of the organizational costs and part of the contractual costs of PCPs conducted by European consortia of public authorities. Call 7 allocated, for example, in 2011, 6M euro to joint PCPs in services for mobile access to patient health info and to robotic solutions for ageing well. Call 8 made in 2012 a budget of 3 M euro available for joint cross-border PCPs in the area of 'Photonic technologies' aimed at improving quality and/or efficiency of public services. Additional funding for PCP networking has also been made available under Call 8 covering any sector of interest.

Funding of joint cross-border PCP has also been made available under the FP7 Capacities – Research Infrastructures work programme (INFRA-2012-2.3.1) on the third implementation phase of the European High Performance Computing (HPC) service organized through PRACE (Partnership for Advanced Computing in Europe). PCP was considered a suitable instrument to advance the state-of-the-art in HPC systems, as the public sector is an important procurer of such systems. Moreover, bundling resources and demand at the EU-level is considered to have the capability to give a boost to the EU HPC sector, which is considered unattainable for Member States individually.[926]

There are currently 8 joint PCP projects funded by the European Commission. The first awarded project is SILVER, a collaboration between several European cities to stimulate the development of robotic solutions to support independent living for the elderly. The project

[925] <http://cordis.europa.eu/fp7/ict/pcp/projects_en.html> accessed 4 February 2013.
[926] Commission, 'High-Performance Computing: Europe's place in a Global Race' COM(2012) 45 final 6.

started in January 2012 and is planned to be completed after 45 month (none of the projects is thus close to conclusion).

The European Commission intends to continue the funding of collaborative PCPs. For example, pre-commercial procurement was introduced as a new funding instrument in Horizon 2020, the new framework programme for EU support to research and innovation for the period 2014-2020. Horizon 2020 will financially support PCPs conducted by consortia of contracting authorities from different Member States. EU institutions or EU funding bodies may also participate in such consortia.[927] For 2014-2015 EUR 130-140 million have been reserved for collaborative PCPs and collaborative procurements of innovation (PPI).[928]

Data collection

Besides funding of collaborative PCPs, the Commission has also offered funding in 2011 for collecting data on R&D expenditure through procurement across Europe. This was meant to support better informed decision-making about public intervention that encourage innovation from the public demand-side, such as through pre-commercial procurement.[929] The project is expected to yield results in the beginning of 2014. The Commission intends to collect this type of data systematically in the future.

Further studies on EU involvement

In addition, the Commission has explored new ways to incentivize the broad implementation of PCP. In 2011, the European Commission commissioned a study to explore the support for EU involvement in PCP-type of procedures. This study concludes that contracting authorities across the EU envisage a coordination role for the EU in cross-border projects, particularly in learning activities and in drafting procurement specifications. Interviewed contracting authorities consider though that defining the needs and assessing the bids should be left to the Member States. A mix of competences is favoured also in setting the topics of the procurement initiatives, both falling within the broad common-EU policy objectives, as well as driven by the concrete needs of the contracting authorities.[930]

Signals regarding support for a more hands-on involvement of the EU in PCPs are also perceived in national studies. EU involvement in stimulating EU-wide competition in PCPs

[927] See <cordis.europa.eu/fp7/ict/pcp/policy_en.html> accessed 5 November 2013.
[928] Lieve Bos, Presentation in Krakow 14 November 2013, <http://ec.europa.eu/enterprise/policies/innovation/files/public-procurement/krakow-2013-bos_en.pdf> accessed 15 December 2013.
[929] Quantifying public procurement of research and development of ICT solutions, Deadline: 16 September 2011 <http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=7157> accessed 2 February 2013.
[930] John Rigby, Patries Boekholt, Abby Semple, Jasper Deuten, Ramona Apostol, Stephan Corvers, Jakob Edler, 'Feasibility study on future EU support to public procurement of innovative solutions: Obtaining Evidence for a Full Scheme' (2 February 2012) (Feasibility Study (2012) <http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/files/meeting-procurement-feb2012/study-eu-support-public-procurement-innovative-solutions_en.pdf> accessed 2 February 2013.

around challenges common to more than one Member State, is seen as an important pre-condition to escape the '*political criticism that national tax money goes to foreign companies*'.[931] There has been so far no analysis of the possibility to combine the national and the EU initiatives on PCP-like schemes. This analysis falls outside the scope of this research as this falls within the ambit of institutional economics.

The new Procurement Directives

Most recently, the Commission has taken the initiative to include in the new Procurement Directives default provisions for cases of cross-border collaborations in (pre-commercial) procurement.[932] The new Procurement Directives also introduce the Innovation Partnership procedure, allowing contracting authorities to purchase R&D and the resulting innovations. A more detailed discussion on the Innovation Partnership procedure and on its relation to PCP can be found in Chapter 5, section 5.4.4.

4.7 Conclusions

This chapter has analysed the state of implementation of collaborative PCPs as envisaged by the European Commission in its 2007 PCP Communication. It concluded that by 2011, there were practically no examples of collaborative cross-border PCP projects.

The studies evaluating the state of implementation of PCP identified the following reasons for the limited appeal of PCP to contracting authorities:

- lack of technical knowledge;
- contracting authorities' aversion to risk particularly when PCP(-like) initiatives are not institutionalized and are not mandated;
- lack of clarity around the distinction between PCP and regular subsidies and the accompanying concerns regarding compliance with EU State aid rules;
- the irrelevance for contracting authorities when subsequent direct purchase of the developed innovation is not allowed;
- the complexity of a cross-border procedure (to find matching partners in other Member States, to define common requirements and to coordinate common procedures etc.).

[931] Holland (2010) 14.
[932] Article 38, Joint procurement between contracting authorities from different Member States, Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.

In the second part, this chapter analysed the forms of PCP that have been set-up at the national level. These were being implemented by innovation agencies in three Member States: the Netherlands, the UK and Belgium. The analysis has revealed that important differences persist between these schemes and the US SBIR scheme. Most of these differences can be related to missing requirements for the effective implementation of R&D procurement, as identified in Chapter 2. Evaluation are planned in 2014 for all three programmes. In view of the poor results booked so far, there is a real chance that they will be discontinued.

The main shortcomings of the analysed national PCP-like schemes are outlined below.

1. The *participation is voluntary* in all the national PCP-like schemes analysed in this chapter. The implementation of the schemes depends on the promotion efforts of the innovation agency running or coordinating the scheme. Arguably, this increases the pressure to come up with success stories and consequently closer-to-commercialization projects are preferred. As a consequence, the PCP-like projects do not target the riskier and the more uncertain R&D projects, which could benefit most from the public funding.

2. The same risk that close to commercialization projects are chosen may also occur when *no market research is performed*. Definition of advanced requirements that go beyond the international state-of-the-art was identified in Chapter 2 as crucial to creating global competitive advantages for firms participating in R&D procurement. This is not achieved when market research is limited to national participants.

3. The centralized deployment of the Dutch and Flemish programmes and the consequent *limited involvement of the end-customers and of the end-users* are important shortcomings. Most competitions within these two programmes target solutions for the private end-customer, which limits the prospects of early adoption of the developed innovation.

4. Moreover, of the three analysed national PCP-like initiatives *none allows for the direct purchase of the developed innovation* by public authorities. This is in line with the EU legislation on public procurement, but in contrast to the US SBIR and to the recommendation to encourage early adoption of innovations in order to enhance the global competitive advantages of the innovating companies.

4. The timelines envisaged for the R&D procurements in all three schemes *are relatively short* compared to the EU guidance and to the US SBIR practice.

5. Moreover, *limited flexibility* is embedded into the three national programmes to deviate from these timelines and from the maximum amounts of funding per Phase.

6. Besides that, none of the 3 programmes provides *the possibility to award multiple sequential Phase 2 awards to the same company*. This indicates that a high degree of experimentation and tolerance to failure are not embedded into the programmes, although they are important prerequisites for successful demand-side R&D funding.

7. The NL SBIR and the Flemish PoI and to a less extent the UK SBRI, award R&D contracts for the development of close-to-market products and the development of innovations in services. According to the conclusions in Chapter 2, innovation in services does not occur as a result of R&D projects, and the drivers of innovation in services are not well understood. This raises the question whether spending of public R&D funds is justified.

8. Finally, the individual Member States that have so far implemented *PCP-like programs are motivated by the desire to support national companies*. This desire can be by itself legitimate, yet may lead to muddled programs. When this occurs, they will miss important characteristics that are needed to achieve their EU aims.

Since 2007, the European Commission has taken action to boost the implementation of PCPs conducted in collaboration by contracting authorities from different Member States. It has not attempted to harmonise the national programmes, as it lacks the necessary competence. However, the Commission has set the boundaries for these initiatives in its 2007 PCP Communication, in line with the EU rules on State aid and freedom of movement. Since 2009, the Commission has also provided funding for exchanges of experiences on PCP projects and since 2011 it has provided funding for the organizational and contractual costs of collaborative PCPs. More recently, it has focused on funding data collection and measurement studies and proposing legislative amendments.

The funding of collaborative PCPs is the most important attempt of the European Commission to create good practice and to enhance collaboration between contracting authorities from different EU Member States. It is considered to be the only tool available to the European Commission to steer the national practices into the desired direction. It has the potential to complement the national PCP-like initiatives and to leverage the support for EU coordinated action in the PCP area. It is unclear though whether the European Commission has a clear vision on the complementarity and consistency of the national and EU initiatives. Moreover, whether the projects co-funded by the EU embed the required conditions for achieving the targeted impact could not be assessed in this research, due to the early stage of the co-funded projects and the lack of information.

The European Commission has moreover not yet paid attention to the large disparities that are being created between the leading Member States in the area of R&D and innovation and the laggards.

My overall conclusion is that there has not yet been any confirmation that the EU initiatives aimed at boosting investments in R&D have had any result. Despite this, the EU continues (and even intensifies) these initiatives – seemingly unaware of the reasons why these initiatives tend to fail in practice.

In the next Chapter 5, I will focus on the most important barriers envisaged by individual contracting authorities to the wide implementation of PCP. I will investigate to what extent legal rules are the origin of these barriers and I will explore possible solutions.

CHAPTER 5. Legal barriers to the implementation of the PCP procedure

5.1 Introduction

In Chapter 4 I concluded that (1) the obligation to conduct a separate competitive award in order to purchase the innovative solution targeted by the PCP competition, and (2) the legal uncertainty regarding compliance with EU State aid rules were identified by contracting authorities as important barriers to the wide implementation of PCP. Contracting authorities (at least in Belgium, Denmark and the Netherlands) express even the concern that a PCP finalist[933] might need to be excluded from a subsequent competitive procedure due to the important knowledge benefits gained during the PCP.[934]

Particularly individual contracting authorities that need to use the developed innovation to fulfill their public tasks feel discouraged to use PCPs by the above mentioned barriers. Besides being the potential end-users, these contracting authorities are also the prospective early adopters of the developed innovations. Stimulating these authorities to act as entrepreneurial risk-taking actors in the innovation market is crucial for achieving the desired policy aims. The existence of the above mentioned barriers weakens thus the potential positive impact of PCP as innovation policy instrument.

The two PCP features identified as barriers to its wide implementation, find their origin in legal rules. I will explore in this chapter which legal rules constrained the choice regarding the above mentioned PCP features. I will subsequently conclude on the remaining flexibility for purchasing the innovative results of a PCP and I will suggest potential legislative amendments or alternative policy solutions.

To this end, I analyse in section 5.3 the provisions of the WTO Government Procurement Agreement that are invoked by the European Commission as reasons for not allowing direct purchase of the innovative solutions developed through PCP. I subsequently analyse how these provisions have influenced the content of the current EU procurement rules, as well as of the proposed procurement directives. Based on this analysis, I will draw conclusions on the suitability of the current regulatory framework to advance EU's interests in the area of R&D and innovation and I will point out possible solutions to the problems thus identified.[935]

[933] A PCP finalist is an undertaking which completed successfully all the PCP stages.
[934] Kincsö Izsak & Jakob Edler, 'Trends and Challenges in Demand-Side Innovation Policies in Europe Thematic Report 2011 under Specific Contract for the Integration of INNO Policy Trend Chart with ERAWATCH (2011-2012) 18 (26 October 2011) (Izsak & Edler (2011)) <http://ec.europa.eu/enterprise/newsroom/cf/_getdocument.cfm?doc_id=7011> accessed 2 February 2013.
[935] Parts of this Chapter are based on a previously published article by the author. See Anca Ramona Apostol, 'Pre-commercial procurement

In section 5.4, I will address the concern of contracting authorities that PCP finalists might need to be excluded from a subsequent competitive procedure for the purchase of a solution as the one developed during the respective PCP, in order to comply with the equal treatment principle.

In section 5.5, I criticize the choice of the European Commission to condition the inapplicability of the EU State aid rules upon compliance with the market price criterion. I define alternative approaches to ensure compliance with the EU State aid rules.

Before entering the discussion on the above mentioned barriers, I will outline the legal landscape in the EU and I will point out the differences between the EU as a supranational order and a national/federal state. This will increase the understanding of the background for some of the choices of the EU legislator and policy-maker regarding the design of the PCP.

5.2 The EU legal landscape

I have already underlined in Chapter 2 that the same type of technically advanced and financially endowed institutions such as the Federal agencies that implement the US SBIR programme cannot be found in the EU. EU is not a state and diverging national interests have prevented the creation of similar institutions. Particularly in areas such as R&D and innovation, national interests have clearly manifested. In this section, I provide an overview of the foundation and development of the EU. This will enhance the understanding of how the EU differs from a national state and will explain the constrains determining the choices around PCP.

The basis of the current European Union was laid in the 1951 Treaty of Paris, establishing the European Coal and Steel Community (ECSC) after the Second World War. The aim of the Treaty of Paris was to supervise the steel and coal sectors, which during the war had been used in the production of war munitions. This would make a rehearsal of the 1939-1945 catastrophe *'not merely unthinkable, but materially impossible'*.[936]

This initial economic collaboration was subsequently extended through the Treaties of Rome of 1957 establishing the European Economic Community (EEC) and the European Atomic Energy Community (EURATOM). These treaties were determined by the increased awareness that coordination of the economic activities and policies of the European states would lead

in support of innovation: Regulatory effectiveness?' (2012) 21 *PPLR* 212.

[936] Damian Chalmers, Gareth Davies and Giorgio Monti, *'European Union Law'* (2nd Edition CUP 2010) 10 (Chalmers et al (2010)).

not only to an increase in political stability but also to *'an accelerated raising of the standard of living'*.[937]

The Treaty of Rome provided the most important tools to achieve economic integration: the obligations for the Member States to refrain from taking action which may impede upon the freedom of movement of goods, workers, services and capital over the borders of the Member States. At the same time, the Treaty of Rome provided the institutional capabilities and the legislative competences to achieve this economic integration.[938]

Through subsequent amendments and accession of new members (28 Member States currently[939]), the European Communities were gradually extended and deepened. Legislative competence was granted to the EEC in additional sectors (health, safety at work, economic and social cohesion, research and development and environmental protection and cooperation in foreign policy[940], monetary union and culture, education, health and consumer protection, home affairs[941], area of freedom, security and justice, immigration, asylum, discrimination based on sex, race or ethnic origin, religion or belief, disability, age or sexual orientation[942]) and simplified voting procedures were introduced.[943]

The deepening and widening of the EEC was supported by the desire of the Member States to increase their economic leverage in a globalized economy. At the same time, awareness grew that further economic integration could only be achieved if the political union was strengthened and the European demos was enhanced on the basis of *'a set of shared values and on commitment to a form of collective identity/sociopolitical unit'*.[944] This translated within the Treaty of Maastricht in 1991 into a claim of a political union besides an economic one.[945] But the enlargement with new Member States each with particular structures and values increased the diversity within the EU and revealed the challenge to reaching a relatively homogenous environment which is the necessary basis for a further political integration.[946]

The fact that the EU is not comparable with a federal state and is not yet moving into that direction became most obvious in 2004, when the Constitutional Treaty was rejected in two referendums in France and the Netherlands. The negative outcome of the referendums

[937] Treaty of Rome establishing the European Economic Community [1957] art 1.
[938] Chalmers et al (2010) 32.
[939] On 1st of July 2013, the newest member, Croatia, acceded the European Union.
[940] Single European Act (SEA) [1986] OJ L169.
[941] Treaty of Maastricht on the European Union [1992] OJ C191.
[942] Treaty of Amsterdam [1997] OJ C340.
[943] The Treaty of Amsterdam extended the qualified majority voting to new fields, thus making the veto an exception. See Chalmers, Damian and Hadjiemmanuil, Christos and Monti, Giorgio and Tomkins, Adam, *'European Union law: text and materials'* (CUP 2006) 43 (Chalmers et al (2006)).
[944] D. Obradovic, 'Policy Legitimacy and the European Union'(1996) 34 *Journal of Common Market Studies* 208
[945] Chalmers et al (2006) 61.
[946] J. Zielonka, 'How New Enlarged Borders will Reshape the European Union'(2001) 39 *Journal of Common Market Studies* 513-15.

signaled the reticence of the European citizens to accept the message of federative integration of the Constitutional Treaty. The failure of the Constitutional Treaty revealed that European citizens had perceived the EU as an intruder into areas of national competence, while the EU suffered from a democratic deficit.[947] The lack of the elective element and the lack of transparency of the decision-making processes were advanced as potential reasons for the rejection.[948]

Despite the drawback of 2004, the European Union remains a unique political union which reached more deeply into the way Member States govern and regulate themselves and their societies than any other international organisation.[949]

The EU has so far achieved important successes, such as an uninterrupted period of 50 years of peace and unprecedented levels of welfare.[950] However, the ambitions of the EU have grown far beyond its initial objectives and cover areas such as security and international justice, ensuring environmental protection and curing world poverty, reaching global leadership based on European values of social welfare.[951] The achievement of these aims requires not only to adapt the EU competences to its ambitions but also to wisely use the flexibility offered by the current legal framework.

The reality for the time being is that there are important differences between the EU and a national state: the EU *'does not tax, spend, implement, coerce or, in most areas, monopolise public authority*'.[952] Moreover, the EU implements very few of its policies (competition, monetary policy, and the conduct and control over the external trade negotiations). For the other areas, the implementation falls within the competence of national states or within the shared competence of the national state and the EU.[953]

According to the Treaty on the Functioning of the European Union (TFEU), fostering industry's competitive potential through policies of innovation, research and technological development constitutes a common goal for the Union and the Member States. The competences to take action in this area are shared between the EU and the Member States based on the principle of subsidiarity. The EU is, for example, allowed to carry out research, technological development and demonstration programmes, provided that the exercise of that competence does not prevent Member States from carrying out their own

[947] Chalmers et al (2006) 64.
[948] According to Chalmers et al (2006) 65-7, this may be simply a question of perception, due to the fact that the areas of competences attributed to the EU do not fall within the themes of main concern to voters (health care, education, law and order, social security and taxation), while sufficient checks and balances are already in place.
[949] A. Moravcsik, 'The European Constitutional Compromise and the Neofunctionalist Legacy'(2005) 12 *Journal of European Public Policy* 349 (Moravcsik (2005)); Chalmers et al (2006) 51.
[950] Chalmers et al (2006) 61.
[951] Chalmers et al (2006) 69.
[952] Moravcsik (2005) 370.
[953] Chalmers et al (2010) 33.

programmes.[954] The European Parliament and the Council are expressly authorized to adopt specific measures to support the Member States in this area, as long as they do not cover harmonisation of Member States' laws and regulations.[955] The specific competences granted to the European Commission are to promote coordination of Member States' actions in the area of innovation, research and technological development. In particular, the Commission is allowed to formulate guidelines and indicators, to organise exchanges of best practice, and to prepare the necessary elements for periodic monitoring and evaluation.[956]

In conclusion, the EU is more divided by national interests than what one expects a Federal state would be. These national interests are the reason for the limited competences granted to the EU in setting-up a centralized PCP programme, centrally coordinated and deployed by supranational institutions such as in the US. These national interests are moreover the reason why the EU embeds in its areas of competence (legislative) safeguards against economically inefficient national practices. The two barriers that form the topic of this chapter are intended to function as such safeguards.

The European Commission explains in the PCP Communication that the obligation to conduct a separate competitive award for the purchase of the innovative solution targeted by the PCP, is motivated by the choice made within the framework of the WTO Government Procurement Agreement not to make any reservations for the direct purchase of supplies (see section 5.3 below). But arguably, this choice was determined by the concern that contracting authorities would use procurement to shield national companies from foreign competition. Based on the analysis of the three national PCP-like programmes in Chapter 4, such a concern appears justified. The European Commission seems to have used the GPA as an excuse to foreclose discrimination within the EU.

The State aid rules have also been put in place to act as safeguards against the tendency of EU Member States to engage in wasteful races to finance their national champions, at the detriment of economic efficiency and of consumers' welfare.

In the sections below, I will investigate more in depth the legal origin of the two above mentioned barriers and I will conclude on the most suitable solutions to both maintain the safeguards and provide the stimuli for the wide deployment of PCP.

[954] Arts 180-1 of the Consolidated version of the Treaty on the Functioning of the European Union 9.5.2008 OJEU C 115/47 (TFEU).
[955] Art 173 TFEU.
[956] Art 173(2) TFEU.

5.3 The burden of a new competitive procedure for the purchase of PCP solutions

5.3.1 Introduction

As already indicated above, according to the PCP Communication, the EU public procurement legislation does not allow the purchase of the PCP results through direct negotiation with (one of) the PCP finalist(s).[957] This barrier is both relevant when the PCP finalist has production capabilities and is able to deliver itself the innovative product in the desired quantities, and when another company than the PCP finalist is able to deliver the innovative products created by the PCP finalist.

The Communication explains that direct purchase of a product developed through PCP is constrained by compliance with the WTO Government Procurement Agreement (GPA).[958] However, the PCP Communication does not explain which GPA provisions create this constrain. Moreover, it should be remembered that the GPA does not legally constrain the freedom EU has in regulating the relations between its Member States. GPA defines the obligations for the EU as a whole to open its public markets to participation of businesses from the other GPA parties.

The PCP Communication most probably refers to the fact that the EU exempted in Annex 4 to the 1994 GPA, R&D service contracts from the scope of application of the GPA, but did not exempt any procurement of commercial products (such as those resulting from the previously exempted R&D service contracts). As a consequence, the GPA would not allow EU contracting authorities to discriminate against suppliers from GPA partner countries when purchasing innovative products resulting from excluded R&D service contracts.

The EU Procurement Directives are drafted in compliance with the GPA obligations towards GPA partner countries and the EU contracting authorities are required to apply the same provisions of the EU Procurement Directives to both EU companies and companies from GPA partner countries.[959] Due to this fact, it is relevant to analyse whether the flexibility offered by the GPA to directly purchase the results of R&D contracts has to its full extent been translated into the EU Procurement Directives. To this end, I will pay particular attention to article XV(1)(e) of the 1994 GPA.I will investigate in section 5.3.2 what degree of flexibility article XV(1)(e) of the 1994 GPA allows to directly purchase the innovative results of an R&D service

[957] Commission, 'Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe' COM (2007) 799 final 9-10 (PCP Communication).
[958] PCP Communication 10. Unlike the EU, the US has excluded from the scope of the GPA set-asides on behalf of small and minority businesses. See para.1 of General Notes of the US, part of the Appendix I to Government Procurement Agreement.
[959] Recitals (7) Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts [2004] OJ L 134/114 (Public Sector Directive) provides: 'the contracting authorities covered by the Agreement [the GPA Agreement] which comply with this Directive and which apply the latter to economic operators of third countries which are signatories to the Agreement should therefore be in conformity with the Agreement'.

contract. In the following section 5.3.3, I will investigate how the current EU Procurement Directives have incorporated this flexibility. I will also investigate the degree of flexibility other provisions of the current EU Procurement Directives grant a contracting authority to directly purchase the PCP results.

In section 5.3.4, I will outline the changes brought in the newly adopted procurement directives to the above analysed provisions and I will particularly scrutinize the newly introduced Innovation Partnership procedure, that covers an R&D contract as well as the purchase of the results thereof.

Based on this analysis, I will draw conclusions on the suitability of the current and future regulatory framework to advance EU's interests in the area of R&D and innovation and I will point out the improvements needed to persuade contracting authorities to perform their key role as demanding first customers of innovative solutions.

5.3.2 The WTO GPA constrains regarding EU's freedom to regulate purchases of PCP solutions

5.3.2.1 Short introduction to the GPA

The international legal framework for the procurement of R&D is the GPA. The GPA is the only WTO agreement on public procurement. It was negotiated during the Uruguay Round in 1994, and entered into force on 1 January 1996. It has at present 14 parties, amongst which the EU with regard to its 27 Member States. The US is also a party to the GPA. An amended GPA text was agreed upon in 2012 and will enter into force upon formal acceptance by two thirds of the GPA parties.[960]

All the states parties are developed countries. Although special and differential treatment for developing countries has been included, such countries have not yet acceded the agreement.

The GPA is a plurilateral agreement. This means that it is the sum of a series of bilaterally negotiated agreements. The provisions of the agreement apply only to the procurements brought by each state party under the scope of application of the agreement and state parties open their public markets to different extents towards each other depending on mutual concessions.[961] The results of these bilaterally negotiated agreements are laid down in Annexes 1-5 and in the General Notes to Appendix I of the GPA. Annexes 1 to 3 list the entities to which the agreement is applicable. Annexes 4 and 5 list the services that are brought

[960] <http://www.wto.org/english/tratop_e/gproc_e/gp_gpa_e.htm> accessed 4 February 2013. By December 2013, the threshold for entry into force of the new Agreement had not been reached.
[961] Ibid.

under the scope of application of the agreement, while the General Notes contain additional reservations.[962]

The text of the GPA provides the common procedural rules all GPA parties agree to apply towards businesses from the other signatory parties, to the extent to which the respective procurement falls within the material scope laid down in Appendix I. As a consequence, the GPA does not govern the relations between the EU Member States, but the relations between the EU as a whole and the GPA parties. To this extent, the EU could have drafted separate procurement rules to regulate these sets of relations. Arguably for reasons of simplicity, the EU chose to formulate one set of rules (the EU Procurement Directives) and to require EU contracting authorities to apply them to both EU companies and companies from GPA partner countries. This had 2 important consequences. The first was already mentioned in the introduction and regards the need to draft the EU Procurement Directives in compliance with the GPA. The second regards the broader opening of the EU public market for foreign competition than required by the GPA (as the EU procurement directives also cover contracts which are exempted from the GPA).[963]

Following the recent conclusion that GPA partners do not open their public markets to the same extent to international competition, the European Commission advances a different approach in the recently adopted Procurement Directives. The new Directives will only be applicable to economic operators from GPA countries when the contracts and entities covered by Annexes I, II, IV and V and by the General Notes to the EU's Appendix 1 of the GPA are involved.[964] However, the EU Procurement Directives will remain the legal framework to be applied to both EU companies as well as to companies from GPA partner countries.

5.3.2.2 GPA's coverage of R&D services and of resulting innovations

The EU left R&D services outside the coverage of the 1994 GPA by not listing these services in Annex IV to the GPA.[965] Most GPA parties have excluded R&D services from the scope of application of the GPA. This choice is arguably due to the particular importance of research and development contracts in strengthening the innovative and competitive capabilities of the domestic economy and the need to be able to reserve these contracts for domestic companies.

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[962] <http://www.wto.org/english/tratop_e/gproc_e/appendices_e.htm#appendixI> accessed 4 February 2013.

[963] Such are R&D contracts fully funded by contracting authorities whose benefits accrue to the same contracting authority. This is further explained in the next section.

[964] Article 23 of Directive 2014/24/EU of the European Parliament and of the Council on public procurement and repealing Directive 2004/18/EC (the new Public Sector Directive) and article 38 of Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (the new Utilities Directive).

[965] See EU Annex 4 Appendix I GPA, available at http://www.wto.org/english/tratop_e/gproc_e/appendices_e.htm#ec> accessed 2 December 2013.

The US also chose for excluding R&D services from the scope of application of the GPA.[966] In addition, the US also excluded set-asides for small businesses from the scope of the GPA.[967] This reservation allows the US not to open to competition from other GPA signatory parties the procurement of the innovative products developed during an R&D contract within the framework of the SBIR programme.

The reason why the EU did not make a similar reservation for small businesses is arguably related to its reluctance to allow EU contracting authorities to award supply contracts without competition. The EU feared that this would encourage inefficient awards by Member States, based on national policy motivations rather than competitive merits. This is a consequence, as shown in section 5.2, of the unique character of the EU as a supranational order of states brought together by the aim to achieve shared goals, but still divided by often diverging national interests.

The PCP Communication suggests that the choice not to include a similar reservation to the US in the GPA, is the reason why direct purchases of products developed through PCP is not legally allowed.[968]

Although the EU did not reserve the right to exclude from the scope of the GPA purchases of the results of an R&D contract, the text of the GPA itself offers the possibility to directly purchase the first product or service resulting from an R&D contract without re-opening the contract to competition (article XV(1)(e) GPA). Hereafter I investigate what degree of flexibility this provision offers for the purchase of an innovative product resulting from a PCP procedure and how this flexibility has been translated into the EU procurement rules.

According to article XV(1)(e) GPA (article XIII(1)(f) of the newly amended GPA), a contracting authority may conduct a limited tendering procedure, which is the equivalent of the negotiated procedure without prior notice of the EU Procurement Directives[969] in order to purchase '*a first product or service which [is] developed at its request in the course of, and for, a particular contract for research, experiment, study or original development*'.[970] The

[966] National IST Research Directors Forum Working Group on Public Procurement in support of ICT Research and Innovation 'Pre-commercial Procurement of Innovation: A Missing Link in the European Innovation Cycle' (March 2006) 7 (PCP Expert Group) <ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/pcp/precommercial-procurement-of-innovation_en.pdf>, accessed 12 November 2012.
[967] See para 1 US General Notes Appendix I GPA.
[968] PCP Communication 9-10. The PCP Communication also takes the view that the direct purchase is not economically desirable. Re-opening the contract to competition ensures that no better solutions have been developed on the market independently from the PCP procedure
[969] The limited tendering is defined as the procedure where the entity contacts suppliers individually. Sue Arrowsmith, 'Reviewing the GPA: the role and development of the plurilateral agreement after Doha' (2002) 5 *J. Int'l Econ. L.* 761.
[970] Art XV (1) The provisions of Arts VII through XIV governing open and selective tendering procedures need not apply in the following conditions, provided that limited tendering is not used with a view to avoiding maximum possible competition or in a manner which would constitute a means of discrimination among suppliers of other Parties or protection to domestic producers or suppliers: (…) (e) when an entity procures prototypes or a first product or service which are developed at its request in the course of, and for, a particular contract for research, experiment, study or original development. When such contracts have been fulfilled, subsequent procurements of products or services shall be subject to Articles VII through XIV(6);

newly amended text of the new GPA reiterates in slightly different words the same provision.[971]

The direct purchase of the first product or service resulting from an R&D contract is thus allowed under the following conditions: the same contracting authority that commissioned the R&D, purchases the resulting first good or service; and at the moment of purchase, the good or service has not been commercialized yet and the contracting authority is the first customer. After the execution of this contract, the purchase of the same goods or services by the same contracting authority or by any other contracting authority needs to be conducted in compliance with a competitive procurement (open or selective tendering). Figure 1 below visualizes the relevant GPA provision:

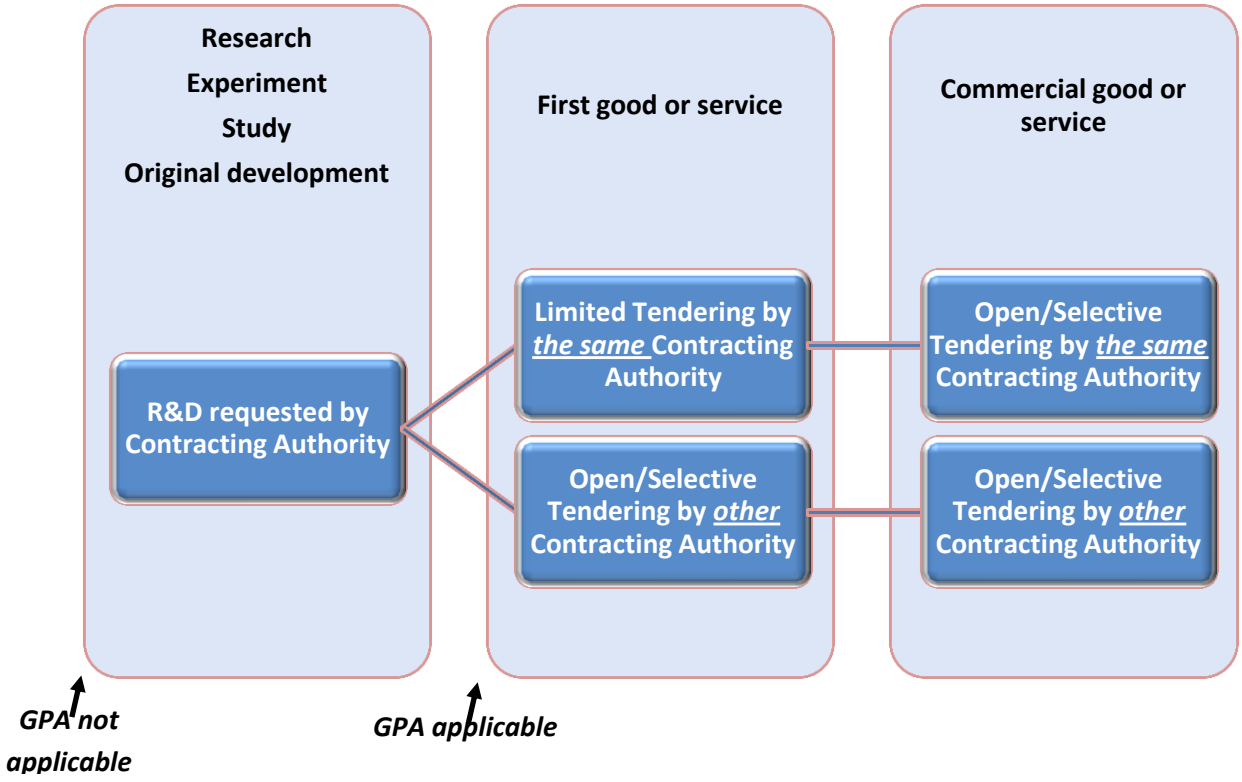


Fig.1

This means that, even if no express set-asides were negotiated within the GPA, the EU still had the flexibility to allow an EU contracting authority to directly purchase the first products or

[971] Art XIII (1) GPA: 'Provided that it does not use this provision for the purpose of avoiding competition among suppliers or in a manner that discriminates against suppliers of any other Party or protects domestic suppliers, a procuring entity may use limited tendering and may choose not to apply Articles VII through IX, X (paragraphs 7 through 11), XI, XII, XIV and XV only under any of the following circumstances: (…) (f) where a procuring entity procures a prototype or a first good or service that is developed at its request in the course of, and for, a particular contract for research, experiment, study or original development. Original development of a first good or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the good or service is suitable for production or supply in quantity to acceptable quality standards, but does not include quantity production or supply to establish commercial viability or to recover research and development costs;

services resulting from an R&D contract without re-opening the competition for suppliers belonging to other GPA parties.

It should be reminded at this point that Phase 3 of a PCP procedure, following the prototyping phase, covers the production of a first batch of pre-products/services, their testing in relevant environments and the incorporation of the results of the field testing in a limited series of products, meant to demonstrate the suitability for full-scale quantity production.[972] It could be argued that this phase concerns the development of first products. This does not mean though that the contracting authority is automatically allowed to retain the ownership of these first products and to subsequently use them in its operational activity. It should be reminded that PCP may only cover R&D services, which entails that the value of the purchased prototype and/or first products may not be higher than the value of the intangible knowledge created within the framework of the PCP. Arguably, the PCP was not envisaged by the EU policy-maker to cover the purchase by the contracting authority of the first products resulting from Phase 3. I will come back to how the flexibility offered by article XV(1)(e) of the 1994 GPA was translated into the EU procurement rules in the next section.

For now, I address two important questions regarding this GPA exception. Firstly, are 'first products or services' operational products which can be used by the contracting authority in fulfilling its public tasks, or are they equivalent to prototypes? Secondly, would favouring domestic businesses during the procurement of the research and development services contract (which is not covered by the GPA) limit the discretion of a GPA party to rely on the limited tendering exception ?

The Trondheim Panel Report shed light on some relevant aspects for the interpretation of article XV(1)(e) GPA.[973] In the Trondheim case, brought before the GPA Panel by the United States, a Norwegian public authority was found to have wrongfully relied on article XV(1)(e) to justify the direct award to a Norwegian company. The Norwegian authority argued that the contract regarded the purchase of prototypes which had been the result of a research contract.[974] The Panel examined whether the contract regarded the purchase of a prototype. However, it also provided some guidance on the interpretation of the concept of 'first products'.

[972] PCP Expert Group 23

[973] *Norway – Procurement of Toll Collection Equipment for the City of Trondheim* (Trondheim case) (panel report adopted 13 May 1992, BISD 40S/319) (Trondheim case).

[974] Trondheim case, section 4.7: In examining this issue, the Panel first noted that, while the provision referred to "research, experiment, study or original development", the parties to the dispute had referred only to research and development. Furthermore, although the provision relates to "prototypes or a first product", only prototypes had been referred to. The Panel therefore limited its examination to these aspects.'

Before going into the substance, the Panel clarified that the exception provided by article XV(1)(e) should be interpreted narrowly and that the Party invoking the provision should bring the proof of conformity.[975] Subsequently, by making reference to the definition of prototypes in the Frascati Manual,[976] the Panel ruled that *'for products to be considered prototypes, they must have as their principal purpose the testing and furthering of the knowledge that the procuring entity was procuring under the contract for research and/or development.'*[977] Subsequently, the Panel extended its conclusions to first products or services. It underlined that a *'contract for research … or original development'* entails the purchase of knowledge. Knowledge should not be expressed exclusively in the form of abstract results such as scientific papers. The procurement of a prototype or a first product could be intended to *'enable the contracting authority to learn of, and to test the validity of, the results of the research and/or development in a more practical way'*.

In this case, the Norwegian authority was considered to have failed to demonstrate that the purpose of the contract had been the purchase of research and/or development results (in the form of a prototype) rather than a final operational product.[978]

In conclusion, the Trondheim case underlined that a contract qualifies as a research or original development contract and may be awarded through a limited tendering only if the scope of the purchase is to perform testing activities and there is still some uncertainty regarding the potential of the prototype or first product or service to fulfill the operational needs of the contracting authority.

Unfortunately the Panel did not clarify the distinction between a prototype and a first product or service, but seemed to treat them as interchangeable concepts.[979] The Panel's interpretation suggests that 'first products or services' may not be used as a ground for directly purchasing operational products that result from a previous R&D contract.

The definition of original development of a first product or service, included in the footnote to article XV(1)(e) also provides a definition of 'original development of a first product or service'.

It states: *'Original development of a first product or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for production or supply in quantity to acceptable quality standards. It*

[975] Trondheim case, section 4.5.
[976] OECD, eim case, section 4.5.ctice for Surveys on Research and Experimental Developmententlopmenti uality public Frascati Manual (2002)).
[977] Trondheim case, section 4.9.
[978] Trondheim case, section 4.11.
[979] The Frascatti Manual (2002) does not use this terminology.

does not extend to quantity production or supply to establish commercial viability or to recover research and development costs'.

This definition suggests that first products or services cover the stage following prototyping. A contract for original development regards thus the purchase of a first batch of operational products which incorporate the results of the prototyping/testing stage, but whose working in real operational environments at the expected quality levels has not been proven. Moreover, the commercial viability of a first product or service is also not proven. Commercial viability means the capability to compete on the basis of price and quality with alternative available solutions.

This suggests that the contracting authority is allowed to use these first products/services for operational purposes, when this is possible. For example, when a water utility purchases R&D services for the development of an innovative water purifying installation, it may also retain the option to purchase from the same company through limited tendering the resulting first product (the purification installation) and use it to operate part of its processes. In response to my first question, it is thus defendable to conclude that the GPA allows a contracting authority that sponsored a PCP procedure to purchase its results (in the form of first products or services) and use them in the fulfillment of operational needs.

The second question refers specifically to the requirement recommended by the PCP Communication for a company to locate its R&D activities within the EU in order to obtain a PCP contract. It is unclear whether this requirement should be considered discriminatory in light of the GPA and if so, whether it breaches article XV(1) GPA (article XIII(1) of the newly amended GPA) which expressly provides that the limited tendering procedure may not be used '*for the purpose of avoiding competition among suppliers or in a manner that discriminates against suppliers of any other Party or protects domestic suppliers'*. In case of a positive answer, the non-competitive purchase of the PCP result would not be possible based on this provision.

It is worth mentioning at this point, that only a GPA party may complain before a GPA Panel against the illegal use of the limited tendering procedure. A discontent EU or GPA supplier would not be able to rely on this provision before EU national courts, as the Procurement Directives expressly exclude the direct effect of the GPA within the EU legal order.[980] It should also be noted that the chances of a challenge by a GPA party are, in practical terms, extremely remote. Contorting EU innovation policy to avoid the possibility of such a challenge seems illogical -- unless, of course, the contortions are really for an 'internal' EU purpose.

[980] Recital (7) Public Sector Directive and recital (14) Utilities Directive.

According to Arrowsmith, the introductory provision to article XV(1) (and of the new article XIII(1)) covers two separate obligations. The first obligation, not to use the limited tendering *'for the purpose of avoiding competition among suppliers'* relates to the reasons for applying the limited tendering.[981] The second obligation, not to use the limited tendering *'in a manner which would constitute a means of discrimination among suppliers of other Parties or protection to domestic producers or suppliers'* relates to the way the limited tendering is carried out and not to the reasons for applying it.[982]

According to the first obligation, a contracting authority which relies on the limited tendering exception to purchase the first products or services resulting from a PCP, should not be motivated by the desire to protect domestic companies, but by the desire to fulfill an operational need (which cannot be fulfilled by commercially available products) and to avoid the financial burden of an additional competition.[983] The obligation to justify the choice for a limited tendering (or negotiated procedure without prior publication) in terms of reasons has not expressly been up-taken in the EU public procurement legislation (see discussion in the next section).

The prohibition to use limited tendering *'for the purpose of avoiding competition among suppliers'* may entail an additional obligation for a contracting authority to organize informal competitive negotiations, in case there are more than one suppliers who could offer similar solutions. Arrowsmith subsequently dismisses this interpretation due to the legal uncertainty it would create.[984] It could be though envisaged that in the context of a PCP which yielded 2 finalists, applying the limited tendering exception to award the contract to the domestic finalist without any informal negotiations with the other finalist originating from a GPA state party, would breach this provision.

When the PCP merely yielded one finalist, it is unclear whether the contracting authority should actively investigate the existence of similar solution on the market. The market consultation/research performed at the preparatory stage of a PCP in order to justify the novelty of the R&D services would arguably be a sufficient source of information, despite the potentially occurred changes in the market situation. In the Trondheim case, the United Stated raised a similar argument. It argued that the contracting authority in question was at least required to consult 'known and eager competitors'.[985] Unfortunately, the Panel did not address this issue.

[981] Sue Arrowsmith, *'Government Procurement in the WTO'* (Vol.16, Kluwer Law International 2003) 282 (Arrowsmith (2003)).
[982] Arrowsmith (2003) 282-4.
[983] Arrowsmith (2003) 283 considers, for example, that a wide range of commercial reasons for invoking the limited tendering exceptions should be recognized.
[984] Arrowsmith (2003) 297.
[985] Trondheim case section 3.5.

The second obligation of the introductory provision to article XV(1) prohibits the use of the limited tendering *'in a manner which would constitute a means of discrimination among suppliers of other Parties or protection to domestic producers or suppliers'*. The question arises whether this provision covers the discriminatory intention and/or effect of the PCP requirement to locate the R&D activities within the EU.

The definition of the non-discrimination principle in Article III GPA sheds light on the interpretation of the introductory provision of article XV(1).[986] The non-discrimination principle is equivalent with the national treatment principle, and entails that suppliers from all member parties will be treated no less favourably than domestic suppliers.[987] According to jurisprudence within the GATT on the interpretation of the national treatment principle, formally identical but de facto (indirect) discriminatory measures are in breach of the non-discrimination principle of the GPA.[988] In this light, the requirement to locate the R&D activities within the EU, although equally applied to both GPA parties and domestic companies, discriminates de facto against companies from GPA state parties, which do not have an establishment on the EU territory.

However, this discriminatory requirement is applied in the context of a contract which is excluded from the scope of application of the GPA, albeit with a de facto discriminatory effect at the stage of a procurement which falls within the scope of application of the GPA. The discussed requirement has the de facto effect that only locally produced products would make the chance to win the contract. However, to adopt this interpretation would effectively bring many GPA obligations on award procedures in expressly excluded R&D contracts 'through the back door'. If the parties to the GPA intended to exclude the effect of requirements set in previous procurements excepted from the scope of application of the GPA, then this obligation could have been specifically provided. On the contrary, article XV refers to the requirements set within the framework of the limited tendering at hand (*'the limited tendering is not used (...) in a manner which would constitute a means of discrimination among suppliers of other Parties or protection to domestic producers or suppliers'*).

In conclusion, it is defendable to argue that the GPA allows a contracting authority to directly purchase the PCP results (namely first products or services) despite the PCP requirement to

[986] The limited tendering is subject to compliance with Article III GPA on non-discrimination. Article III.1 GPA provides: 'With respect to all laws, regulations, procedures and practices regarding government procurement covered by this Agreement, each Party shall provide immediately and unconditionally to the products, services and suppliers of other Parties offering products or services of the Parties, treatment no less favourable than: (a) that accorded to domestic products, services and suppliers…'

[987] Caroline Nicholas, 'Work of UNCITRAL on government procurement: purpose, objectives and complementarity with the work of the WTO' 766 in Sue Arrowsmith and Robert D. Anderson (eds) *'The WTO Regime on Government Procurement: Challenge and Reform'* (CUP 2011).

[988] Arrowsmith (2003) 160-1.

locate the R&D activities within the EU, provided that the contracting engages in informal negotiations with all PCP finalists belonging to GPA state parties.

Lastly, it should be mentioned that the question of non-conformity with the GPA does not arise when a EU contracting authority opens an R&D services contract to competition from GPA businesses and does not impose a requirement regarding the location of the R&D activities. Such a contracting authority may directly purchase the innovative first product or service from (one of) the contractor(s) in the R&D contract, provided it does not exclude from the informal negotiations the PCP finalists belonging to GPA state parties.

This does not change the fact that a EU contracting authority would still breach the EU public procurement rules when procuring directly such results, as the Procurement Directives have chosen to adopt a stricter approach than allowed by the GPA and do not provide this possibility. In the following section, I will outline how the EU has so far regulated the award of R&D contracts and how much flexibility it allows for the direct purchase of the innovative results thereof.

5.3.3 EU Procurement Directives provisions relevant for the purchase of PCP solutions

5.3.3.1 R&D contracts

As already mentioned, the EU exempted from the application of the GPA R&D service contracts, but not R&D works or R&D supplies contracts. The EU further divided the R&D service contracts into two categories and brought them partially under the scope of the EU GPA by leaving them under the scope of the EU Procurement Directives and by requiring contracting authorities to apply the EU Procurement Directives to tenderers from GPA partner countries as well. The R&D works and R&D supplies contracts are also regulated by the EU Procurement Directives. They allow more flexibility to (directly) negotiate with a market party. However, they do not extend their reach to first operational products.

R&D service contracts

The EU divided the R&D service contracts into two categories and allowed increased purchasing flexibility (by exempting them from the scope of the EU Procurement Directive) only to R&D service contracts whose risks and benefits are shared between the contracting authority and the R&D service provider. The R&D service contracts whose benefits exclusively accrue to the contracting authority and whose costs are fully paid by the same contracting authority remain within the scope of application of the EU Procurement Directives and should be awarded in compliance with their provisions.

R&D services procured under a shared risk-benefit approach have from the start been excepted from the scope of application of the EU procurement rules. The first procurement directive regulating services (Directive 92/50/EC) excluded these R&D services from the concept of public service contracts.[989]

R&D services fully funded by the contracting authority and whose benefits exclusively accrue to the same contracting authority have always been covered by the EU procurement regime. However, the 1997 Services Procurement Directive - which brought the procurement legislation in line with the 1994 GPA – allowed contracting authorities to exclude competitors from GPA countries. In Directive 97/52/EC, it was made clear that the scope of the GPA does not cover R&D service contracts mentioned in category 8 of Annex I A thereto.[990] Category 8 of Annex I A refers to R&D services when all benefits accrue to the contracting authority and the full cost of development is paid by the contracting authority/entity.

This provision has been dropped into the current Procurement Directives.[991] This means that, under the current rules, EU contracting authorities are encouraged to open these R&D contracts to competition from GPA state parties. The proposed Procurement Directives change this again. The Directives will only be applicable to contracts that are brought by the EU within the scope of application of the GPA.[992]

R&D works and R&D supplies contracts

The EU did not translate into the Procurement Directives the flexibility offered by the above discussed art XV(1)(e) GPA on limited tendering of first products or services.

In Article 31(2)(a) and (d) of Directive 2004/18/EC allows the use of the negotiated procedure without prior publication of a contract notice (which entails direct negotiations with a particular firm) only for products which are destined to be used within the framework of research, experimentation, study or development projects.[993] This provision covers prototypes which can only be procured for the purpose of testing and does not extend to the purchase

[989] Art 1 Directive 92/50/EC of 18 June 1992 relating to the coordination of procedures for the award of public service contracts [1992] OJL 209: For the purposes of this Directive: (a) public service contracts shall mean contracts for pecuniary interest concluded in writing between a service provider and a contracting authority, to the exclusion of: (….) ix) research and development service contracts other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority.'

[990] See Art 1 European Parliament and Council Directive 97/52/EC of 13 October 1997 amending Directives 92/50/EEC, 93/36/EEC and 93/37/EEC concerning the coordination of procedures for the award of public service contracts, public supply contracts and public works contracts respectively [1997] OJ L 328.

[991] See Annex IIA Directive 2004/18 and Annex XVIIA Directive 2004/17/EC of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors [2004] OJL 134/1.

[992] Recital (8) of the new Public Sector Directive.

[993] Art 31(2)(a) Public Sector Directive: *'when the products involved are manufactured purely for the purpose of research, experimentation, study or development; this provision does not extend to quantity production to establish commercial viability or to recover research and development costs'*.

of *first* products developed within the context of a PCP procedure.[994] For the procurement of R&D works, article 30(1)(d) allows even less flexibility. The award should be open to competition. However, negotiations with the tenderers are allowed.

Directive 2004/17/EC includes a more general provision which allows direct negotiations for the award of all kinds of R&D contracts, whether services, supplies or works. However, article 40(3)(b) clearly states that the purchase of the products developed through such an R&D contract should be conducted through competitive procurement procedures. This entails that the direct purchase of first products/services resulting from a PCP is neither covered by this provision.

5.3.3.2 Other grounds to justify the direct purchase of PCP solutions

In the previous section I analysed how the flexibility allowed by the GPA to directly purchase the first operational results following an R&D contract was reflected into the EU Procurement Directives. In this section, I investigate under which conditions articles 31(1)(b) of Directive 2004/18 and 40(3)(c) of Directive 2004/17 provide the legal ground for the direct purchase of the first products/services resulting from a PCP procedure.

According to the above mentioned provisions, a contacting authority may follow a negotiated procedure without prior publication of a contract notice, if *'for technical or artistic reasons, or for reasons connected with the protection of exclusive rights, the contract may be awarded only to a particular economic operator'*.[995]

The Court of Justice of the European Union (CJEU) has already stated in jurisprudence that the scope of application of these provisions is restrictive.[996] In Case C-328/92, in which the European Commission contested the non-competitive purchase of pharmaceutical products by the Spanish government, the European judge clarified that it is not enough that a product is protected by exclusive rights. It must also *'be capable of being manufactured or delivered only by a particular supplier'*. The judge added that this requirement *'is satisfied only in respect of those products and specialties for which there is no competition in the market'*.[997] In other words, the Spanish government could rely on this exception only if it had the following cumulative proof:

- that the owner of the IP of the pharmaceutical products had not granted licenses to other parties for manufacturing and delivering the same IPR protected products; and

[994] Art 32(3)(a) of the new Public Sector Directive restricts this provision to supply contract (thus prototypes).
[995] Art 31(1)(b) Public Sector Directive and art 40(3)(c) Utilities Directive.
[996] Case C-199/85, *Commission v Italy* [1987] ECR I-039 para 14; Case C-57/94 Commission v Italy [1995] ECR I-1249 para 23; Case C-318/94 *Commission v Germany* [1996] ECR I-1949 para 13; Case C-385/02 *Commission v Italy* [2004] ECR I-08121 paras 19-20; Case C-394/02, *Commission v Greece* [2005] ECR I-4713 para 33.
[997] Case C-328/92, *Commission v Spain* [1994] I-01569 para 17.

- that there were no competing products on the market in respect of functionalities and/or performance levels.

When technical reasons are relied on for derogating from a competitive award, the Court similarly ruled that it must be *'absolutely essential'* that the contract in question be awarded to a particular undertaking, and not to another undertaking.[998] The Court suggested that a contracting authority should prove that the technical difficulties could not be surmounted if the contract were awarded to another undertaking and should rely to this end on a technical report of an independent expert. [999] In other words, the contracting authority should be able to prove that the preferred contractor is the only one on the market who possesses of the needed expertise to deal with the respective technical difficulties. [1000]

5.3.3.3 Conclusions

In conclusion, by allowing the choice for a negotiated procedure without prior publication only for the purchase of a prototype and not for the purchase of a first product or service, the EU legislator has adopted a stricter approach than the GPA. The PCP itself covers the development of first products at Phase 3. However, this does not entail that the contracting authority may retain ownership of these first products and subsequently use them for operational purposes. The requirement that the value of the R&D services is higher that the value of the R&D supplies (prototypes and first products) prevents this scenario in most cases.

As a consequence, the EU legislator failed to embed into the EU Procurement Directives the incentive for contracting authorities to act as early adopters of innovations developed in previously performed PCPs. It didn't strike thus the right balance between the need to stimulate innovation from the demand-side and the need to ensure that innovation is pursued under EU-wide competition.

I argued in the previous section that this choice was not due to legal constrains flowing from the GPA, but it was due to the desire of the EU legislator to prevent excessive reliance by national contracting authorities on this exception, based on national industrial policy motivations rather than real needs. Nevertheless, this missing incentive has a negative impact on the potential of the PCP to achieve its innovation policy aims.

However, there is some room within the current legal rules to formulate strict requirements which may lead to the procurement of the product/service developed during a PCP. When a contracting authority can demonstrate that the innovative solution developed through a

[998] Case C-57/94 paras 24-5; Case C-385/02 Commission v Italy, paras 18, 20 and 21; Case C-394/02 para 34.
[999] Case C-57/94 para 27.
[1000] Case C-394/02 paras 35-9.

PCP procedure, performs certain functionalities and achieves certain levels of performance which are not met by other products on the market, it may successfully rely on this exception to directly award the contract to the PCP finalist. This will thus be possible when:

- only one company successfully finalized the PCP procedure (if there are two finalists, a competitive procedure should be organized); and
- when the result of a PCP procedure is a breakthrough innovation, which significantly advances state-of-the-art.

However, reliance on this provision for the direct purchase of a PCP result is not expressly allowed by the current rules. As a consequence, individual contracting authorities may perceive legal risks in pursuing such an approach.

In the next section, I will investigate whether the Proposals for the new EU Procurement Directives[1001] increase or restrict the flexibility to purchase the innovative solutions developed during a PCP procedure.

5.3.4 The Proposals for the new EU Procurement Directives EU – constrains and incentives for the purchase of PCP solutions

5.3.4.1 Introduction

The Proposal for the new Public Sector Directive maintains the same provision regarding the use of negotiations without prior notice for the purchase of R&D supplies (in practice prototypes or first products).[1002] R&D works contracts may still be purchased through a negotiated procedure with prior publication of a contract notice (now called 'competitive procedure with negotiations'). This is not expressly mentioned anymore, as the grounds for application of the competitive procedure with negotiations have become more lenient. According to article 24(1c)(a)(ii), a contracting authority may choose this procedure when the contract includes design or innovative solutions. R&D works would qualify though as contracts including innovative solutions.

The Proposal for a new Utilities Directive also maintains the old provision for all types of R&D contracts.[1003]

Changes are brought by the Proposals in respect of the grounds for the negotiated procedure without prior notice when due to artistic reasons, technical reasons, IPRs or other

[1001] The European Parliament has adopted on the 15th of January 2014 the new procurement directives. The directives will be due for implementation within 2 years from their adoption.
[1002] Art.32(3)(a) of the new Public Sector Directive.
[1003] Art50(b) of the new Utilities Directive. Art.32(3)(a) of the new Public Sector Directive.

exclusive rights only a particular economic operator can supply the works, supplies or services.[1004] Moreover, the Proposals introduce the new Innovation Partnership procedure.

This section analyses in how far the changes brought by the new Procurement Directives increase or restrict the flexibility to purchase the innovative solutions developed during a PCP procedure. To this end, section 5.3.4.2 focuses on the use of the negotiated procedure without prior notice for technical or IPR reasons and section 5.3.4.3 analyses the newly introduced Innovation Partnership procedure. Section 5.3.4.4 concludes whether sufficient incentives are embedded in the new procurement rules to stimulate contracting authorities to act as early adopters of innovative products or services.

5.3.4.2 The use of the negotiated procedure without prior notice for technical or IPR reasons

The novelty brought by the Proposals in the negotiated procedure without prior notice for technical or IPR reasons is the following addition: when relying on the technical or exclusive rights grounds, the contracting authority needs to demonstrate that no *'reasonable alternative or substitute'* exists and that *'the absence of competition is not the result of an artificial narrowing down of the parameters of the procurement'*.[1005]

The question arises whether these additional conditions restrict the possibility of a contracting authority to rely on direct negotiations in order to purchase the innovative products/services developed through a PCP procedure, as compared to the current Procurement Directives.

More specifically, do these additional conditions require the contracting authority to lower the required level of performance or the amount of functionalities, depending on the level of competition on the market?

To find an answer to this, I will first take a look at the judicial interpretation of the concept of *'reasonable substitutes or alternatives'* by the CJEU (sub-section a). Subsequently, I will outline the interpretation of the concept of 'reasonableness' and 'proportionality' in the administrative area in national or international jurisdictions (sub-sections b, c and d). In sub-section e., I will conclude on the most suitable interpretation of the obligation to demonstrate that no *'reasonable alternative or substitute'* exists. After investigating the interpretation of

[1004] Art32(2)(b) of the new Public Sector Directive; art 50(c) of the new Utilities Directive. The negotiated procedure without prior publication of a contract notice is allowed *'where the works, supplies or services can be supplied only by a particular economic operator for any of the following reasons:*
(i) the aim of the procurement is the creation or acquisition of a unique work of art or artistic performance;
(ii) competition is absent for technical reasons;
(iii) the protection of exclusive rights, including intellectual property rights.
This exceptions set out in points (ii) and (iii) only apply when no reasonable alternative or substitute exists and the absence of competition is not the result of an artificial narrowing down of the parameters of the procurement'.

[1005] The recitals of the Proposed Directives reiterate that *'only situations of objective exclusivity can justify the use of the negotiated procedure without publication'* and that this will not be the case if the contracting authority has designed the award requirement such as to create that exclusivity. Moreover, the availability of adequate substitutes should be assessed thoroughly.

the concept of reasonable alternatives or substitutes, I will analyse what concrete obligations the prohibition to *'artificially narrowing down the parameters of the procurement'* potentially entails (sub-section f).

a. CJEU jurisprudence on reasonable alternatives or substitutes

Cases regarding the evaluation of two services/products as reasonable alternatives are most common in the area of competition law. The identification of reasonable alternatives in such cases has a different objective than discussed in the context of procurement. By investigating the existence of reasonable alternatives, the CJEU aims to identify the relevant market (made of competitive products) for the calculation of the market share of one or more undertakings. Nevertheless, the analysis of the CJEU is helpful in understanding the characteristics which determine two products being considered alternatives or substitutes.

In case T-395/94, the Court of First Instance (CFI) evaluated the grounds for annulment of European Commission's decision that the agreement between North European shipping lines for the scheduled transport of containers, which fixed conditions (such as prices and available capacity) for the provision of maritime and inland transport services to shippers from various Member States, negatively affected trade between EU Member States and was in breach of the EU competition rules.[1006]

In order to conclude whether competition was unjustifiably restricted, CFI analyzed whether the agreement covered most of the operators in the relevant market, or whether there still existed reasonable alternatives to containerized liner shipping services on the market, beyond those covered by the agreement. Following a thorough analysis, the Court concluded that other maritime, air or conventional bulk transport modes are not reasonable alternatives to containerized liner shipping services, because they cost more and do not offer transportation services for all types of products.[1007]

In a previous case, C-322/81,[1008] the Court analyzed whether there are products which can form a genuine alternative as regards quality and price to the products offered by the investigated undertaking. In that case, Michelin argued that for the calculation of its market share the Commission should have included second-hand tyres (retreads) to the relevant market. The Court concludes that *'new tyres and retreads are interchangeable to some*

[1006] Case T-395/94 *R II Atlantic Container Line and Others v Commission* [1995] ECR 11-2893.
[1007] Ibid paras 272-3, 279, 281.
[1008] Case C-322/81 *Michelin v Commission* [1983] ECR 3461 para 37.

degree, but only to a limited extent and not for all purposes' and that to the extent they were interchangeable constituted a genuine alternative.[1009]

In conclusion, a service or a product is considered to be a reasonable or genuine alternative, if it fulfills the same functionalities and levels of performance and if it is offered against competitive/similar prices. If any of these elements is missing, the product does not qualify as a reasonable alternative or substitute.[1010]

It is defendable to argue that the same interpretation should be used in the context of provisions 30(2)(b) of the Proposal for a new Public Sector Directive and 44(d) of the Proposal for a new Utilities Directive. The assessment of reasonableness of the alternative or substitute should thus not put into discussion the functionalities and purposes required by the public purchaser.

This also entails that the contracting authority is not mandated to investigate the degree of competition on the market, before deciding on its procurement requirements in terms of functions and levels of performance.

However, if we take the view that the decision to formulate its need (particularly in the area of innovation) weighs diverse interests and policy objectives, a different test may apply when reviewing how the contracting authority exercises its discretion to set the desired levels of performance and functionalities.

In order to conclude on the most suitable test to be applied in this context, I analyse the reasonableness test, as applied in the administrative area in national or international jurisdictions when reviewing the limits of discretion conferred by legislation on public authorities. The Anglo-Saxon legal traditions employ the reasonableness principle, while in German-Austrian legal traditions, the extent of the discretion of a public authority is reviewed through the application of the proportionality principle. The latter principle will only be analysed in the context of the CJEU's jurisprudence and within the legal framework of the WTO.

b. The standard for judicial review of reasonableness of administrative acts

Reasonableness has been a ground for review of administrative acts in the UK since the Associated Provincial Picture Houses v. Wednesbury case.[1011] In the UK, the approach to

[1009] Ibid paras 49-53.
[1010] 'Suitable alternative goods' are defined in the WTO framework as *'those goods which perform the same or similar function as the imported good and which would compete directly with the imported good'*. See 'Trade Policies and Practices by Measure', WT/TPR/S/216, para 29.
[1011] Wednesbury [1948] 1 K.B. 223 (C.A.).

judicial review on grounds of reasonableness is characterized by judicial deference. Reasonableness is a ground of annulment of administrative acts, only when it amounts to irrationality or bad faith. At no time, the court will *'replace the legislature's intent or the executive's legally exercised discretion'*.[1012]

In the Wednesbury case, the English Court concluded that a reasonable use of discretion entails compliance with the following two cumulative conditions: on the one side, to consider all interests which are relevant for taking the decision and to leave out irrelevant aspects; and on the other side, to draw therefrom a decision which finds itself within the range of rational possible conclusions. A decision could thus be struck down when it has a defect either in *'the evidentiary foundation itself or in the logical process by which conclusions are sought to be drawn from it.* '[1013]

In balancing individual human rights against policy interests, the UK Courts apply a stricter, less deferent test, which involves a general assessment of the competing interests, weighed against each other and comes closer to the proportionality test.[1014] In the view of UK judges, the central difference between the reasonableness and proportionality test is that proportionality '*may require the reviewing court to assess the balance which the decision maker has struck, not merely whether it is within the range of rational or reasonable decisions',* and this *'may require attention to be directed to the relative weight accorded to interests and considerations'*.[1015]

The decision to set certain levels of performance and functionality within the framework of a public procurement does not entail balancing human rights against policy interests. The deferent reasonableness test may prove to be the most relevant for the purposes of this discussion.

In the Netherlands, the reasonableness test, codified in article 3:4 of the General Administrative Law, appears to set a similar standard of review to the UK.[1016] It entails two similar steps. Firstly, the judge should investigate whether all relevant interests have been considered. Which interests should be considered in the decision-making may be limited by the extent of the competence (discretion) offered by the applicable legislation. For example, if the legislation allows a public authority to refuse to grant a building permit on grounds of protection of underground water, the public authority may not involve other public interests

[1012] Ibid 19.
[1013] Baker v. Canada (Minister of Citizenship and Immigration) [1999] 2 S. C. R. 817, para 63 (Baker v Canada case).
[1014] Margit Cohn, 'Legal Transplants Chronicles: The Evolution of Unreasonableness and Proportionality Review of the Administration in the United Kingdom' 19 (2010) *American Journal of Comparative Law* 27-8 (Cohn (2010)).
[1015] Cohn (2010) 29 referring to R. (Daly) v. Secretary of State for the Home Department [2001] 2 A.C. 532 (H.L.) 547.
[1016] Art 3:4 provides: '1. The administrative organ weighs the interests which are directly related to the decision-making, as far as this is not limited by legislation or the extent of the competence being exercised. 2. The negative consequences of the decision for one or more of the interested parties may not be unreasonable in comparison to the intended objectives of the decision'.

which may negatively impact the decision-making, besides the impact on the underground water.[1017] On the other side, even when the interests of third parties have been weighed in the legislative process, the public authority remains obliged to consider the interests of the individuals directly affected by the concrete decision. [1018]

Secondly, the judge should investigate whether by weighing the relevant conflicting interests the public authority has struck the balance such as not to cause unreasonably negative consequences to one or more of the interested parties. The judge will thus not investigate whether the public authority stroke the best balance between the competing interests, but will only strike down a decision, if the respective conclusion based on the weighing of the relevant interests amounts to arbitrariness. [1019]

The Canadian federal law applies the same approach. Decisions classified as discretionary may only be reviewed on limited grounds such as *'the bad faith of the decisions-makers, the exercise of discretion from an improper purpose, and the use of irrelevant considerations'*.[1020] In other words, a reasonable exercise of the discretion offered by the legislation entails a close weighing of the interests at stake.[1021] A deferent review by the courts entails, on the other hand, *'a respectful attention to the reasons offered or which could be offered in support of a decision'*.[1022]

In setting the appropriate level of deference of the judicial review, the Canadian courts take into consideration several concrete factors: the level of expertise of the decision-maker (the more expertise the more deferent the court should act); the purpose of the legislative provision (and legislation as a whole) awarding discretion to the authority, the competing interests or rights which need to be balanced (when the decision impacts directly the rights and interests of an individual in relation to the government, judicial scrutiny should be stricter than when the decision involves balancing the interests of various government constituencies); the nature of the decision, fact- or law-based (when a decision is of a fact-based nature, deference is appropriate).[1023]

Within the context of a decision to rely on the direct negotiations procedure to purchase the resulting innovative products/services from a PCP procedure, a contracting authority is weighing the interest of opening the Internal market to competition against the interest to

[1017] PJJ van Buuren and TC Borman, *'Algemene Wet Bestuurrecht – Tekst & Commentaar'* (Kluwer 2009) 82 refering to Memorie van Toellichting, Parl. Gesch. Awb I, p.210 (van Buuren and Borman (2009)).
[1018] Cases AB 1984, 21 August 1984, ARRS 542 and AB 1987, 27 May 1986, Vz. ARRS 267, JB 2005/248, 22 June 2005, ABRS.
[1019] Van Buuren and Borman (2009) 83 refering to cases CRvB 28 mei 1998, AB 1998, 244; CRvB 6 september 2006, JB 2006/311.
[1020] Baker v. Canada case para 55.
[1021] Baker v. Canada case para 55.
[1022] D. Dyzenhaus, 'The Politics of Deference: Judicial Review and Democracy' 286 in M. Taggart (ed) *'The Province of Administrative Law'* (Hart Publishing 1997) (Dyzenhaus (1997)).
[1023] Baker v. Canada case paras 58-62.

promote innovative capabilities of EU firms and bring breakthrough innovation earlier to the commercialization stage.

The contracting authority should be given significant leeway in defining its own needs, in requiring the desired minimum levels of performance and specific functionalities, irrespective of the market structure. The contracting authority should only be able to convincingly demonstrate that its minimum levels of performance and functionality are not met by more than one supplier on the market.

c. The proportionality principle in the CJEU jurisprudence

CJEU does not employ reasonableness as a principle to review the exercise of discretion in derogating from the obligations under EU law.[1024] For these purposes, CJEU has employed the proportionality principle since the Internationale Handelsgesellschaft case[1025] as a general principle of Community law.

The proportionality principle may be either related to weighing of two competing rights or to weighing collective/state interests against individual interests/rights.[1026] The following tests are applied by the CJEU.[1027] Firstly, the suitability/appropriateness test assesses whether the measure is suitable or appropriate to achieve the targeted aim. This test includes also a review of the legitimacy of the objectives. Derogations from EU law are permitted on restricted grounds, provided by the TFEU[1028] or recognized in CJEU's jurisprudence[1029]. Once it concludes that the policy reason behind the measure falls within the range of legitimate policy reasons, the Court does not question the level of protection chosen by the Member State.[1030]

Secondly, the necessity test assesses whether the measure is the least restrictive one capable to achieve the aim, or whether there are less restrictive measures which may achieve the

[1024] Dyzenhaus (1997) 386.
[1025] Case C-11/70 *Internationale Handelsgesellschaft v Einfuhr- und Vorratstelle Getreide* [1970] ECR 1125 para 4.
[1026] Tor-Inge Harbo, 'The Function of the Proportionality Principle in EU law' 16 (2010) *European Law Journal* 164 (Harbo (2010)).
[1027] Case C-331/88 *R v Minister for Agriculture, Fisheries and Food* [1990] E.C.R. I-4023, para 13 ("[b]y virtue of [the principle of proportionality], the lawfulness of the prohibition of an economic activity is subject to the condition that the prohibitory measures are appropriate and necessary in order to achieve the objectives legitimately pursued by the legislation in question; when there is a choice between several appropriate measures recourse must be had to the least onerous, and the disadvantages caused must not be disproportionate to the aims pursued"). Harbo (n83) 173.
[1028] Article 52(1) TFEU (ex Article 46(1) TEC): "The provisions of this Chapter [on the right of establishment] and measures taken in pursuance thereof shall not prejudice the applicability of provisions laid down by law, regulation or administrative action providing for special treatment for foreign nationals on grounds of public policy, public security or public health."
[1029] Such as maintaining media pluralism or protecting human rights. Case C-368/95, *Familiapress* [1997] ECR I-368; Case C-112/00 *Schmidberger* [2003] ECR I-5659.
[1030] Ibid.

same goal. Thirdly, the proportionality test *stricto sensu* assesses whether the measure, although necessary and suitable, poses an excessive burden on the individual.[1031]

According to some authors, CJEU scrutinizes with different levels of strictness the decisions of the authorities and it is sometimes more creative than others when it comes to envisaging less restrictive alternatives (it applies sometimes the three-tier test and sometimes the two-tier test).[1032] Harbo finds a pattern in the CJEU jurisprudence: in cases concerning alleged infringements of the EU fundamental freedoms by national legislative or administrative measures, the Court performs a thorough proportionality test.[1033] In cases concerning a balancing exercise between human rights and EU fundamental rights, the Court strikes the balance differently depending on the importance of the human right.[1034]

Heyvaert concludes that the CJEU applies the proportionality test in a changing manner, depending on the importance of a derogation ground at a certain moment in time. Although the European Union was set-up mainly as a custom union and a free trade zone in which economic objectives were overriding social and welfare considerations, this changed with the increasing importance of environmental and human health concerns.[1035]

The CJEU has in its jurisprudence continuously balanced the fundamental freedoms (the imperatives of the internal market) against the prerogatives and regulatory powers of the Member States. Even if we admit that in the case of formulating a procurement need, a contracting authority is balancing various objectives, the fact that these are two legitimate EU objectives, argues in favour of a deferent standard for review of its discretion.

d. Reasonableness and proportionality in international economic law

In international trade law, the WTO Appellate Body applies a similar test to the proportionality principle when reviewing the discretion of State Parties to deviate from the agreement's obligations for public policy reasons.

Firstly, the Appellate Body analyses how close the link is between the measure and the aims. In other words, in how far the measure contributes to the aim pursued. Secondly, the Appellate Body analyses the importance of the common interests or values protected by the measure. The third element taken into consideration is the extent of the negative impact of

[1031] Harbo (2010) 165.
[1032] Cohn (2010) 26. Harbo (2010) 172.
[1033] Harbo (2010) 172-6.
[1034] Harbo (2010) 179.
[1035] Case C-473/98, *Kemikalieinspektionen v Toolex Alpha AB* ECR 2000 I-05681. Veerle Heyvaert, 'Balancing Trade and Environment in the European Union: Proportionality Substituted ?' (2001) 13 *Journal of Environmental Law* 402-3.

the measure on trade.[1036]

These three elements are subsequently balanced against each other. This comes down to investigating whether a WTO-consistent or a less WTO-inconsistent alternative is reasonably available.'[1037]

When performing this last test, the Appellate Body adopts a deferent approach to the level of protection defined by the State Party. In cases in which the exceptions set forth in GATT Article XX(b) and (d) were invoked, the Appellate Body did not question the prerogative of a State Party to set the desired level of protection.[1038] Other WTO agreements arguably codify this jurisprudence and expressly recognize the right of States Parties to set high levels of protection based on public policy.[1039]

The Appellate Body not only does not question the high level of protection set by the State, but it requires clear evidence from the complainant that the alternative, less restrictive/WTO compliant measure will achieve the same level of protection. For example, in *EC – Asbestos* case, where France had set high level of health protection against exposure to asbestos and prohibited the use of asbestos products, the review body disagreed with the complainant (Canada) who argued that a reasonable alternative measure was the controlled use of asbestos. The Appellate Body considered that there was not sufficiently clear scientific evidence that controlled use of asbestos would protect human health to the same levels as prohibition in the use of asbestos products.[1040] Similarly, in the *US –Gambling* case, the Appellate Body dismissed the international consultations as a reasonable alternative to the restricted access of online betting providers to its gambling market, due to the uncertainty that they may achieve the same objective of preventing crime and underage and pathological gambling.[1041]

However, the Appellate Body adopts a less deferent approach when other policy reasons than human health or human morality are invoked. In these cases, international cooperation

[1036] Meinhard Hilf and Sebastian Puth, 'The Principle of Proportionality on its Way into WTO/GATT Law' in Armin von Bogdandy, Petros C. Mavroidis & Yves Mény (eds) *'European Integration and International Co-ordination'* (Kluwer Law International 2002) (Hilf and Puth (2002)). Federico Ortino, 'From 'non-discrimination' to 'reasonableness': a paradigm shift in international economic law ?' (2005) Jean Monet Working Paper 01/05, 30 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=922524> accessed 5 February 2013.
[1037] See Appellate Body Report, Korea-Beef, para 166; citation in Hilf and Puth (2002).
[1038] Panel Report, *Australia –Salmon*, paras 8.173 and 8.175. Appellate Body Report, *Australia – Salmon*, paras 210, 242; Panel Report, *Japan – Agricultural Products II,* paras 8.83-4.
[1039] Art 2.2 of the TBT Agreement provides that 'technical regulations shall not be more trade-restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create'. Art 5.6 SPS Agreement provides: 'Without prejudice to paragraph 2 of Article 3, when establishing or maintaining sanitary or phytosanitary measures to achieve the appropriate level of sanitary or phytosanitary protection, Members shall ensure that such measures are not more trade-restrictive than required to achieve their appropriate level of sanitary or phytosanitary protection, taking into account technical and economic feasibility.'
[1040] Appellate Body Report, *EC –Asbestos*, para 174.
[1041] Appellate Body Report, *US – Gambling,* para 317.

or negotiations are considered as reasonable alternative measures.[1042]

e. *Reasonableness – summarizing remarks*

In European law, the judicial investigation of the existence of reasonable alternatives to goods or services in the area of competition law, entails an objective investigation of the existence on the market of products or services which comply with the same levels of functionality and performance as those of the reference products/services and have similar prices.

However, when reviewing measures applied by Member States to advance national/industrial policy aims, the EU judges weights the different interests/policy aims involved. They review the legitimacy of the policy objective set by the Member State, the suitability of the adopted measure to achieve this legitimate objective and the existence of less trade restrictive measures.

Within the legal framework of the WTO, reasonableness as a concept is part of the evaluation of WTO-compliant or less trade restrictive measure and involves deference to the right of the State to define the desired levels of protection.

In the UK reasonableness is applied as a fully-fledged principle, which illustrates *'a positivist concept of law and constitutional design underpinning a strong legislator and weak basis of individual rights and judicial power'*.[1043] These jurisdictions adopt a deferent approach to reviewing the discretion exercised by administrative bodies. The UK judges merely strike down these decisions when they amount to irrationality or bad faith.

The proportionality test as employed by the EU judge is not suitable for reviewing the discretion of a contracting authority in defining its own needs within the framework of a public procurement. The proportionality test involving a weighing of relevant private and (EU or national) collective interests should be avoided for the degree of uncertainty it would introduce in the public procurement area, at a time when the EU actively supports contracting authorities to act as launching customers of breakthrough innovations.

Nevertheless, if we admit that a review of the balancing of interests should be applied, the reasonableness principle in its deferent form is more suitable. When taking the decision to purchase through direct negotiations the innovative PCP results, a contracting authority favours the EU innovation policy goals and serves on a long-term the economic objectives of increased welfare. Its decision should thus only be reviewed on grounds of bad faith and

[1042] Daniel Lovric, *'Deference to the Legislature in WTO: Challenges to Legislation'* (Kluwer Law International 2010) 158.
[1043] Harbo (2010) 184.

irrationality, such as adopted by the UK and Canadian jurisdictions. This should of course be the case, only when the decision is not informed by national industrial policy considerations.

f. Artificially narrowing down the parameters of the procurement

In addition to the requirement that no alternative products or services are available, article 30(2)(b) of the Proposal for a new Public Sector Directive and 44(d) of the Proposal for a new Utilities Directive, require that the *'absence of competition should not be the result of an artificial narrowing down of the parameters of the procurement'*. The question which arises in this context is whether this only prohibits the formulation of redundant requirements which do not contribute to fulfilling the legitimate need of the contracting authority or whether this means that the contracting authority is mandated to lower its functionality and performance requirements in order to ensure competition.

In line with the above discussion on the legitimate prerogative of the contracting authority to formulate the desired level of performance and functionality, the first interpretation should be considered correct.

This conclusion is also supported by the decision of the CJEU in the Concordia case. In this case, the contracting authority awarded additional points at the evaluation stage to proposals offering vehicles that did not emit more nitrogen oxide than 2 g/k Wh. Competitors complained in this case that only natural gas powered buses could comply with the requirement and there was only one service station in the whole of Finland which could supply natural gas. Moreover, the capacity of the service station was already fully used by one company, which in practice amounted to the practical consequence that only one company could comply with the requirement.[1044]

The CJEU performed in this case a test of the legitimacy of the requirement and concluded that integrating environmental protection requirements into Community policies and activities is a Treaty objective and therefore environmental criteria may be used to assess the economically most advantageous proposal.[1045]

5.3.4.3 Innovation Partnership procedure

The most important novelty in the Proposals for the purposes of the discussion in this section, is the Innovation Partnership procedure.[1046] This new procedure allows the set-up of a structured partnership with one or several private undertakings with the aim of conducting research and

[1044] Case C-513/99 *Concordia Bus Finland v Helsingin kaupunki and HKL-Bussiliikenne* [2002] ECR I-07213 (Concordia case) para 71.
[1045] Ibid para 57.
[1046] Art 29 of the new Public Sector Directive and art 40 of the new Utilities Directive.

development activities (in parallel) and subsequently purchasing the resulting product, service or work, provided it can be delivered at the initially agreed performance levels and costs.

The Innovation Partnership procedure has been introduced with the aim to provide contracting authorities with a clear tool to act as demanding customers and early adopters of desired innovations. The EU seems to have dropped the concerns that direct purchase of the results of an R&D service contract would be in breach of the GPA.

In the initial drafts of the Proposals, it was not made clear whether the legislator had in mind to provide an alternative or an additional instrument to the pre-commercial procurement procedure. The relation between the two was nowhere in the Proposals clarified, which may create the impression that the Innovation Partnership procedure was meant to provide an improved and legally accepted alternative. In the text of the new Procurement Directives, adopted by the European Parliament in January 2014, pre-commercial procurement is mentioned.[1047] It is made clear that pre-commercial procurement remains applicable to R&D contracts excluded from the scope of the Directives, while the Innovation Partnership procedure is applicable to contracts falling within the scope of the directives.

However, this distinction is theoretical, as the new Procurement Directives do not prohibit a contracting authority to bring an excluded contract within the scope of the directives and award it according to their provisions. In Chapter 1, section 1.6 I indicated that the obligations flowing out of the fundamental principles of public procurement outside the scope of the Directives are far-reaching. As a consequence, there would be not much procedural flexibility in conducting a PCP procedure as compared to an Innovation Partnership. A contracting authority will thus be able to freely choose between the two procedures depending on whether it wants to purchase the innovative results. The co-funding for PCP available under the new funding programme of the EU, Horizon 2020, may though constitute an incentive to choose for PCP.

Many aspects of the implementation of the Innovation Partnership procedure remain open. In this section, I outline these aspects and identify its weaknesses.

Phases

Article 29(2) of the new Public Sector Directiveand its equivalent within the new Utilities Directive specify that the Innovation Partnership covers the R&D phase as well as the subsequent purchase of the resulting supplies, services or works.

[1047] Recital (17) of the new Public Sector Directive.

The R&D phase of the partnership must follow the sequence of steps in the research and innovation process. It is not made clear whether these steps correspond to the R&D phases proposed by the PCP Communication, namely solution exploration, prototyping, field tests or whether they could start at a more fundamental research stage. Moreover, no definition of R&D is provided and no reference to the *Frascati Manual* as guiding authority is made.

The new Procurement Directives underline that at the end of each phase (e.g. R&D, manufacturing, delivery etc.) the contracting authority may decide to terminate the partnership or may decide to reduce the number of partners if applicable, provided this has been indicated in the procurement documents.[1048]

IPR arrangements

The legislator does not specify any type of IPR sharing between the contracting authority and the private partner as minimum requirement for the application of the Innovation Partnership.[1049] The only indication is provided in recitals, which mention that the Innovation Partnership is applicable to contracts falling under the scope of the Directive.[1050] This means that Innovation Partnerships were intended to cover R&D contracts whose IPR accrue to the contracting authority and whose costs are fully covered by the contracting authority. However, the directive does not prevent a contracting authority that shares the IPRs with the supplier to conduct an Innovation Partnership procedure.

Rules of a competitive procedure with negotiation

The new Procurement Directives make clear that the choice of the private partner(s) should be done *'in accordance with the rules of a competitive procedure with negotiation'* (replacing the old negotiated procedure with prior call for competition). Article 24(1b) makes clear that the contracting authority does not need to demonstrate one of the application grounds for the competitive procedure with negotiations.[1051] The contracting authority is though obliged to follow the procedural steps of a competitive procedure with negotiation.[1052]

The procedural steps of a competitive procedure with negotiations are more prescriptive in the new Public Sector Directive as compared to the new Utilities Directive. Under both

[1048] Art.29(2) of the new Public Sector Directive.
[1049] See article 29(3c) of the new Public Sector Directive.
[1050] Recital (17a) of the new Public Sector Directive.
[1051] However, the applicability grounds are more flexible compared to the current directive and would provide justification in the case of an innovation partnership as well (e.g. article 24(1c)(a)(ii) of the new Public Sector Directive rative action prs or services that include design or innovative solutions).
[1052] Within the framework of the new Utilities Directives contracting authorities do not have to justify their choice, but may freely choose for the competitive procedure with negotiations.

regimes, the contracting authority/entity is mandated to start the procedure with an open call which invites any economic operator within the EU to submit a request to participate within a period of 30 days (the minimum time limit).[1053]

Within the public sector rules, the invited economic operators will need to submit a tender which will form the basis of negotiations, while in the framework of the utilities sector, these negotiations may be more freely organized and the previous submission of a tender is not mandatory.[1054]

Under both regimes, the contracting authority/entity may formulate selection criteria to be met by the economic operators in order to be invited to tender/to negotiate.[1055]

Only the new Public Sector Directive expressly mentions that the contracting authority/entity may reduce the number of economic operators during the negotiations.[1056] This may be performed by applying the award criteria specified in the contract notice. Initial drafts of the Proposals allowed selection during the negotiations merely when a sufficient number of candidates had passed the suitability criteria.[1057] The Proposal for the new Public Sector Directive imposed a minimum number of 3 candidates to be invited to submit an initial tender,[1058] while the Proposal for a new Utilities Directive did not mention a minimum number, but required the contracting authority/entity to maintain competition.[1059] In the final text of the new Procurement Directives these additional requirements have been dropped.

Only the new Public Sector Directive expressly mentions that certain elements of the procurement may not be changed during negotiations (the minimum requirements and the award criteria). The new Public Sector Directive also mentions that during negotiations candidates should be treated equally and if needed, sensitive information should be treated confidentially. This means that all tenderers should receive information in a non-discriminatory manner and should be allowed the same amount of time to (re-)submit tenders.[1060] Although not specifically mentioned in the new Utilities Directive, the same obligations will flow from the application of the principle of equal treatment.

Following negotiations, all selected candidate will be allowed the same amount of time to prepare and submit the tenders. A time-limit is not prescribed, but should be mutually agreed

[1053] Both new Procurement Directives provide the possibility to reduce this time limit. See art 42(1) of the new Utilities Directive and art 26(3)-(6) of the new Public Sector Directive.
[1054] Art 42(2) of the new Utilities Directive.
[1055] Art 42(2) of the new Utilities Directive and art 27(2) of the new Public Sector Directive.
[1056] Art 27(5) of the new Public Sector Directive.
[1057] Art 64(1) of the new Public Sector Directive and art 72(2) of the new Utilities Directive.
[1058] Art 64(2) of the new Public Sector Directive.
[1059] Art 72(2) of the new Utilities Directive.
[1060] Art 27(3)-(4) of the new Public Sector Directive.

between the contracting authority/entity and the selected candidates.[1061] Only the new Utilities Directive provides for a minimum of 10 days when mutual agreement cannot be reached.

Purchase of the R&D results

The new Procurement Directives allow the public partner to directly purchase the supplies, services or works resulting from the R&D trajectory of the Innovation Partnership, provided these can be delivered at the initially agreed performance levels and maximum costs.[1062] But the provisions on innovation partnerships do not clarify how the purchase should be conducted when there is more than one company that successfully completes the R&D trajectory and develops an operationally viable product. It is not clear whether the contracting authority may freely choose one of these companies or should organize some kind of competition among them.

The only limitation set to the subsequent purchase of the R&D results regards the value of the contract. This should not be disproportionate in relation to the investment in the development phase.[1063] It is not clear whether this provision refers to the investments made by the contracting authority within the framework of the innovation partnership or whether the investments made previously by the private partner should also be considered. If the second view is accepted, the provision allows significant discretion to contracting authorities to award large value contracts for long durations for the purchase of the R&D results.

In an earlier version of the Proposals, it was provided that the value and duration of the commercial procurement following the development phase *'shall remain within appropriate limits, taking into account the need to recover the costs, including those incurred in developing an innovative solution, and to achieve an adequate profit'*.[1064] Arguably, this provision granted contracting authorities even greater discretion in deciding on the value and duration of a contract for the purchase of the R&D results.

The fact that the old provision was replaced by a proportionality tests indicates that the risk of market foreclosure was acknowledged during the negotiations of the Proposals, but there was lack of agreement on a different approach. As a consequence, the final text of the new Procurement Directives leaves it to the judiciary to resolve this dispute. The European judges will need to evaluate on a case-by-case basis whether the value of such a contract is proportional in relation to the R&D investments.

[1061] Art 42(2) of the new Utilities Directive and article 27(1) of the new Public Sector Directive.
[1062] Art 29(2) of the new Public Sector Directive.
[1063] Art 29(4) of the new Public Sector Directive.
[1064] Draft of 20.12.2011.

Another shortcoming of the current provision is that it does not limit the commercial purchase of the R&D results to *'first products or services'*. As a consequence, a contracting authority could in theory buy the developed product/service even after this was commercialized. The contracting authority will thus not be stimulated to act as first customer and *'pull'* onto the market innovative products/services. On the contrary, it will be allowed to create obstacles to competition. Moreover, this would potentially breach the GPA, when the Innovation partnership is not open to competition from GPA parties.

This is arguably a dangerous choice, considering the recent economic and financial crisis which has increased the disparities between the budgetary strengths of Member States and has increased the potential for anticompetitive reactions. Under such conditions, Europe's growth can be maintained through better and bundled use of scarce public resources. This entails that public spending (in whatever form: direct spending, tax refunds, loans etc.) should be carefully targeted at growth-promoting policies and should make use of bundled efforts towards common European objectives.[1065] Public spending in the form allowed by the Innovation Partnership procedure is not only a potential waste of public resources, but it may potentially worsen the conditions for competition for the actors active in the Single Market.

The recitals of the new Procurement Directives warn that the partnership *'should be structured in such a way that it can provide the necessary 'market-pull''* instead of foreclosing the market or preventing, restricting or distorting competition.[1066] The extended warning is an acknowledgement of the risks brought by the innovation partnerships. It also re-confirms that strenuous negotiations preceded the adoption of this legislative provision.

Relation to GPA

Also interesting to mention is, that the new Procurement Directives retain the requirement to apply the Directives equally in respect to EU and GPA parties. However, the new Procurement Directives limit their applicability to contracts brought by the EU under the scope of the GPA.[1067] This means that in theory a contracting authority may exclude GPA participation from the award of R&D contracts that fall under the scope of the new Procurement Directives, including an Innovation Partnership. However, when the Innovation Partnership procedure also covers the purchase of the commercial results of the R&D trajectory, it is doubtful that a contracting authority may exclude GPA participation.

Arguably, according to my argumentation in section 5.3.2, to the contracting authority may at least require that the R&D activities are conducted within the EU. It is otherwise difficult to

[1065] Commission, Communication from the Commission, EU State Aid Modernisation (SAM) COM(2012) 209 final.
[1066] Recital (17a) of the new Public Sector Directive;
[1067] See art 23 of the new Public Sector Directive; and art 38 of the new Utilities Directive.

imagine that EU contracting authorities will be willing to finance R&D trajectories which would be undertaken not only outside the national borders, but even outside the EU. This could only be envisaged when the Innovation Partnership is not used strategically to improve the innovative capabilities of national or European companies, but purely to development a new solution which is needed for the daily functioning of the contracting authority.

Either way it is certain that Innovation Partnerships should be open to participation from companies from GPA partner countries.

Mandatory transposition

Finally, it should be reminded that in the initial draft of the Proposals Member States had the choice to implement in their procurement legislations the Innovation Partnership procedure, but were not mandated to do so. The final text of the new Procurement Directives leaves this choice out. Member States are mandated to transpose the Innovation Partnership procedure into national legislation.[1068]

Concluding remarks

In conclusion, from the perspective of a contracting authority, the Innovation partnership presents certain important advantages compared to the PCP procedure. Firstly, the resulting innovative products can be directly purchased without re-opening competition. Secondly, the Innovation Partnership covers R&D services, as well as contracts which are qualified as R&D works and supplies. The contracting authority is thus not mandated to demonstrate that the value of the R&D services is higher than the value of the prototypes/R&D works. Thirdly, the Innovation Partnership does not require cross-border collaboration and does not impose conducting parallel R&D trajectories with more than one economic operator. Fourthly, the contracting authority is not mandated to ensure compliance with a market price criterion, but it may cover the costs of the R&D plus profit margins. Moreover, the obligation to select the private Innovation partner through a competitive procedure with negotiations does not constitute an additional burden. As shown in section 1.6, except for precise time limits and application grounds, the applicable fundamental principles of public procurement amount to the same obligations as imposed by a negotiated procedure with prior notice (or competitive procedure with negotiations).

From a public policy point of view the Innovation Partnership is not a better choice compared to the PCP procedure. The Innovation Partnership holds the advantage that it is provided by legislation and creates legal certainty on the possibilities of contracting

[1068] Art 24(1) of the new Public Sector Directive and 43(1) of the new Utilities Directive.

authorities to engage in a long-term (high-risk) R&D project and that it overcomes the barrier of a separate competitive award to purchase the innovative end results. Moreover, it limits the application by contracting authorities only in case when it can also act as end-user, and purchase the innovative results of the R&D trajectory. However, the main risks for its efficiency lie in the potential lack of competitive pressure during the R&D stages and in the possibility to purchase the developed products long after the products have been developed and do not depend on the contracting authority to act as an early adopter.

The introduction of the Innovation Partnership procedure is thus welcome for its potential to stimulate contracting authorities to invest in R&D and to purchase the resulting products/services. However, its weak drafting in ensuring competition and preventing abusive use will probably reduce its effectiveness in achieving the innovation policy objectives.

It should also be mentioned that the contracting authority retains under certain circumstances the choice between an Innovation Partnership and the negotiated procedure without prior publication. Under the new public sector regime, whenever the value of a prototype or of R&D works outweighs the value of the R&D services, a contracting authority has the choice between the Innovation Partnership and the negotiated procedure without prior publication.[1069] Under the new utilities regime, contracting authorities will have the free option between the Innovation Partnership and the negotiated procedure without prior call for competition, irrespective of the type of the R&D contract (whether it qualifies as services, works or supplies).[1070] The choice will be determined by the desire of the contracting authority to procure the innovative results of the R&D contract.

5.3.4.4 Conclusions

The new Procurement Directives bring several changes in the provisions that may be relied on by a contracting authority in order to justify the direct purchase of PCP results. For example, when relying on technical or IPR reasons to directly award a contract to one supplier, the contracting authority will need to demonstrate that no *'reasonable alternative or substitute'* exists and that *'the absence of competition is not the result of an artificial narrowing down of the parameters of the procurement'*. I argued in this section that these additional obligations do not restrict the discretion of a contracting authority in defining high levels of performance and advanced functionalities for the desired solutions.

The most important novelty in the new Procurement Directives is the Innovation Partnership procedure. I have analysed in this section whether the new procedure enables contracting authorities to play their key role in stimulating innovation from the demand side. I concluded

[1069] Art 32(3)(a) of the new Public Sector Directive.
[1070] Art 50(b) of the new Utilities Directive.

that this new procedure fails to strike an adequate balance between European innovation and competition interests. The procedure does not limit the direct purchase to the 'first' products/services resulting from the R&D phase. By allowing the direct purchase of the resulting products/services long after they were commercialized, the procedure not only fails to incentivize a contracting authority to act as first customer of innovation, but allows room for potential distortion of competition. Moreover, the new Procurement Directives fail to enhance the legal certainty around its application.

Arguably, the Innovation Partnership procedure was adopted under the pressure of strengthened national interests. The fact that the Horizon 2020 only provides funding for PCP supports this hypothesis.

5.4 The obligation to ensure a 'level playing field'

5.4.1 Introduction

As illustrated in section 5.3.3, a contracting authority will not always be able to conduct direct negotiations for the purchase of a PCP solution in accordance with the current EU Procurement Directives. It will most of the times be obliged to conduct a separate competitive procurement.

However, within the framework of such a competitive procurement, a PCP finalist has significantly improved chances to win the contract, due to the knowledge/IPR acquired during the PCP, and to the possibility to offer the product at a lower price (as the contracting authority has gained during the PCP the right to freely use the developed product/service).

These circumstances are often considered by contracting authorities (at least in Belgium, Denmark and the Netherlands) as reasons, to exclude the PCP finalist from the later award procedure for the purchase of the developed novel product.[1071]

This section investigates to what extent these concerns are justified. More concretely, this section will analyze whether the equal treatment principle and the thereof derived obligation to ensure a level playing field restrict the freedom of a contracting authority to set the same demanding requirements of the PCP procedure, or obliges the contracting authority to neutralize (some of) the advantages possessed by a PCP finalist.

5.4.2 The extent of the obligation to level the playing field

The obligation of a contracting authority to ensure a level playing field for bidders stems out

[1071] Izsak & Edler (2011)18.

of the principles of equal treatment,[1072] and transparency. The principle of equal treatment is meant to *´promote the development of healthy and effective competition between undertakings taking part in a public procurement procedure'*.[1073] This principle obliges the contracting authority to afford all tenderers *´equality of opportunity when formulating their tenders, which therefore implies that the tenders of all competitors must be subject to the same conditions'*.[1074] Moreover contracting authorities are not allowed to formulate strict technical specifications which *unjustifiably* restrict the access of economic operators to the procurement procedure.[1075] Finally, the transparency principle obliges the contracting authority to make relevant information available to all bidders.

In the context of an award procedure following a PCP, the question arises whether the contracting authority needs to exclude a PCP finalist because of its involvement in the pre-procurement phase, or otherwise lower the strictness of the technical requirements in order to enhance participation of other companies than the PCP finalists.[1076] In addition, the question arises which information related to the pre-commercial procurement needs to be made available to all bidders.

Important answers to the above formulated questions can be found in jurisprudence of the CJEU. In the Fabricom case,[1077] the European judge decided that the Belgian law which mandated a contracting authority to exclude from a procurement procedure persons instructed to carry out research, experiments, studies, or development in connection with that procurement, was disproportionate and therefore in breach of the procurement directives. According to the Court, the Belgian law went beyond what was necessary to ensure equal treatment. According to the Court the involvement of such a firm in the pre-procurement preparations does not necessarily involve a risk to competition and this should be decided on a case-by-case basis. A proportionate law would only exclude the firms which are not able to provide the proof that competition is not at risk. The Court overturned the balance made by the Belgian government between the interest of competition and the competing interests of certainty and transparency.[1078] The Court did not clarify though whether a contracting authority would be *mandated* to exclude a firm when there is a risk to competition or when the firm involved in the pre-procurement preparations cannot prove there is no risk to

[1072] The equal treatment principle requires that comparable situations must not be treated differently and that different situations must not be treated in the sa00me way unless such treatment is objectively justified. See, for example, Case C-106/83 *Sermide* v *Cassa Conguaglio Zucchero and Others* [1984] ECR 4209 para 28, Case C-203/86 *Spain* v *Council* [1988] ECR 4563 para 25, and Case C-306/93 *SMW Winzersekt v Land Rheinland-Pfalz* [1994] ECR I-5555 para 30.
[1073] Case C-496/99 *Commission of the European Communities v CAS Succhi di Frutta SpA* [2004] ECR I-3801 paras 110-1.
[1074] Ibid para.110; Case T-437/05 *Brink's Security Luxembourg v Commission* [2009] ECR II-3233 paras 112-5; Case T-332/03 *European Network* v *Commission* [2008] ECR II-32 para 125.
[1075] Art 23(2) Public Sector Directive and 34(2) Utilities Directive: *'Technical specifications shall afford equal access for tenderers and not have the effect of creating unjustified obstacles to the opening up of public procurement to competition'*.
[1076] The second question has been answered negatively in the context of the negotiated procedure without prior notice in section 5.2.4.1.
[1077] Joined Cases C-21/03 and C-34/03, 3 March 2005 Fabricom v Belgian State [2005] I-1559 paras 32-6.
[1078] Sue Arrowsmith, 'Past and Future Evolution of EC Procurement Law' (2006) 35 *Public Contract Law Journal* 355.

competition.

The Court of First Instance (CFI) confirmed in a subsequent case that a previous contractual relation with a tenderer does not generate an obligation for the contracting authority to neutralize *all* the advantages enjoyed by that tenderer.[1079] A contracting authority must protect as far as possible the principle of equal treatment and must avoid all consequences which are contrary to its own interests, but should not neutralize the advantages of the tenderer if it is not technically easy and economically acceptable or if it infringes the rights of that tenderer (such as IP rights).[1080] In this case, one company complained that the sitting contractor did not have to follow the 3 months "run in phase" and had an advantage because it did not have to make these costs. The Court clarified that the existing contractor and its subcontractors have an *'inherent de facto advantage'* whenever they decide to participate in the re-tendering of the contract, which is not the consequence of any conduct on the part of the contracting authority.[1081] The contracting authority is not obliged to neutralize such an advantage. The Court did not specify whether the choice of the existing contractor through competition in the previous tendering procedure was important for the extent to which the contracting authority needs to ensure a level playing field. It can be envisaged that the court would not consider the advantage of the previous contractor as inherent, when the choice for that contractor took place outside competition.

In the context of a post-PCP procurement, a contracting authority would thus neither be mandated to exclude a PCP finalist nor to neutralize any inherent price advantage. However, the contracting authority should make available all information which is relevant for the level of quality or of the price of the offer, unless that information is protected by intellectual property rights or confidentiality.[1082] Moreover, a contracting is forbidden to use in a post-PCP procurement imprecise award criteria which could in practice favour the PCP finalist, due to the fact that he is in the best position, as a result of its experience, to assess what the real needs of the contracting authority are.[1083]

The CJEU has also ruled that a contracting authority does not breach the principle of equal treatment when allowing participation in the award to bodies which receive subsidies allowing them to submit lower priced tenders. This clarification of the CJEU is important for the

[1079] Case T-345/03 –European Dynamics V Commission [2008] ECR II-341 para 73.
[1080] Ibid paras 75-6.
[1081] Ibid para 70: 'In that regard, it should be pointed out that the fact that an advantage may be conferred upon an existing contractor by a running-in phase is not the consequence of any conduct on the part of the contracting authority. Unless such a contractor were automatically excluded from any new call for tenders or, indeed, were forbidden from having part of the contract subcontracted to it, it is inevitable that an advantage will be conferred upon the existing contractor or the tenderer connected to that party by virtue of a subcontract, since it is inherent in any situation in which a contracting authority decides to initiate a tendering procedure for the award of a contract which has been performed, up to that point, by a single contractor. That fact constitutes, in effect, an 'inherent de facto advantage'.
[1082] Ibid paras 183-203.
[1083] Case T-461/08 referred to the advantages of the incumbent contractor. See *Evropaïki Dynamiki v European Investment Bank* [2011] paras 149-50.

case when the PCP does not comply with the market price criterion and entails a State aid element. In this case, the CJEU considered that the legislator would have stated such a prohibition explicitly, if it had so desired.[1084]

Whether a contracting authority is mandated by the equal treatment principle to downgrade its requirements in order to ensure that a large number of potential bidders can submit a compliant offer has also been answered negatively in section 5.2.4.1.[1085] Two undertakings would in this case be treated differently only because they are not in identical situations. Nor does the proportionality principle prevent a contracting authority from setting demanding requirements - which may only be complied with by the PCP finalist -, if justified.[1086] Such restrictive requirements are justified if they are appropriate to the specific nature of the public task[1087] and if they are not formulated with the only scope of distorting the competition by favouring one bidder (the PCP finalist).[1088] Such requirements could possibly be acceptable even if indirectly discriminatory, but in any case when they are non-discriminatory.[1089]

A contracting authority could in addition require the bidders to show experience in implementing the respective product/service. It can be envisaged that the PCP finalist who completed all the stages of a PCP, including the testing stage, is the only one able to provide such a reference. Arguably, such a requirement is justified by the concern for the quality and reliability of such innovative products/services and is sufficiently related to the subject-matter of the procurement. Unjustifiably restrictive technical specifications are those which are not related to the nature of the contract or to the need of the contracting authority. However, the contracting authorities may freely define their need in high levels of functionality and performance.

5.4.3 Conclusions

In conclusion, the advantages accumulated by a PCP finalist in terms of knowledge/IPR and costs are inherent advantages and such a bidder does not have to be excluded from participation in the post-PCP procurement procedure. A contracting authority should though make all the necessary information available to the other tenderers, unless it regards

[1084] Case C-305/08, *Consorzio Nazionale Interuniversitario per le Scienze del Mare (Conisma) v Regione Marche* ECR 2009 I-12129, para 40.
[1085] *Concordia* case para 86: '*the principle of equal treatment does not preclude the taking into consideration of criteria…. solely because the contracting entities owned transport undertaking is one of the few undertakings able to offer a bus fleet satisfying those criteria*'
[1086] According to article 23(2) Public Sector Directive: 'technical specifications shall afford equal access for tenderers and not have the effect of creating *unjustified* obstacles to the opening up of public procurement to competition'.
[1087] T-437/05 para.120-1. Based on case C-324/93 *Evans Medical and Macfarlan Smith* [1995] ECR I-563 , the AG in the Concordia case argued that criteria are not allowed, only if they could not be justified objectively, having regard to the characteristics of the contracts and needs of the CA (para.151).
[1088] However, if the winning tenderer also helped in the preparation of the tender, that might be an indication that the award requirements were unduly restricted. Case C-315/99 *Ismeri Europa* v *Court of Auditors* [2001] ECR I-5281 para 47.
[1089] S. Arrowsmith and P.Kunzlik (ed), *'Social and Environmental Policies in EC Procurement Law – New Directives and New Directions'* (CUP 2009) 63.

information protected by IPR and should define all the requirements clearly.

This is not the same as ensuring that a large number of bidders comply with the requirements. A contracting authority is allowed to formulate during the commercial procurement the same demanding requirements for the desired product/service as it did in the preceding PCP procedure. The fact that potentially only the PCP-finalist(s) can submit a compliant offer, would not entail a breach of the principles of public procurement law.

5.5 Interplay between PCP and EU State aid rules

5.5.1 Introduction

As already mentioned earlier in this thesis, the PCP Communication mentions the need to pay a market price for the R&D services within a PCP procedure, in order to exclude the applicability of the EU State aid rules. However, the PCP Communication admits that a contracting authority may disregard this requirement and choose to justify a State aid element in conformity with the EU rules applicable in that area.

In this section, I outline the argumentation around the market price criterion and I criticize this choice, for being dissonant with the philosophy behind PCP, for difficulties in its proper application in practice and for being easily abused in the form accepted by the European Commission (sections 5.5.2 and 5.5.3). I outline an alternative, more suitable approach (section 5.5.4). In addition, this section summarizes the conditions for justification of a State aid element (section 5.5.5).

5.5.2 The argumentation for the market price criterion

The current Framework for R&D&I takes the view that conducting a procurement procedure for the procurement of R&D, in line with the Procurement Directives represents a presumption of market conditions and leads to the inapplicability of the State aid rules.[1090] More recent State aid rules nuance this statement by considering only the competitive procedures of the Procurement Directives, that ensures the least cost to the community, as sufficient proof of no illegal aid.[1091]

As shown in section 1.6 above, PCP as recommended by the European Commission is the equivalent of a negotiated procedure with prior publication of a contract notice as described in the Procurement Directives, except for compliance with the grounds of

[1090] Commission, 'Community Framework for State aid for Research and Development and Innovation' (30 December 2006) OJ C 323/1 (Framework for State aid for R&D&I), para 2.1. The recent Communication SGEI 2012, on the other side, limits the scope to open and restricted procedures. The presumption does not exist for the negotiated procedures. See Commission, Communication on the application of the European Union State aid rules to compensation granted for the provision of services of general economic interest (2012/C 8/02) (Communication SGEI (2012)).
[1091] Communication SGEI (2012) paras 65-6.

application of such a procedure and the mandatory time-limits. Thus, it is not a procurement procedure conducted in compliance with the Procurement Directives.

This means that within the current State aid rules, the competitive award of a PCP contract in line with the 2007 Communication does not automatically entail that a market price has been paid. The contracting authority needs to perform an additional objective check (in comparison with prices in other sectors for example) on whether the price offered by a bidder is in line with market conditions.

The European Commission expressed the same view in its 2007 PCP Communication. The Commission developed thus the market price criterion. According to the Commission, a PCP procedure escapes the applicability of the EU State aid rules if a market price is paid for the R&D services and if the market price reflects the previously decided division of risks and benefits. By paying a market price, the contracting authority does not – according to the Commission - provide an unwarranted advantage to a certain economic operator and does not distort thus competition.[1092]

The reason for creating the market price requirement was on the one side, to clarify that PCP could not be used to circumvent the State aid rules which prohibit the payment of 100% of the costs for applied R&D.[1093] Because the market price should reflect the division of risks and benefits prior established in the PCP call, and because the PCP participant retains by default the ownership of the results, a market price entails in principle that less than 100% of the R&D costs should be paid by the contracting authority.

On the other side, the European Commission attempted to find a simple method to avoid the applicability of the EU State aid rules, which require prior notification of the planned funding and prior evaluation by the European Commission.

The European Commission outlines two ways of complying with the market price criterion. The first is to determine the maximum price a contracting authority is ready to pay by deducting from the total cost of R&D[1094] plus a reasonable profit margin, the market present value (MPV) of the commercialization opportunities left to the participating company (this value will need to reflect also the risks assumed by the participating company, such as the cost carried by

1092 PCP Communication 8; Commission, 'Example of a possible approach for procuring R&D services applying risk-benefit sharing at market conditions, i.e. pre-commercial procurement'(PCP Staff Working Document) SEC(2007) 1668.

[1093] As shown in Chapter 4, the innovation agencies of the UK and the Netherlands introduced the possibility to pay 100% of the R&D costs in the SBRI, and the SBIR scheme respectively.

[1094] This is made of all the costs incurred by the company - for example the market value of the salaries of researchers/developers in a certain sector and the costs of R&D material required to perform the work. Commission, 'Policy related Frequently Asked Questions on Pre-Commercial Procurement (PCP) and the link with Public Procurement of Innovative Solutions (PPI)' (FAQ PCP) question nr 8 <http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf> accessed 30 January 2013.

the company for maintaining the IPRs and commercializing the products).[1095] Bidding companies are invited to compete by offering an equal or lower price. The Communication does not elaborate on the situation when the MPV of the commercialization opportunities may appear higher than the total R&D costs (including reasonable profit margins).[1096]

Due to the difficulty in determining the value of the commercialization opportunities of yet-to-be-developed products, the European Commission accepts a second type of check. This consists of asking bidding companies (1) to supply the calculation of the price reduction they can offer in return for the IPR benefits (this calculation should be related to their business cases analysis in their PCP offer) and (2) to include a financial expert in the PCP tender evaluation committee who is charged with assessing whether the business-case and associated price reductions for the IPRs offered by different companies are indeed in line with normal market conditions in that sector.[1097] As already shown in Chapter 4, the national PCP-like programmes either cover 100% of the R&D costs or ignore the market price criterion.

The above options can be visualised as follows:

1095 PCP Staff Working Document 9.

[1096] John Rigby, rking Document 9.t of Pre-commercial Procurementw Direcentation at the OECD workshop on measuring the link between public procurement, R&D and innovation, 5-6 December 2013.

1097 FAQ PCP question nr.8: 'one way used by patent traders to calculate the price reduction for IPR ownership rights uses the so-called *present value method*. It is normal practice that companies make a business case, and thus estimate the potential market over the years to come, when deciding to start investing in a new development or not. The price reduction on the PCP bid towards the procurer can be calculated as a portion of the 'present' value of projected profits for the company (the 'present' value is the value discounted back in time to the day of the bid), that is proportional to the investment/risks taken by the government (PCP price paid to the company) compared to the total investments required to turn the R&D efforts into a commercially viable product (this includes the projected investment/risks that will be carried by the company e.g. costs of maintaining IPR projection, further production, marketing and commercialisation investments). Companies can extract these values from the business case they prepare at the moment they make their PCP offer'.

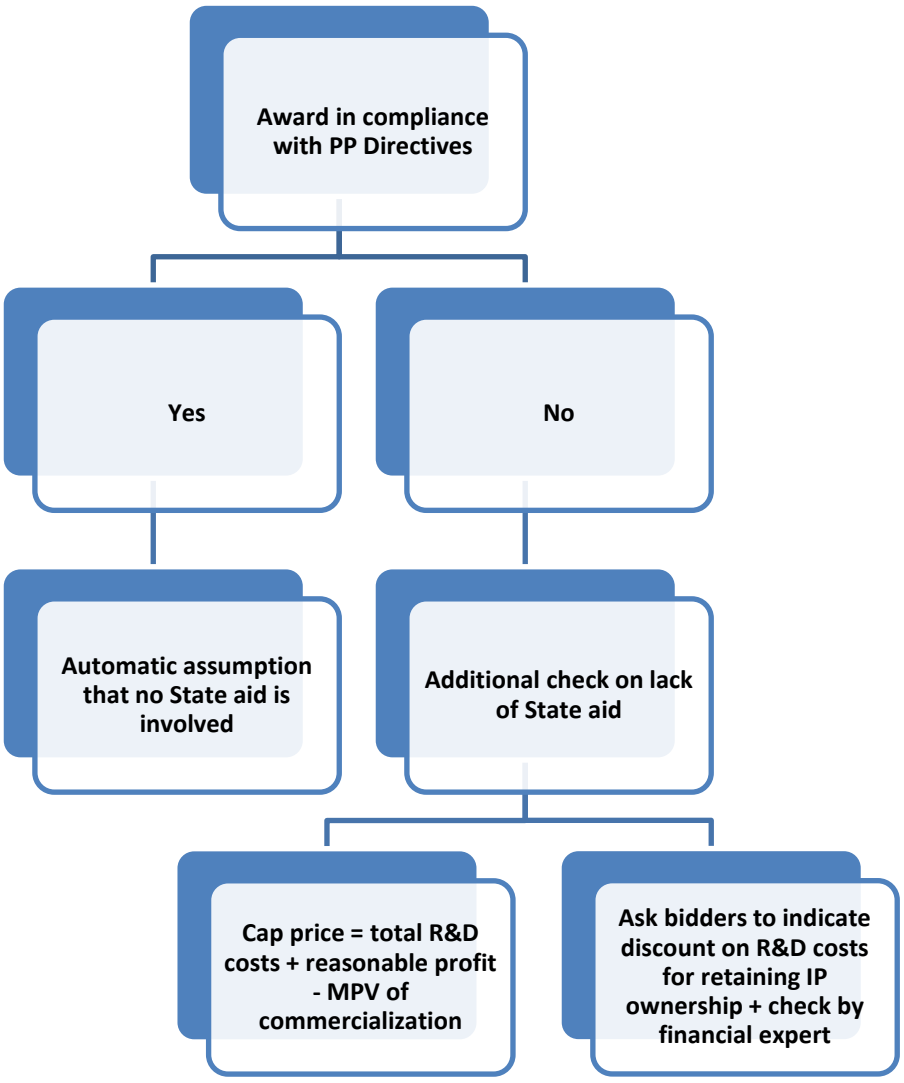


Fig. 2

However, the market price criterion is not a necessary condition to ensure that public procurement of R&D whose risks and benefits are shared between the contracting authority/entity and the private actors, complies with the EU State aid rules.

Legally, a state aid element within a PCP could be justified at the moment when the PCP Communication was adopted within the Framework for R&D&I and since 2008 also within the framework of the GBER.

The PCP Communication misses though the opportunity to draw a clear distinction between the situation in which it would be employed to award of a public contract as opposed to granting a subsidy. This was discussed in section 1.7.3 above.

5.5.3 Criticism

As already shown in Chapter 4, the UK SBRI and the Dutch SBIR, which were implemented in the two Member States before the adoption of the EU PCP guidance, allowed 100% coverage of the R&D services costs. Currently, the UK SBRI maintains the 100% coverage despite the clarification in the PCP Communication.[1098] The Dutch SBIR, on the other side, formally applies the second approach accepted by the Commission. However, in the Dutch SBIR, companies bidding on an SBIR call are requested to indicate the discount in price they grant for retaining the IPR and no control mechanisms are embodied into the award process. This leaves room for circumventing the EU State aid rules in practice.[1099] The Flemish PoI does not set a standard approach regarding the market price criterion.

This shows that the market price criterion, is either too difficult to implement or it can easily be abused.

In addition, the market price criterion is dissonant with the philosophy of PCP. PCP was in theory brought into existence with the aim to relieve the difficulties encountered by companies to find (sufficient) private investments for risky but potentially highly beneficial R&D projects. As a consequence, it can be argued that the funding of R&D contracts through PCP never entails the payment of a market price. In other words, even payment of less than the R&D costs is more than a normal market investor would be willing to pay. The PCP award is intended to signal quality and lower the risks, in order to incentivize private investments. It is thus never a normal commercial transaction at a market price, but *always* entails a State aid element.

This argumentation is supported by jurisprudence of the CJEU in the area of competition law.[1100] According to the *Tubacex* case, when the state decides to provide funds to an undertaking, the test of aid is whether a market creditor would act in the same way. In other words, the proof that there is no State aid granted, is that the undertaking could find the finance on the private market.

The European judge has also confirmed that a State aid element may be present even when a procurement procedure in line with the Procurement Directives is conducted. The European Court of First Instance ('CFI') has ruled that a purchasing decision which does not correspond to '*actual needs felt by the authorities*' involves State aid even when the purchase was made on market conditions which a private investor would have accepted

[1098] TSB, 'SBRI – Government challenges, ideas from businesses, innovative solutions' (September 2011) 3 <http://www.innovateuk.org/_assets/sbri_brochure_2011.pdf> accessed 5 February 2013.
[1099] SBIR programmabureau van Agentschap NL, 'SBIR handleiding voor ondernemers' (7 July 2011) 5 <http://www.agentschapnl.nl/sites/default/files/bijlagen/SBIR%20handleiding%202011-1.pdf> accessed 18 December 2013.
[1100] Case C-342/96, *Tubacex* [1999] ECR I-02459.

(regarding for example duration, and price), or in other words it constituted a normal commercial transaction.[1101] Actual needs is not interpreted by the CFI as operational needs of the contracting authority acting as end-user. Rather the Court took into consideration in this case the fact that the public authority bought a much larger number of vouchers than there was demand for (end-users were in this case private citizens).

This case could though provide support for the conclusion that a catalytic PCP would earlier contain an element of State aid, when the contracting authority cannot demonstrate that there is a corresponding need on the private market for the products being developed. As contracting authorities which get involved in catalytic PCPs seldom analyse the availability of private demand, investments through PCP could generate breaches of the EU State aid rules.

5.5.4 Proposed solution

As already mentioned in section 1.7.3 above, the EU policy guidance should clarify that PCP may be employed to either award public contracts or to grant a subsidy. A clear distinction should further be made between public contracts and subsidies, in line with the 'direct economic interest' criterion outline by the Court of Justice of the EU (CJEU) in the Helmut Muller case. In accordance with this criterion, the PCP would lead to the award of a public contract when the involved contracting authority is the end-user of the envisaged innovation. When private entities are the end-users of the envisaged solution and the contracting authority pursues only a public goal of indirect economic interest, PCP would be employed to grant a subsidy.

This distinction should be codified in the State aid rules in order to provide legal certainty and eliminate one barrier to the applicability of PCP. Instead of the 'market price' criterion, the Framework for State aid for R&D&I should for example, enumerate the cumulative conditions under which a PCP can be presumed to lead to the award of a public contract, as opposed to a subsidy. Besides the end-user criterion (or the 'direct economic interest' criterion), the Framework for State aid for R&D&I mentione additional criteria, related to the competitive nature of the award.

The European Commission has recently conducted a public consultation regarding the amendment of the Framework for State aid for R&D&I.[1102] In the proposed Framework several cumulative conditions create the presumption that no State aid is granted. These pertain to the openness, transparency and fairness of the PCP procedure, separation from commercial procurement of the developed solutions and dissemination or commercialization of the

[1101] Joined cases T-116/01 and T-118/01, *P&O European Ferries (Vizcaya) SA and Diputación Foral di Vizcaya v Commission* [2003] ECR II-2956, para116.
[1102] See http://europa.eu/rapid/press-release_IP-13-1300_en.htm.

developed knowledge.[1103] At the time of writing this thesis, the text of the new Framework was however not finalized. As already mentioned, the 'direct economic interest' or the end-user criterion should be added to these conditions.

The Framework should also clarify that whenever one of the cumulative conditions is not complied with, PCP leads to a subsidy. Such a subsidy should be subject to the EU State aid rules. In the following section, I will describe the obligations which need to be observed under the current legislative framework, when a contracting authority chooses to grant a subsidy through PCP.

5.5.5 Applicable rules to a PCP subsidy

According to the PCP Communication, when contracting authorities/entities do not commission R&D from companies at a market price, this will involve State aid within the meaning of Article 107(1) TFEU.

In this case, the contracting authority is held to comply with the applicable EU State aid rules.[1104] These rules are provided by the Community Framework for State Aid for Research and Development and Innovation ('Framework for State aid for R&D&I') and by the General Block Exemption Regulation ('GBER').[1105] In the previous section, I proposed to replace the market price criterion with a set of cumulative conditions regarding the competitive, transparent and fair nature of the award procedure and regarding the role of the involved contracting authority as end-user of the envisaged innovation. Whenever, one of these condition is not complied with, I proposed to apply the same EU State aid rules as currently outline in the Framework for State aid for R&D&I and GBER. In this section I describe the content of these rules.

As already mentioned in section 2.4.5.2 above, the EU State aid rules ensure the achievement of one of the underlying concepts of the European Union, according to which a market-based economy in which companies are rewarded according to their innovativeness and efficiency is the best way to ensure that consumers are provided with the products they wish to obtain, at low prices. This eventually leads to increased living standards for all European citizens. Unwarranted support provided by Member States to some national companies may lead to the exclusion from the market or the delayed reward of the most competitive firms,

[1103] Commission, a.aper of the services of DG Competition containing a draft Framework for state aid for research and development and innovationn' (19 December 2013) 16, available at <http://ec.europa.eu/competition/consultations/2013_state_aid_rdi/rdi_draft_framework_en.pdf> accessed 25 February 2014.
[1104] PCP Staff Working Document 5-6.
[1105] Commission, Regulation (EC) No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General block exemption Regulation or GBER) OJ 214/3.

with the negative consequence related (such as higher prices, lower quality goods and less innovation).[1106]

When the Communication on PCP was published, the possibility to justify state aid for R&D under Article 107(3)(b) and 107(3)(c) TFEU, was governed by the Community Framework for State Aid for R&D&I. The Framework acknowledged the conclusion of the 2000 Lisbon European Council that investment in R&D in the EU does not happen at optimal levels. Because state aid can be distortive and may lead to disincentives for economic operators to invest themselves in R&D if used improperly,[1107] the Commission developed in this Framework some economic tests to assess whether the aid measures envisaged by public authorities are suitable to achieve their target. In 2008, GBER amended the regime created by the Framework.

Within the current regime created by the Framework and GBER, the following rules are applicable.

Aid granted to an SME and which remains under the threshold of 20 million for a fundamental research project, 10 million for an industrial research project and 7,5 million for an experimental development project[1108] and does not constitute more than 75%, 50% and 25% respectively of the value of the above mentioned types of projects,[1109] are automatically considered to be compliant with the State aid rules, subject to several transparency-related obligations (the R&D subsidy is easily identifiable as R&D grant[1110], the aid scheme or individual measure (whether based on the scheme or ad-hoc) contains an express reference to the GBER[1111] and the request for aid is made prior to the start of the subsidized activity[1112]). Aid to a large company will be considered in compliance with the State aid rules if, in addition to the above mentioned conditions, the contracting authority brings proof of the incentive effect (increase in size, scope, total amount or speed of completion of the project,

[1106] Commission, State Aid Action Plan: Less and better targeted state aid: a roadmap for state aid reform 2005–2009 (Consultation document) COM(2005) 107 final 3.
[1107] Framework for State aid for R&D&I para 1.2.: 'When an undertaking receives aid, this generally strengthens its position on the market and reduces the return on investment for other undertakings. When the reduction is significant enough, it is possible that rivals will cut back on their R&D&I activity. In addition, when the aid results in a soft budget constraint for the beneficiary, it may also reduce the incentive to innovate at the level of the beneficiary. Furthermore, the aid can support inefficient undertakings or enable the beneficiary to enhance exclusionary practices or market power.'
[1108] Art.6(1)(e) GBER. Which category of research the project falls in for the calculation of the applicable threshold depends on the predominant activities (50% or more of the eligible costs). When the predominant character cannot be determined, the lower threshold will apply.
[1109] Art.31(3)-(4) GBER.
[1110] Art.5 GBER. it should be 'possible to calculate precisely the gross grant equivalent ex ante without a need to undertake a risk assessment'. See recital 20 GBER.
[1111] Art.3 GBER.
[1112] Art 8 (1)-(2) GBER

or proof that the project would not have been carried out in the assisted region without the regional investment aid).[1113]

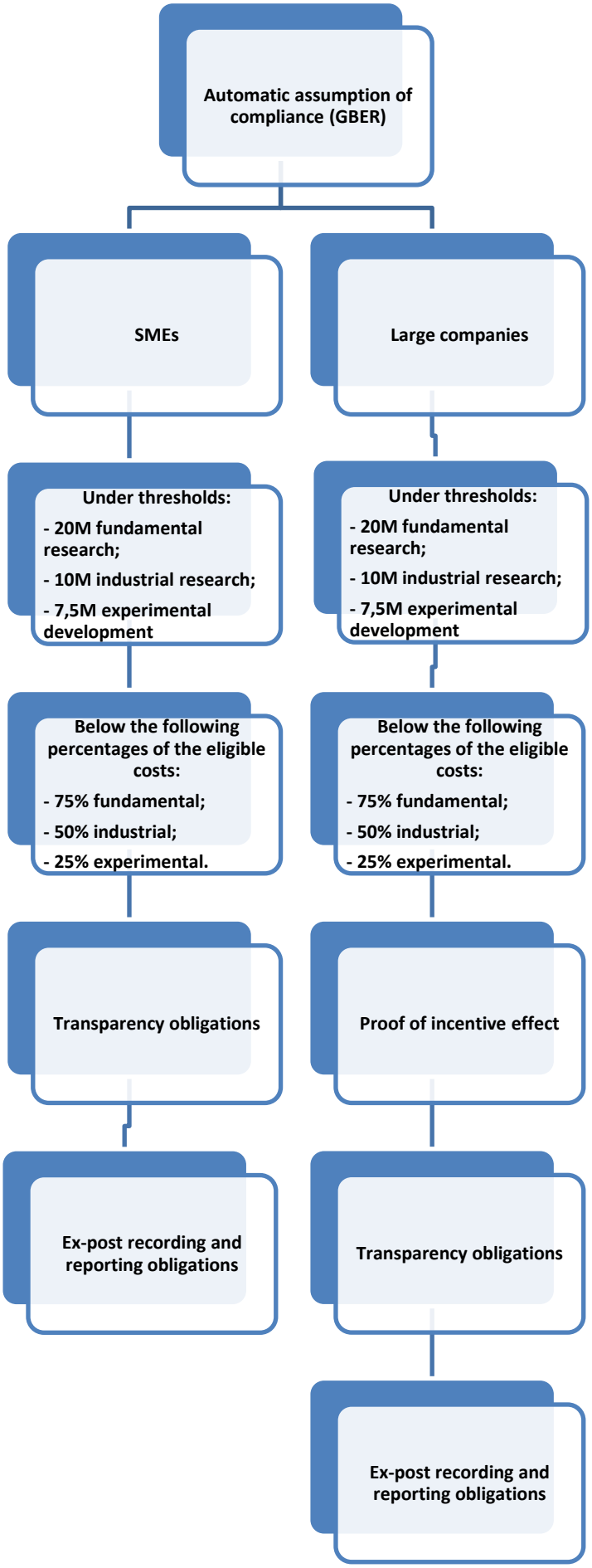
The State aid regime for R&D embodies a more lenient approach towards aid to SMEs, based on the presumption that innovative SMEs experience more difficulties to access funding for R&D than large companies.[1114]

In these cases, the granting authority does not need to notify its intention to grant the aid to the European Commission,[1115] but needs though to fulfill certain administrative tasks which enable an ex post control. Member State should send to the Commission summarized information regarding the granted aid (whether an aid scheme or ad hoc aid) within 20 days from the entry into force of the scheme or from the awarding of the ad hoc aid and should publish it as well on its own website for as long as the measure stays in force with a reference to the relevant provisions of the GBER. Detailed records shall be maintained during 10 year from the date of the grant and shall be presented to the Commission whenever required.[1116] Finally, annual report regarding each aid measure (whether a scheme, individual aid under a scheme or ad hoc aid) should also be submitted by each Member State to the Commission.[1117] These GBER presumptions apply equally to aid projects justified on the basis of both art.107(3)(b) and 107(3)(c).

This means that a PCP scheme could obtain approval as a State aid scheme. However, the main disadvantage, besides the ex post transparency obligations, is that the contracting authority will only be able to reimburse 50% or 25% of the industrial research and experimental development project respectively.

The above described cumulative conditions to benefit of an assumption of compliance with EU State aid rules, can be summarized in the following visual form (see Fig.3 below):

[1113] Art 8(3) GBER.
[1114] Framework for State aid for R&D&I para.1.5.
[1115] Art 6(1)(e) GBER.
[1116] Art 10 GBER.
[1117] Art 11 GBER.


Automatic assumption of compliance (GBER)
SMEs
Large companies
Under thresholds:
- 20M fundamental research;
- 10M industrial research;
- 7,5M experimental development
Under thresholds:
- 20M fundamental research;
- 10M industrial research;
- 7,5M experimental development
Below the following percentages of the eligible costs:
- 75% fundamental;
- 50% industrial;
- 25% experimental.
Below the following percentages of the eligible costs:
- 75% fundamental;
- 50% industrial;
- 25% experimental.
Transparency obligations
Proof of incentive effect
Ex-post recording and reporting obligations
Transparency obligations
Ex-post recording and reporting obligations

Aid to SMEs or large companies, which is not covered by GBER (such as aids above 20 million for fundamental research, 10 million for industrial research and 7,5 million for experimental development) or aid to process and organisational innovation, remains under the scope of the Framework and needs to be notified for approval to the European Commission, before being granted. The Framework will also apply if a Member States decides to '*notify a measure which could in principle have been exempted under the (G)BER*'.[1118]

Aid may be justified only if it remains below the same percentages of the eligible costs of the R&D project (100% for fundamental research, 50% for industrial research and 25% for experimental research, with possibilities to raise the percentage under specific circumstances) and passes a detailed test of appropriateness, proportionality, incentive effect and overall positive effects.[1119] This can be visualised as follows:

[1118] Framework for State aid for R&D&I para.1.2.
[1119] Framework for State aid for R&D&I para 1.3.6.

The Framework develops a separate test for justification under article 107(3)(b), when aid is employed for a common European interest.[1120] The common European interest is present if the benefits extend to the whole European Union (for example, spillovers for society, improvements to EU's position in R&D&I on the international market through the development of new technologies or creation of new markets), and it is rolled-out by co-operating authorities from different Member States. In such a case, the aid need not be limited to certain thresholds or percentages of the total project value, but more flexibility is granted to the subsidizing institution.

This provision may be used as escape from the market price criterion when PCP procedures are conducted through collaboration between contracting authorities from different Member States. However, this possibility is limited to large projects, with an aid value above 20 million for fundamental research, 10 million for industrial research and 7,5 million for experimental development. But this provision can be used for process and organisational innovations, irrespective of the value of the project.

Finally, an additional disadvantage when granting a PCP subsidy is the administrative burden posed by both the Framework and the GBER to calculate the maximum aid intensities for R&D by taking into account the total amount of public support for the aided activity or project, coming from local, regional, national or Community sources.[1121]

5.6 Conclusions

I have explored in this chapter the legal rules that lie at the foundation of two important barriers to the wide and efficient implementation of PCP: (1) the obligation to conduct a separate competitive award in order to purchase the innovative solution targeted by the PCP competition, and (2) the legal uncertainty regarding compliance with EU State aid rules.

I argued in section 5.3 that although the GPA was advanced by the European Commission as the reason to prohibit EU contracting authorities to directly purchase the resulting innovations from a PCP procedure, the GPA allows more flexibility than the current Procurement Directives or the recently adopted Procurement Directives. I argued that the GPA provision on limited tendering allows a EU contracting authority to directly purchase the first PCP results in spite of the PCP requirement to locate the R&D activities within the EU, provided that the EU contracting authority engages in informal negotiations with all PCP finalists belonging to GPA state parties (if any).

The new Procurement Directives seem to have dropped the concerns that allowing for direct

[1120] According to art107(3)(b) TFEU; Framework for State aid for R&D&I 12-13.
[1121] Framework for State aid for R&D&I para 8; art 7(1) GBER.

purchase of resulting innovations from an R&D trajectory would breach the GPA. The newly introduced Innovation Partnership procedure accommodates contracting authorities to act as early adopters of innovations developed at their request. However, the main risks related to this procedure lie in the potential lack of competitive pressure during the R&D stages and in the possibility to purchase the developed products long after the products have been developed. The new procedure seems to have been adopted under increasing pressure of national interests and will constitute a serious threat to the uptake of the PCP. Yet, the envisaged EU funding available for collaborative cross-border PCPs will provide some incentives for contracting authorities to continue engaging in PCPs.

Other provisions of the current and future Procurement Directives also offer the possibility to directly purchase the results of a PCP. E.g., the provision of the EU Procurement Directives on negotiated procedure without prior publication of a contract notice when technical reasons or IPRs make it absolutely essential that the contract be awarded to one specific tenderer. The new Procurement Directives seem to restrict the flexibility to negotiate directly with one of the PCP finalists. However, this chapter argued that the newly introduced requirement that *'no reasonable alternative or substitute exists on the market'* does not constrain the freedom of a contracting authority to define its needs in ambitious terms of functionality and performance.

This chapter has also discussed in section 5.4 the obligation of a contracting authority to neutralize the inherent advantages of a PCP finalist when participating in a post-PCP competitive procedure. I concluded that the equal treatment principle does not mandate the contracting authority to exclude the PCP finalist(s) or to lower the ambitious level of functionality or performance. The equal treatment principle neither mandates the contracting authority to neutralize an inherent price or technical advantage. It does mandate, however, that the contracting authority provides all relevant information (including in precise terms the scope of the contract) to all competitors, unless the information is protected by IPR.

In section 5.5 I argued that the market price criterion as currently recommended by the European Commission is complex and leaves room for abuse. In practice, none of the national PCP-like initiatives complies with it. Increased certainty and simplification can be achieved by replacing the 'market price' criterion with several cumulative conditions related to the qualification of the involved contracting authority as end-user of the envisaged innovation and to the competitive, transparent and fair nature of the award procedure. It should be clarified that under these conditions a PCP public contract is awarded, as opposed to a PCP subsidy. Whenever one of the cumulative conditions is not complied with, the PCP will lead to granting a subsidy. This subsidy should be subject to the EU State aid rules

as defined in the Framework for State aid for R&D&I and GBER.

These rules impose payment limitation to less than 100% of the costs of the R&D services as well as additional administrative burdens.

CHAPTER 6. Conclusions and recommendations

Research background

The PCP procedure was proposed by the European Commission in 2007 as a means to enhance Europe's competitiveness on the global market and to incentivize private innovation efforts towards solutions for several important European problems (such as climate change, ageing, shortage of natural resources etc.). This initiative was driven by the desire to emulate the perceived success of the US SBIR programme in bringing innovative technologies to the market and boosting the competitive advantages of its national businesses. The European Commission did not question the effectiveness of government intervention in support of innovation and did not define pre-conditions for an effective implementation of SBIR-type of government measures. It simply noted that SBIR-type of measures were missing from the innovation policies of the EU Member States and decided to stimulate their adoption.

Despite great expectations, by 2010 there were no known examples of PCP procedures in the form proposed by the European Commission in its 2007 PCP Communication. A few initiatives inspired by the US SBIR were being piloted in the Netherlands, UK and Belgium. But these initiatives were implemented by centralised national innovation agencies with no or sporadic interaction with the end-customer and without competition beyond national borders. Moreover, the few implementations had not proven their effectiveness. The EU still lags behind its main competitors in important innovation indicators.

The European Commission concluded that contracting authorities with operational needs, that may act as end-customers of novel products developed through PCPs, needed additional incentives to engage in PCPs. The European Commission contracted a series of studies to find instances of PCP implementation and to understand why individual contracting authorities refrained from PCP deployment. These studies revealed a series of barriers, ranging from organizational complexities in cross-border collaborations to risk aversion, to legal uncertainties on compliance with State aid rules and to the impossibility to directly purchase the end-results from a PCP finalist.

Since 2009 the European Commission started to tackle the organizational and risk aversion barriers. Funds have been made available for the creation of networks of contracting authorities that could stimulate collaborations and exchanges of best practices. Since 2011 funds are available for all the organisational costs as well as for part of the contractual costs

of cross-border collaborative PCPs. Several collaborative PCP projects are currently running under European Commission supervision (monitoring).

This research has focused on the following central research question:

In how far do current legal and policy arrangements in the EU enable pre-commercial-procurement, as innovation policy instrument, to achieve its objectives to stimulate the competitiveness of European companies and to find solutions to Europe's public challenges ?

To answer the above question, I first address the six research sub-questions mentioned in the beginning of this thesis.

6.1 What is PCP and what are the gaps in PCP's framework conditions ? (Q1)

In this thesis I analysed the objectives and features of PCP as described by the European Commission in its 2007 PCP Communication and in the accompanying Staff Working Document. I identified several gaps in the EU policy guidance regarding the rationale for implementing the PCP and its applicability conditions. I concluded that clear guidance from the European Commission is missing on several important aspects, that I outline below.

Concepts surrounding PCP: demand-side as opposed to supply-side innovation policy instrument; public contracts as opposed to subsidies

As mentioned in section 1.3, PCP may cover the development of innovative solutions for both the involved contracting authorities as end-users (direct procurement) and for private end-users (catalytic procurement). In practice, some national innovation agencies have adopted a coordinating role in the application of national PCP-/SBIR-like schemes, which focus on catalytic PCPs. They have not ensured (sufficient) connection with the (private or public) end-users. This is the case, to a larger or lesser extent, in all three Member States that have begun implementing PCP-like initiatives (UK, Netherlands, Belgium) (as documented in Chapter 4). In neither of the 2 cases, the contracting authority/innovation agency directly purchases the resulting innovations, as this is prevented by the applicable EU procurement rules. However, the contracting authority/innovation agency neither commits nor guarantees to organize a subsequent procurement procedure which would offer PCP suppliers the chance to compete for public contracts and sell the resulting innovation.

This has led policy researchers to criticize the conceptualization of PCP as demand-side policy instrument in support of innovation. Involvement of the end-users in the R&D trajectory as well as the early and sufficiently sizeable uptake of the developed innovations has also

been identified in Chapter 2 as key prerequisites for the effective deployment of public R&D investments.

From a legal point of view, the deployment of PCP to meet direct and societal needs of contracting authorities has raised questions of compliance with the EU State aid rules. This has deterred individual contracting authorities throughout the EU from engaging in PCPs, undermining the potential impact of this policy instrument. The PCP Communication refers to the 'market price' criterion to exclude that EU State aid rules become applicable. However, I showed in Chapter 4 and 5 that this criterion has proven both difficult to implement correctly and easy to circumvent. National innovation agencies implementing SBIR-/PCP-like initiatives have formally embraced this criterion while depriving it of any practical meaning.

It is also important to clarify and simplify under which conditions PCP results in a subsidy, not only to incentivize the wide implementation of PCPs and to enhance the impact of this policy, but also to prevent the unwarranted use of subsidies, which are considered to have a harmful impact on the EU Internal market. According to the European Commission, subsidies lead to a skewed playing field (the exclusion from the market or the delayed reward of the most competitive and innovative firms) to the detriment of consumers' welfare.

In sections 1.7.3 and 5.4, I stressed the need for a clear conceptual distinction between the cases when PCP leads to the award of a public contract as opposed to granting a subsidy. I also advocated the need to simplify the conditions for non-applicability of the EU State aid rules, as alternative to the current 'market price' criterion.

In order to provide legal certainty and encourage the wide implementation of PCP by contracting authorities throughout the EU, a clear distinction should be made between PCP public contracts and PCP subsidies, according to the 'end-user' criterion which derives from the recently outlined 'direct economic interest' introduced by the Court of Justice of the EU in the Helmut Muller case. This should be clearly mentioned in the EU State aid rules regarding R&D and innovation, in addition to requirements regarding the competitive, transparent and fair nature of the award procedures. Whenever one of these conditions misses, and the PCP results in a subsidy, the EU State aid rules as codified in the Framework for State aid for R&D&I and GBER should be applicable. In these cases, cross-border collaborative PCPs could be justified on the basis of art.107(3)(b) TFEU. As part of the ongoing amendment of the State aid rules, lowering the financial threshold for the application of this exemption could be considered, next to explicit reference to PCP procedures.

From a policy point of view, it should be clarified that PCP is a demand-side innovation policy instrument when the involved contracting authorit(y)ies (is)/are committed or guarantee to

purchase commercial volumes of the developed innovation. Of course, competition will need to be re-opened in accordance with the Procurement Directives. Whenever no commitment or guarantee of subsequent uptake is present, PCP should be defined as a supply-side instrument in respect of the envisaged innovation.

In Chapter 2 I argued that the involvement of the end-users in the R&D trajectory and the early uptake of the developed innovations are crucial prerequisites for speeding up the commercialization of valuable research projects. As a consequence, catalytic PCPs do not contribute to achieving the aims of the PCP.

Unclear relevance of PCP in supporting the development of service innovations

The PCP guidance is not clear on the relevance of PCP for the development of services innovations. On the one hand, the PCP Communication talks about the role of PCP to assure the development of *technological solutions* to meet challenging societal needs. On the other hand, the same policy documents indicate that the result of a PCP can be either an innovative *product or service*. This begs the question whether innovative services can/must be technological.

Based on an analysis of relevant economic literature, Chapter 2 concluded that the process of innovation in service sectors remains insufficiently understood and that the European Commission believes there is insufficient proof that public R&D investments are the right incentives for service innovations. This is reflected in the approach adopted in the State aid area. In this area, the Framework for State aid for R&D&I establishes several minimum conditions for exempting national funding of organizational and process innovative activities from the obligation to pre-notify the aid to the European Commission. These minimum conditions refer to relation with the use and exploitation of ICT, degree of risk entailed by the project, delineation of the performed innovative activities and tangibility of the result (standard, business mode, methodology etc.).

Within the current legal and policy framework, whenever innovative activities in service sectors qualify as R&D according to the *Frascati Manual*, PCP may be applied. Chapter 1 concluded that the *Frascati Manual* lacks clarity on the concept of R&D for services innovations. The *Manual* proposes to use the same generic criteria to identify R&D in products and in services. As a consequence, identifying R&D in services often comes down to a subjective judgment regarding the presence of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty.

I believe the European Commission should take a clear stand on the suitability of PCP to stimulate the development of service innovations. More specifically, it should adopt a similar approach to the definition of R&D in services innovations as it has done in the State aid area.

Insufficient guidance on sharing IPR or alternative benefits

As indicated in section 1.5.1 b, the European Commission's guidance is missing on important aspects related to IPR sharing as well as on the possibilities to share alternative benefits. The documentary analysis of the national PCP-/SBIR-like initiatives in the Netherlands, UK and Belgium revealed that the guidance on these aspects in these national initiatives is also incomplete.

Additional guidance would be beneficial on the following aspects related to patentable solutions: the arrangements needed to enforce parties' obligations (such as time-limits for disclosure of the invention, consequences related to non-disclosure, reporting on application of the invention after the PCP procedure, dealing with background IPR etc.). Moreover, guidance should be provided on sharing IPR in the case of non-patentable solutions (such as copyrighted software) or on sharing alternative benefits (such as profits made during commercialization).

Relevant guidance could be found in the US Bayh-Dole Act, which governs since 1980 the division of rights to inventions made by small businesses under government grants, contracts and cooperative agreements.

Insufficient guidance on the concept of R&D (services)

Chapter 1 concluded that the *Frascati Manual* is the most clear and complete source of definitions and explanations regarding the R&D concept. The EU has however not made any reference in the 2007 PCP Communication to the *Frascati Manual*, although the EU officially endorses it and although it is also used as guiding authority in the State aid area (in the Framework for State aid for R&D&I).

Chapter 1 also concluded that the *Frascati Manual* lacks clarity on the concept of R&D in service innovations (already discussed above) and that it does not distinguish between the concepts of R&D services, R&D supplies (products) and R&D works as used by the EU.

The European Commission should provide complementary guidance on these issues. Based on an analysis of the concepts of public works contracts, public supply contracts and public service contracts as defined in the Public Sector Directive, Chapter 1 concluded that PCP targets R&D projects which entail a large share of knowledge creation and are not very close

to commercialisation. When the value of the prototype and/or the value of building/installing the test object (prototype) is larger than the value of the R&D services, the contract will not qualify for a PCP procedure.

In conclusion, the European Commission should provide additional guidance on the interpretation of the R&D concept, partly by reference to the *Frascati Manual*.

6.2 What is the political context in which the PCP procurement was shaped and what are the economic prerequisites for its effective implementation ? (Q2)

Political context

Chapter 2 presented the political steps that led to the adoption of the PCP. It also outlined the current political support provided by the main EU institutions active in the innovation policy arena: the European Council (which gives the political impetus and support for certain action to stimulate innovation), the European Commission (which translates the European Council´s guidance into concrete activities) and the European Parliament (which has a say as co-legislator, in case legislation needs to be adopted).

Chapter 2 also clarified the economic context in which the PCP emerged. This was governed by the worsening EU performance in the innovation area. The data published by the European Commission in the Innovation Union Scoreboards between 2001-2010 show that the gap between Europe on the one side, and the United States and Japan on the other, has consistently been widening along several dimensions of innovation. At the same time, the BRIC economies (Brazil, Russia, India and China) are quickly catching up and may overtake the EU in terms of key indicators of innovation performance, such as education, patents and investment in R&D. The statistics also show that despite similar levels of public R&D spending (to the US, Japan and China), the difference was substantial in private spending. The EU understood this as an indication that public R&D investments do not sufficiently incentivize private R&D investments.

Against this background, the EU started since 2000 to embrace economic theories supporting the role of demand-side instruments in the innovation policy and began to pay particular attention to the use of public procurement. In 2005, pre-commercial procurement was identified as an important policy tool to incentivize increase private investments in R&D.

Chapter 2 concluded that PCP is an important part of EU's strategy to catalyze a technological revolution in order to cope with the numerous and enormous challenges of the

not so far-away future. All main EU institutions (European Council, European Commission and the European parliament) have expressed their support for PCP.

However, the competences of the EU to adopt measures in the innovation area (and implicitly in relation to PCP) are limited. The European Commission may only guide Member States in defining their innovation policies (through drafting guidelines and specific timetables) and may only monitor and measure the amount and impact of their investments against quantitative and qualitative indicators and benchmarks. For the comparative assessment of the research and innovation performance of the 27 Member States and the relative strengths and weaknesses of their research and innovation systems, the Commission uses the innovation indicators of the Innovation Union Scoreboard.

This approach leaves the European Commission with no direct enforcement mechanisms, yet it allows for evidence-based arguments to persuade and leverage peer pressure.

Despite its limited competences, the European Commission has adopted important steps to encourage the up-take of PCP by individual contracting authorities in the EU, ranging from the funding of exchanges of knowledge and good practices up to the funding of concrete PCPs. Within the new funding instrument Horizon 2020, significant funds are reserved for the organizational and contractual costs related to collaborative cross-border PCPs.

This initiative (Horizon 2020) has the potential to create (as attractors) leading examples in how a PCP should be conducted. On the other hand, such attractors have not yet been realized and neither have the reasons for such failure been established scientifically. This research focuses on legal contributions to these states of affairs and warns that PCP presents several features that are not suitable to achieve the desired impact as an innovation policy instrument (see next section).

Economic prerequisites for effectiveness

The policy expectations around PCP were built on the desire to emulate the success of the US SBIR and on the assumptions of several experts that such an approach would work equally well within the EU context. Designing the procedural details was left to the European Commission. It used the US SBIR as point of departure and adapted it to the EU legal framework. Particular attention was paid to coherence with the EU procurement rules and with the EU State aid rules. Less attention was paid to economic considerations that could ensure the achievement of PCP's objectives (incentivize increased private investments in R&D, steer private R&D investments towards socially desirable innovations, improve the competitive position of EU firms in global markets).

In order to check whether the PCP has indeed the potential to live up to the policy expectations built around it, the second part of Chapter 2 analysed relevant economic theories/studies that underpin the main assumptions on which PCP is based. The following assumptions were used:

- Innovation leads to (social) welfare;
- R&D investment is a necessary pre-condition of innovation;
- Venture capitalists underinvest in risky R&D projects;
- Public needs can influence firms' strategies for creativity and innovation;
- PCPs is a suitable instrument to develop technological, as well as services innovations.

Chapter 2 concluded that a successful PCP implementation needs intelligent, informed and demanding public customers/purchasers, who are the end-users of the envisaged innovations, who are willing to take the high risk of failure inherent to cutting-edge R&D projects and who are capable to offer a clear prospect for the adoption of the developed innovation.

More specifically, the following conditions emerge as prerequisites for an effective implementation of PCP:

1. the public R&D funding targets the most experimental and riskiest R&D projects

2. the public R&D funding targets small companies, that experience difficulties in obtaining (sufficient amounts of) private capital for experimental/risky R&D projects;

3. a high degree of experimentation and tolerance to failure are accepted;

4. competition is maintained throughout the whole innovation process;

5. the public purchaser is the technologically sophisticated end-user of the envisaged innovation;

6. the public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation;

7. when the public purchaser is not the end-user of the envisaged innovation, it is capable to convey the advanced needs of the private end-users to the innovator and it is capable to adopt additional policy measures to stimulate the early up-take of the developed innovations by the private end-users (the case of the so-called catalytic PCP);

8. the adaptation of the product to larger (foreign/global) markets is not cumbersome;

9. innovative technologies rather than innovative services are targeted;

10. a continuous scrutiny/measurement of the impact of PCP is performed and lessons learnt are codified in guidance.

6.3 How does PCP differ from the US SBIR and how can these differences impact PCP's efficacy ? (Q3)

Chapter 3 of this thesis showed that the adaptation of the US SBIR to the EU legal framework led to significant differences between PCP and the US counter-programme. These differences are related to:

- the mandatory set-up of the US SBIR,
- the flexibility embedded into the SBIR programme to tailor the size and timeline of awards to the concrete needs of the project,
- the flexibility to adopt complementary support measures,
- the possibility to purchase the SBIR results without reopening the contract to competition,
- the restricted participation in the US SBIR to small companies,
- periodic assessments.

PCP as defined in the 2007 Communication is not mandatory and is not limited to participation by small companies who lack funding for the riskiest or most uncertain R&D projects. Moreover, the PCP Communication does not limit implementation to public end-users who can potentially act as early adopters. According to the PCP Communication, EU procurement rules do not allow the direct purchase of the PCP results. As consequence, the EU initiative lacks important incentives (attractors) for contracting authorities to engage in PCPs. It consequently also lacks important prerequisites for effectively achieving its policy objectives.

6.4 What is the state of implementation of PCP in the EU and how are the economic prerequisites for an effective deployment of PCP reflected into the available PCP(-like) initiatives ? (Q4)

Chapter 4 showed that the most advanced national PCP-/SBIR-like initiatives in the Netherlands, UK and Belgium fail to implement the same attractors as the EU PCP. In addition, they do not embed sufficient incentives for experimentation, nor sufficient tolerance to failure. They do not allow project managers to tailor the size and timeline of the awards to the concrete needs of each project and do not appoint project managers with state-of-the-art technical knowledge.

Most importantly, they are grounded in national innovation policies. They aim to support national companies and to achieve this end they use legitimate mechanisms, such as national language requirements or restricted participation in market consultations preceding the PCP. The national policy aims are by themselves legitimate. However, due to this approach the national initiatives tend to protect national companies from foreign competition. They may thus waste public funds on solutions that already exist elsewhere, instead of driving national companies to advance the international state-of-the-art and gain global competitive advantages. As a consequence, it is doubtful that the national initiatives are capable to achieve their policy objectives.

It became obvious by 2011, that individual contracting authorities were not engaging in PCPs. The European Commission realized that by 2011 there were practically no known examples of collaborative cross-border PCP projects.

The studies evaluating the state of implementation of PCP identified the following reasons for the limited appeal of PCP to contracting authorities:

- lack of technical knowledge;
- contracting authorities' aversion to risk, particularly when PCP(-like) initiatives are not institutionalized and are not mandated;
- lack of clarity around the distinction between PCP and regular subsidies and the accompanying concerns regarding compliance with EU State aid rules;
- reduced incentives for contracting authorities to engage in PCPs when direct purchase of the developed innovation is not allowed;
- the complexity of a cross-border procedure (to find matching partners in other Member States, to define common requirements and to coordinate common procedures etc.).

The European Commission has already undertaken steps to ease the difficulties encountered by contracting authorities in finding matching partners in other Member States (see section 6.2). The Commission supported financially the formation of procurer groups and networking activities related to PCP and since 2010, consortia of public authorities from around Europe received EC funding for the organizational costs of undertaking joint pre-commercial procurements.

Moreover, the Commission has introduced into the new Procurement Directives a rule that

defines default provisions for cases of cross-border collaborations. These can also be applied in the case of pre-commercial procurement.

Based on the analysis of the current national implementations of PCP, this thesis concluded that the EU efforts aimed at boosting investments in R&D through PCP have not proven successful. The EU continues (and even intensifies) these efforts – seemingly unaware of the reasons why these initiatives tend to fail in practice. It is therefore important that the European Commission performs a thorough evaluation of the effectiveness of its initiatives and acknowledges the reasons for their limited success.

Based on this, the European Commission should provide additional guidance on the economic conditions for effective implementation of PCP(-like) initiatives. Although it cannot make them mandatory, as it lack competence to do so, it can potentially use them as framework for conducting the PCPs funded under Horizon 2020.

As already mentioned previously, the European Commission should also clarify the concepts surrounding PCP and should replace the market price criterion with the end-user criterion next to requirements of fair and transparent competition. Arguably, facilitating the deployment of PCPs by contracting authorities with concrete and real operational needs will advance the EU innovation policy aims. Such contracting authorities will not seek to restrict competition to national companies, but will be focusing on objectively the best potential solutions. This will lead to the achievement of PCP's objectives to support European companies to gain competitive advantages on global markets.

6.5 How did the legal context shape and constrain the choices around the PCP features ? (Q5)

6.5.1 Constraints posed by the WTO GPA

The 2007 PCP Communication explains that direct purchase of a product developed through PCP is constrained by the WTO Government Procurement Agreement (GPA). As already mentioned, the direct purchase of the PCP results is both an important incentive for contracting authorities to engage in PCPs and a prerequisite for an efficient use of demand in support of innovation.

I concluded in Chapter 5 that the EU chose to exclude R&D services from the scope of the GPA, but did not exclude R&D supplies or works and neither other types of supplies. The US on the other hand, excluded set-asides for small businesses from the scope of the GPA. This reservation allows it not to open to competition from other GPA signatory parties the procurement of the innovative products developed during an R&D contract within the framework of the US SBIR programme.

This choice of the EU was arguably motivated by the desire to enhance competition within the Internal market and to prevent reliance of contracting authorities on industrial public policy to support national champions.

The PCP Communication invokes the choices made within the GPA as the main reason for not allowing the direct purchase of the PCP results. However, the GPA offers the possibility to directly purchase the 'first' product or service resulting from an R&D contract without re-opening the contract to competition (article XV(1)(e) GPA and article XIII(1)(f) of the newly amended GPA). Although the GPA does not restrict the freedom of the EU to regulate the area of procurement for its Member States, the fact that the EU chose to draft one set of rules applicable to both the EU and the GPA parties, turned the GPA into a reference framework for the EU Procurement Directives.

In Chapter 5 I argued that first products cover operational products following the R&D phase. Phase 3 of the PCP as defined by the PCP Communication also covers the development of the same type of products. However, Phase 3 of the PCP does not provide for the purchase of those products by the contracting authority. It does not prohibit their purchase either. But whenever purchased within the framework of a PCP, the value of these first products together with the value of the prototypes should remain lower than the value of the R&D services. Otherwise, the PCP becomes an award covered by the EU Procurement Directives.

In Chapter 5 I also argued that the GPA allows a contracting authority to directly purchase the PCP results (namely first products or services) despite the PCP requirement to locate the R&D activities within the EU, provided that the contracting engages in informal negotiations with all PCP finalists belonging to GPA state parties. This does not change the fact that a EU contracting authority would still breach the EU public procurement rules when procuring directly such results. This is due to the fact that the Procurement Directives adopted a stricter regime than allowed by the GPA and consequently does not provide this possibility.

6.5.2 Constrains posed by the EU legal context

Competence to regulate on issues of PCP

This research underlined that the lack of mandatory set-asides for PCPs is potentially a missing incentive for its wide implementation. It showed that in the US, the SBIR has from the beginning been mandated by legislation and was placed under the coordination and supervision of one central authority, the Small Business Administration (SBA). This created a framework of legal certainty that determined federal agencies to engage in SBIR competitions.

Chapter 1 and Chapter 5 concluded that the EU lacks competence to legislate mandatory set-asides for PCP or to impose minimum conditions for PCP-like national initiatives. Mandatory set-asides are thus in the EU left to the discretion of each Member State. It is questionable though that a coherent and eventually successful PCP programme for the whole EU will be attained if deployed separately by the EU Member States. It is doubtful that all Member States will voluntarily follow the recommendations of the EU in terms of conditions of implementation of PCP.

At a national level, mandatory set-asides for PCP-like initiatives were adopted in the UK. The UK SBRI set minimum set-asides of 2,5% of the R&D budgets of the participating public agencies, but subsequently concluded that these public agencies found ways to circumvent the legislative obligations (e.g., by procuring public policy studies). The UK contracting authorities invoked the lack of understanding of this instrument as a reason for this behaviour. This leads to the conclusion that a legislative imposition of PCP is not sufficient. It should be accompanied by clear and comprehensive guidelines on its rationale and modes of implementation.

Currently, EU's initiative to fund collaborative PCPs by contracting authorities from different Member States is the only available means to the EU to bring coherency and bundle forces in this area. This research also suggested that clear guidelines regarding the concepts surrounding PCP and regarding its applicability conditions would enhance the implementation of PCPs and would create additional safeguards to shape good PCP practices.

Procedural flexibility when conducting the PCP

PCP is a procedure excluded from the scope of application of the EU Procurement Directive. In Chapter 1 I investigated the degree of procedural flexibility when conducting a PCP, in comparison to a negotiated procedure with prior publication, as defined by the Public Sector Directive. I concluded that contracting authorities who engage in a PCP procedure have limited procedural flexibility. This is potentially a missing incentive for contracting authorities to implement PCPs.

Following the transposition of the new EU Procurement Directives, contracting authorities will have strong incentives to choose for the Innovation Partnership procedure, which allows increased procedural flexibility compared to the PCP. It allows a contracting authority to fund all the R&D costs as well as to directly purchase the results from one private partner. No restrictions are posed on the timeline of this partnership or on the applicability of the procedure. Although the proposed procurement rules indicate that the Innovation

Partnership procedure is applicable to contracts falling within the scope of the directives (including R&D service contract whose benefits and costs are shared between the contracting authority and the service provider), this is a theoretical distinction, as a contracting authority is not prohibited to bring an excluded contract (such as an R&D service contract with shared risks and benefits) within the scope of the directives and award it according to their provisions.

In Chapter 5 I expressed concerns regarding the suitability of the Innovation Partnership procedure for promoting the shared innovation policy aims of the EU Member States. I criticized the procedure for its potential foreclosure of competition during long periods of time. I also criticized the choice not to limit the commercial purchase of the R&D results to the first products or services. I also concluded that insufficient safeguards have been put in place for preventing abuse.

Constrains emanating from the EU procurement rules

In Chapter 5, I analysed two of the main barriers to the wide implementation of PCP by individual contracting authorities: the obligation to conduct a separate competitive award in order to purchase the innovative solution targeted by the PCP competition, and the legal uncertainty regarding compliance with EU State aid rules. I also addressed the concern of contracting authorities (at least in Belgium, Denmark and the Netherlands) that a PCP finalist[1122] might need to be excluded from a subsequent competitive procedure for the purchase of the solution targeted by PCP, due to the important knowledge benefits gained during the PCP.

I underlined that these barriers weaken the potential positive impact of PCP as innovation policy instrument, not only because PCP is not widely applied, but because particularly individual contracting authorities that are potentially end-users and early adopters of the developed innovation, feel discouraged to use PCPs. Involvement of the end-user in the development of the innovation as well as its early adoption were identified as prerequisites for an effective deployment of PCP. Stimulating these authorities to adopt such an entrepreneurial and risk-taking attitude in the innovation field is crucial for achieving the desired policy aims.

This research concluded that the EU Procurement Directives do not expressly allow the direct purchase of the first PCP results. It also concluded that the WTO GPA allowed more flexibility to this end than invoked by the European Commission in the PCP Communication.

[1122] PCP finalist is an undertaking which completed successfully all the PCP stages.

Nevertheless, within the current and proposed rules, there is room for contracting authorities to require high levels of performance and functionality that may lead to the purchase of a PCP solution, provided that the procurement is not designed to fit the PCP innovative result. But the fact that the legal rules do not specifically mention this possibility constitutes an important source of uncertainty. This creates disincentives for the application of PCP.

I argued in this research that the negotiated procedure without prior publication of a contract notice (articles 31(1)(b) of Directive 2004/18 and 40(3)(c) of Directive 2004/17) may under certain circumstances be used to directly purchase the results of a PCP procedure with only one PCP finalist. This is arguably the case when the innovative solution developed through PCP significantly advances on the levels of performance and functionality of the market.

The proposed new Procurement Directives condition the use of the negotiated procedure without prior publication of a contract notice upon proof that no *'reasonable alternative or substitute'* exists and that *'the absence of competition is not the result of an artificial narrowing down of the parameters of the procurement'*. In Chapter 5 I questioned whether this new condition included in article 32(2)(b) of the new Public Sector Directive and article 50(c) of the new Utilities Directive mandates contracting authorities to lower the required level of performance or the amount of functionalities depending on the level of competition on the market.

Based on an analysis of the concept of *'reasonable alternatives or substitutes'* in EU jurisprudence and on an analysis of the reasonableness concept in the EU, as well as national and international jurisdictions, I concluded that the level of performance and functionality chosen by a contracting authority for the subject-matter of a public procurement should not be questioned beyond their potential to cover up protectionist practices. When it corresponds to the legitimate needs of the contracting authority, setting high levels of performance and functionality, cannot be considered '*an artificial narrowing down of the parameters of the procurement'*.

A contracting authority is thus allowed to require that the procured solution achieve high levels of performance and functionality. Only when these levels are met by more than one solution available on the market, the contracting authority would not be allowed to rely on direct negotiations to procure the innovative solution developed through PCP.

This research also clarified to what extent the advantages (in terms of knowledge and IPR) gained by a company during its participation in a PCP procedure must be neutralized by the contracting authority at the stage of the competitive award procedure. Chapter 5

concluded that a PCP finalist does not need to be excluded from a competitive procedure following the PCP. The obligation to level the playing field is limited to making all the necessary information available to the other tenderers, unless it is confidential or protected by IPR. Of course, this obligation includes defining all procurement requirements clearly and unambiguously. Under these conditions, a contracting authority is allowed to impose the same requirements for the desired product/service as it did in the preceding PCP procedure. The fact that only the PCP-finalist(s) can submit a compliant offer, does not entail a breach of any principle of public procurement law.

The proposed Procurement Directives also introduce the Innovation Partnership procedure. It gives contracting authorities a legitimate mechanism to both support R&D and purchase the results thereof.

I criticized in Chapter 5 this procedure for the potential lack of competition during the R&D stages. I also mentioned the problem introduced by the freedom to purchase the developed products long after their having been developed. Then, their commercialization need no longer depend on the contracting authority to act as a launching customer.

Constrains emanating from the EU State aid rules

Regarding the interplay with the State aid rules, Chapter 5 concluded that the *'market price'* criterion developed in the PCP Communication constitutes a barrier to the implementation of PCPs due to its complexity and its susceptibility to abuse. Moreover, the 'market price' criterion is not coherent with the rationale behind the use of PCP as innovation policy instrument. Thus, if PCP is used to alleviate the difficulties of finding private investors for socially valuable R&D projects, the *'market price'* criterion can arguably never be met (and de facto never is, as shown in the Member-State initiatives discussed).

A suitable alternative to the *'market price'* criterion is the adaptation of the State aid rules to expressly exclude the PCP procedure from their scope of application when the PCP contract is awarded in competition as prescribed by the 2007 PCP Communication and when the contracting authority is the end-user of the envisaged innovation. Such an approach is preferable for reasons of simplicity and legal certainty.

6.6 How can the current legal and policy context be improved to stimulate the effective implementation of PCP ? (Q6)

The conclusion of the research is that the current EU policy and legislative framework does not optimally support the effective and wide implementation of pre-commercial procurement.

The majority of the barriers to the wide and effective implementation of PCP lie both in the legal and in the public policy sphere. Some may be swiped away through additional guidance on the following topics:

- the concept of R&D;

- the economic prerequisites for an effective implementation of PCP;

- the suitability of PCP to stimulate the development of services innovations;

- the division of IPR;

- under which circumstances the current EU Procurement Directives allow the use of a negotiated procedure without prior publication in order to purchase the solution developed by the only finalist of a preceding PCP procedure;

- the new requirements introduced by the new Procurement Directives to use the negotiated procedure without prior publication, when no *'reasonable alternatives or substitutes'* exist on the market and when *'the absence of competition is not the result of an artificial narrowing down of the parameters of the procurement';*

- the obligations imposed by the EU procurement rules to neutralize in a subsequent competitive award the inherent advantages (in terms of knowledge and IPR) gained by a company during its participation in a PCP procedure;

Other barriers, which are inherent to the EU context of PCP, such as the tendency of contracting authorities to support national companies (particularly in the case of catalytic PCPs) can only be avoided through clear legislative frameworks. A clear and simple distinction should be made between the circumstances when PCP leads to the award of a public contract or to granting a subsidy. The EU State aid rules should clarify that a public contract is awarded – as opposed to a subsidy - when the contracting authority is the end-user of the envisaged innovation and when it applies fair and transparent competitive procedures. In addition, safeguards should be tied to the Innovation Partnership procedure in order to prevent potential foreclosure of competition during long periods of time. These safeguards could refer to: maintaining competition during the R&D stage and restricting the timeline of the partnership (e.g. limit the commercial purchase following the R&D trajectory to first products).

Finally, the monetary incentives provided under the current Horizon 2020, accompanied by European Commission's coordination and supervision should be used as tools to incentivize

the wide implementation of the PCP and to create good practice. The analysis and recommendations in this dissertation must eventually be assessed politically, with the risk in mind that EU-policies have currently to live in a climate where they can harm rather than support the intrinsic motivation of Member States to participate in the Union. But this is beyond my research.

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Pre-commercial procurement – regulatory effectiveness ?
Summary

This thesis is concerned with an initiative of the European Commission and a few European Union ('EU') Member States to stimulate through R&D procurement the private market to become more innovative. Since 2004, three Member States (the UK, the Netherlands and Belgium) have experimented with national versions of the Small Business Innovation Research ('SBIR') programme in the United States ('US'). Their declared aim was to emulate the perceived success of the US in using R&D procurement to bring more innovations to the market and to enhance the competitive advantages of US firms in the global economy. The respective Member States did not question the effectiveness of public policy in the area of innovation. Neither did they investigate other or additional factors that potentially explain the more innovative character of the US economy. In reality, the Member States were motivated by the desire to fund their national companies and R&D procurement offered them an opportunity to circumvent the rigid EU State aid rules. Their initiatives did not remain unnoticed by the European Commission, whose main role is to foreclose discriminatory behaviour in the EU Internal market and wasteful subsidy races among the EU Member States. In response to national SBIR-'like' initiatives, the European Commission outlined in 2007 the legal conditions for the use of public procurement of R&D services (or 'pre-commercial procurement') by public agencies in the EU Member States. The Commission used the only soft-law instrument at its disposal, an Interpretative Communication. An Interpretative Communication is meant to explain the legal rules as they are stated in legislation and interpreted by the Court of Justice of the European Union. The Commission used the current procurement and State aid rules to draw its version of pre-commercial procurement, that can serve shared EU goals.

The Commission appeared less preoccupied with justifying government intervention for innovation or with identifying success indicators for pre-commercial procurement. The immediate goal seemed to be to foreclose further discriminatory behaviour by national

innovation agencies.

In 2007, pre-commercial procurement became one of the new instruments of EU's innovation policy. It was supposed to complement the existing innovation policy, based particularly on supply-side subsidies. Pre-commercial procurement was meant to make private innovation efforts more responsive to public, shared problems such as dealing with climate change, ensuring qualitative and affordable health care in the face of an ageing population, coping with security threats etc. It was also meant to make use of the collective strength of EU Member States in order to strengthen the competitive advantages of EU companies in a non-discriminatory manner.

To this very moment though, the few implementations of pre-commercial procurement have not proven their effectiveness. The EU still lags behind its main competitors in important innovation indicators.

The primary objective of this thesis was to examine whether the legal and policy framework in the EU represents an example of regulatory effectiveness or rather creates barriers to the wide and effective implementation of pre-commercial procurement.

The research starts from the main assumption that pre-commercial procurement has the potential to incentivize increased private investments in desired innovations. This assumption lies behind the policy-makers' decision to employ this innovation policy instrument in the EU. In Chapter 2 I found support for this assumption in numerous economic studies.

But economists do not unanimously agree on the usefulness of government intervention in support of innovation. Various highly regarded economists point out that it is not possible to predict or even determine in hindsight with scientific exactness whether a certain public policy has triggered innovation. Moreover, numerous factors have an impact on technological evolution besides public policy. Economists have so far not met the challenge to identify a formal set of such factors. Complexity theories explain that it is practically impossible to capture the knowledge of the political, social, technological and economic variables that can potentially influence the working of a public policy in the real world, particularly on the long term. Even if we had the needed information, due to the 'computational complexity of the economy', we would not be able to predict the future

before it actually happened. Under such circumstances, policy making becomes a case of decision-making in situations characterised by imperfect information and by uncertainty. In this context, public innovation policy should be based on a mix of theory, measurement, heuristics and participatory decision-making.

Based on the analysis of those economic studies that consider public R&D funding from the demand side justified, I further identified several pre-conditions for an effective implementation of pre-commercial procurement.

In Chapter 3, I concluded that the US SBIR embeds most of these pre-conditions. I based this conclusion on an analysis of the programme's features and on an overview of the evaluations performed so far. I identified several evaluation studies that have either been commissioned by the US government or have been conducted independently by economy researchers. The performed evaluation studies are overall positive regarding the positive economic impact of the US SBIR. The strengths of the SBIR program or the improvements suggested by these studies match the pre-conditions identified in Chapter 2. These pre-conditions are:

1. public R&D funding targets the most experimental and riskiest R&D projects;

2. public R&D funding targets small companies, that experience difficulties in obtaining (sufficient amounts of) private capital for experimental/risky R&D projects;

3. a high degree of experimentation and tolerance to failure are accepted;

4. competition is maintained throughout the whole innovation process;

5. the public purchaser is the technologically sophisticated end-user of the envisaged innovation;

6. the public purchaser is willing to pay the premium price for the early use of the developed innovation and is capable to offer a sufficiently sizeable market for the developed innovation;

7. when the public purchaser is not the end-user of the envisaged innovation, it is capable to convey the advanced needs of the private end-users to the innovator and it is capable to adopt additional policy measures to stimulate the early up-take of the developed innovations by the private end-users (the case of the so-called catalytic PCP);

8. adaptation of the product to larger (foreign/global) markets is not cumbersome;

9. innovative technologies rather than innovative services are targeted;

10. a continuous scrutiny/measurement of the impact of PCP is performed and lessons learnt are codified in guidance.

I further investigated in Chapter 4 whether the instances of national implementations in the UK, the Netherlands and Belgium comply with the identified pre-conditions for an effective implementation of pre-commercial procurement. To this end, I performed a documentary analysis of all call for proposals published by the 3 national agencies by January 2014. I analysed these documents on several effectiveness criteria, as identified in Chapter 2: (1) the existence of a public end-customer, (2) targeting technological innovations, (3) targeting high-risk or uncertain R&D. I have chosen these 3 criteria from the list of criteria in Chapter 2, based on their relevance for the type of information available in the SBIR calls.

I concluded that all three national programmes miss important prerequisites for an effective implementation of R&D procurement. Due to the centralised set-up and voluntary character, they depend on the promotion efforts of the coordinating agency and are biased towards less risky R&D projects; they often disregard the need for a thorough analysis of state-of-the-art in the targeted technological field; despite being labelled as demand-side policy instruments, these programmes disregard, particularly in the Netherlands and in Belgium, the involvement of the end-customers and of the end-users. Moreover, all three programmes lack flexibility in adapting the timeline and amount of funding to the needs of each project. In view of the planned evaluation of all 3 programmes for 2014, I pointed out that there is a real chance that they will be discontinued.

I also concluded that by 2011 there were no examples of collaborative cross-border PCP projects as envisaged by the European Commission in its 2007 Communication. Based on various studies commissioned by the EU to evaluate the state of implementation of PCP, I concluded that the main barriers to the wide implementation of this policy instrument are:

1) lack of technical knowledge;

2) risk aversion;

3) lack of clarity around the distinction between PCP and regular subsidies and the accompanying concerns regarding compliance with EU State aid rules;

4) the fact that subsequent direct purchase of the developed innovation is not allowed;

5) organisational difficulties in cross-border projects.

In the following Chapter 5, I focused on the legal origin of barriers 3) and 4). I pointed out that these barriers have a negative impact on the wide and effective implementation of pre-commercial procurement. I argued that the Government Procurement Agreement ('GPA') of the World Trade Organisation ('WTO') allows more flexibility to purchase the PCP solutions than claimed by the European Commission. Moreover, the chances of a challenge by a GPA party are so remote, that one can only conclude that the European Commission is using the GPA legal framework as an excuse to foreclose discriminatory 'PCP-like' initiatives.

In Chapter 5, I also outlined additional legal grounds for the direct purchase of PCP solutions. I concluded that a contracting authority may directly purchase the PCP solution - through a negotiated procedure without prior publication of a call for proposals - whenever a contracting authority is able to demonstrate that the PCP solution performs certain functionalities and achieves certain levels of performance which are not met by other products on the market. This would be the case when the PCP solution significantly advances state-of-the-art and only one company finalises Phase 3 of the PCP procedure. This conclusion stands under both the current and the newly adopted legal regime for public procurement in the EU. The newly adopted Public Procurement Directives, due to be transposed into national legislation by the EU Member States by the 18th of April 2016, introduce another important novelty, the Innovation Partnership procedure. This procedure presents the advantage that PCP solutions may be directly purchased by the funding contracting authority. Moreover, the funding agency is not required to prove that a market price is paid for the R&D contract, in order to escape the applicability of the rigid EU State aid rules. However, the Innovation Partnership procedure presents serious shortcomings that jeopardise its potential positive impact on innovation. The main shortcomings regard: 1) the potential lack of competitive pressure during the R&D stages; and 2) the possibility to purchase the developed products long after the products have been developed and do not

depend on the contracting agency to act as early adopter. The failure to embed safeguards against abusive use will probably reduce the effectiveness of Innovation Partnerships in achieving EU's innovation policy objectives.

In the final part of Chapter 5, I criticised the choice of the 2007 PCP Communication to require contracting authorities to prove that they paid a 'market price' for the pre-commercial procurement, in order to escape the applicability of the EU State aid rules. I argued that the 'market price' proof is very difficult to provide, if not impossible. In practice, the companies bidding for a PCP are required to indicate which price discount they offer for retaining the IP ownership of the developed solution. This indication is considered sufficient proof of compliance with the 'market price' criterion. No control mechanisms are embodied in the award process. Such an approach deprives this criterion of any practical meaning. It is moreover, prone to abuse by government agencies who may grant illegal subsidies to national companies. I recommended in both Chapter 1 and Chapter 5 to drop the confusing dichotomy between PCP with or without a State aid element. Instead, I suggest to clarify that PCP is an instrument that can either lead to awarding public contracts or to granting subsidies, based on the 'direct economic interest' criterion, advanced by the Court of Justice of the European Union in the Helmut case. Increased clarity surrounding the PCP concept would stimulate its wider and more effective implementation.

In accordance with the 'direct economic interest' criterion, a public contract is awarded through PCP, when the involved contracting authority is the end-user of the envisaged innovation and is committed or guarantees to purchase commercial volumes of the developed innovation. In such a case the procurement should be exempted from the applicability of the EU State aid rules, provided that additional requirements such as the competitive nature of the PCP award are also fulfilled.

When private entities are the end-users of the envisaged solution and the contracting authority pursues only a public goal of indirect economic interest, PCP would result in granting a subsidy and would be subject to the EU State aid rules.

Finally, the research concludes that the current EU policy and legislative framework does not optimally support the effective and wide implementation of pre-commercial

procurement. The barriers to the wide and effective implementation of PCP lie both in the legal and the public policy sphere. They can be swiped away through additional guidance or legislative amendments.

Pre-commercieel aanbesteden - doeltreffend gereguleerd ?

Samenvatting

Dit proefschrift betreft het initiatief van de Europese Commissie en van een aantal EU-lidstaten om door middel van aanbestedingen van R&D diensten bedrijven te stimuleren om innovatieve oplossingen te vinden voor publieke problemen gerelateerd aan klimaatverandering, vergrijzing, veiligheid etc. Sinds 2004 hebben Nederland, het Verenigde Koningrijk en België programma's opgezet naar het voorbeeld van het Small Business Innovation Research ('SBIR') programma in de Verenigde Staten ('VS'). De drie lidstaten hadden de bedoeling om het vermeende succes van het VS-programma te evenaren. De lidstaten hebben de efficiëntie van dit overheidsingrijpen echter niet onderzocht. Ze hebben ook niet uitgezocht of andere additionele factoren de reden zijn van het innovatieve karakter van de VS-economie. In de praktijk hebben de drie lidstaten de kans aangegrepen om hun nationale bedrijven te financieren ondanks de strikte EU- staatssteunregels. Hun initiatieven zijn niet aan de aandacht van de Europese Commissie ontsnapt. Om de goede werking van de Europese Interne markt te waarborgen, heeft de Europese Commissie in een Interpretatieve Mededeling uitgelegd hoe de aanbestedings- en staatssteunregels de initiatieven van de lidstaten beperken. De Commissie heeft de juridische kaders gebruikt om een eigen gewenste versie van R&D aanbestedingen, 'pre-commercieel aanbesteden' (Pre Commercial Procurement, afgekort PCP) aan te bevelen. Pre-commerciële aanbestedingen zouden naar de mening van de Commissie ingezet moeten worden door aanbestedende diensten uit verschillende EU-lidstaten om innovatieve oplossingen voor gezamenlijke uitdagingen te vinden.

De richtlijnen van de Europese Commissie omtrent pre-commercieel aanbesteden zijn dus bedoeld om discriminatoir gedrag van de EU-lidstaten tegen te gaan. Ze zijn minder gericht op de economische efficiëntie van dit beleidsinstrument.

Niettemin is pre-commercieel aanbesteden sinds 2007 een vast onderdeel geworden van

het EU- innovatiebeleid, als een aanvulling op de bestaande beleidsinstrumenten, die vooral gericht waren op het verstrekken van R&D subsidies vanuit de aanbodzijde. Pre-commercieel aanbesteden werd gezien als het ontbrekende instrument dat additionele private R&D investeringen gericht op het oplossen van publieke problemen zou stimuleren. Het werd ook beschouwd als een geschikt instrument om de gezamenlijke krachten van de verschillende EU-lidstaten in te zetten om de concurrentievoordelen van EU-bedrijven in de wereldeconomie te versterken.

Ondanks de verwachtingen van de beleidsmakers hebben de nationale- en EU-implementaties van pre-commercieel aanbesteden hun effectiviteit niet bewezen. De EU loopt nog steeds op een aantal belangrijke innovatie-indicatoren achter vergeleken met de belangrijkste concurrerende landen, zoals de VS en Japan.

Het hoofddoel van dit proefschrift was om uit te zoeken of de juridische- en beleidskaders op EU-niveau geschikt zijn om de brede en effectieve implementatie van pre-commercieel aanbesteden te bevorderen.

Het proefschrift is gebaseerd op de aanname dat pre-commercieel aanbesteden meer innovatieve oplossingen voor de publieke problemen kan bieden en tegelijk concurrentievoordelen voor Europese bedrijven kan betekenen. Deze aanname onderbouwt de keuze van beleidsmakers voor dit beleidsinstrument. In Hoofdstuk 2 heb ik steun voor deze aanname gevonden in verschillende economische studies.

Maar niet alle economen zijn het eens over het nut van overheidsingrijpen om de innovatie te bevorderen. Verschillende hoog aangeschreven economen zijn van mening dat het niet mogelijk is te voorspellen, of zelf achteraf met wetenschappelijke precisie vast te stellen, of een bepaalde overheidsactie tot innovatie heeft geleid. Bovendien zijn er veel andere factoren behalve het overheidsbeleid die invloed hebben op technologische vooruitgang. Economen zijn tot op heden niet in staat gebleken om deze factoren te identificeren. Economische theorieën over complexe systemen leggen uit dat het praktisch onmogelijk is om voldoende kennis te vergaren over de politieke, sociale, technologische en economische factoren die, vooral op de lange termijn, van invloed zijn op de werking van een overheidsbeleid in de echte wereld. Zelfs als alle benodigde informatie beschikbaar zou

zijn, zouden wij niet in staat zijn om de toekomst te voorspellen voordat deze daadwerkelijk zou gebeuren, vanwege de 'rekenkundige complexiteit van de economie'. Daardoor wordt publiek beleid een kwestie van besluitneming op basis van imperfecte informatie en onzekerheid. Onder deze omstandigheden adviseren economen om publiek beleid te baseren op een mix van theorie, meting, heuristiek en democratische besluitvorming.

Op basis van de analyse van economische studies van R&D aanbestedingen, heb ik verder een aantal voorwaarden geïdentificeerd in Hoofdstuk 2, voor de efficiënte implementatie van pre-commercieel aanbesteden.

In Hoofdstuk 3 heb ik geconcludeerd dat het SBIR programma van de VS aan de meeste van deze voorwaarden voldoet. In ben tot deze conclusie gekomen op basis van een analyse van de eigenschappen van dit SBIR programma, en op basis van de tot heden uitgevoerde evaluatiestudies. De evaluatiestudies die ik heb geanalyseerd zijn zowel door de overheid als door onafhankelijke academische instellingen uitgevoerd. Zij geven een algemeen positief beeld weer over de economische impact van dit programma.

Ik heb verder in Hoofdstuk 4 uitgezocht of de nationale implementaties van pre-commercieel aanbesteden in Nederland, het Verenigde Koningrijk en België, voldoen aan de bovengenoemde voorwaarden voor effectiviteit. Hiervoor, heb ik alle aanbestedingsdocumenten geanalyseerd die door de drie nationale organisaties op hun website waren gepubliceerd tot januari 2014. Ik heb deze documenten onderzocht op drie effectivitietscriteria: 1) was de aanbestedende dienst de eindgebruiker van de ontwikkelde innovatie; 2) had de beoogde innovatie een technologische karakter; en 3) waren risicovolle R&D projecten gefinancierd. Ik heb deze drie criteria uit de lijst van Hoofdstuk 2 gekozen vanwege hun relevantie voor de beschikbare aanbestedingsdocumenten.

Mijn conclusie was dat alle drie nationale programma's belangrijke voorwaarden voor effectiviteit missen. Vanwege de gecentraliseerde opzet en het vrijwillige karakter zijn ze afhankelijk van de capaciteit van het implementerende innovatie-agentschap bij het erbij betrekken van aanbestedende diensten. Dit leidt ertoe dat weinig risicovolle R&D projecten worden gefinancierd, dat niet gecontroleerd wordt of de projecten daadwerkelijk de huidige stand van de techniek bevorderen, en dat de eindgebruikers weinig of niet bij het

project betrokken worden. Bovendien bieden de drie programma's geen flexibiliteit bij het fine tunen van de tijdlijn en de hoeveelheid financiering aan de behoefte van elk individueel project. Alle drie programma's worden in 2014 geëvalueerd. Gezien de bovengenoemde tekortkomingen lijkt hun stopzetting een reëel scenario.

Ik heb in dit proefschrift ook geconcludeerd dat er tot 2011 geen voorbeelden waren van grensoverschrijdende PCP-projecten zoals die zijn beschreven door de Europese Commissie in haar 2007 Mededeling. Op basis van de verschillende onderzoeken naar de status van implementatie van PCP, heb ik geconcludeerd dat de belangrijkste belemmeringen die aanbestedende diensten tegenhouden om PCP-projecten te implementeren, zijn:

1) gebrek aan technologische kennis;

2) risicomijdende houding;

3) zorgen over naleving van staatssteunregels;

4) het feit dat directe inkoop van de voortvloeiende innovatie niet toegestaan is;

5) organisatorische uitdagingen in grensoverschrijdende projecten.

In het volgende Hoofdstuk 5 heb ik de juridische oorsprong van belemmeringen 3) en 4) geanalyseerd. Ik heb geconcludeerd dat deze belemmeringen een negatieve impact hebben op de brede en effectieve implementatie van pre-commercieel aanbesteden. Ik heb betoogd dat de Government Procurement Agreement (GPA) van de Wereld Handel Organisatie (WTO) meer flexibiliteit biedt om de PCP-innovaties direct in te kopen dan de Europese Commissie beweert. Bovendien is de kans van een klacht bij de WTO-rechter uiterst gering. Dat leidt tot de conclusie dat de Europese Commissie de juridische kaders van de GPA als excuus gebruikt om discriminatoire 'PCP-type' programma's tegen te houden.

In Hoofdstuk 5 heb ik ook een overzicht gemaakt van de wettelijke gronden die het direct inkopen van de PCP-oplossingen rechtvaardigen. Mijn conclusie was dat aanbestedende diensten een PCP-oplossing door middel van onderhandelingen zonder voorafgaande bekendmaking mogen inkopen wanneer zij kunnen bewijzen dat de PCP-oplossing over een unieke functionaliteiten en prestatieniveau beschikt. Dit zou het geval zijn wanneer de PCP-oplossing de huidige stand van techniek aanzienlijk bevordert en wanneer slechts een partij de PCP-procedure afrondt. Dezelfde conclusie geldt zowel voor het huidige als voor het

recent aangenomen EU-regime voor aanbestedingen. De nieuwe aanbestedingsrichtlijnen, die op 18 april 2016 in de nationale wetgeving van de lidstaten dienen te zijn geïmplementeerd, introduceren een andere belangrijke noviteit, te weten het innovatie partnerschap. Deze nieuwe procedure biedt het voordeel dat de uit de PCP voortvloeiende oplossingen direct door de aanbestedende dienst ingekocht kunnen worden. Bovendien hoeft de financierende overheidsinstelling niet te bewijzen dat zij de marktprijs betaalt voor de uitgevoerde R&D diensten, om de toepassing van de EU-staatssteunregels te vermijden. Maar de nieuwe procedure incorporeert ernstige tekortkomingen die een eventuele positieve impact op innovatie in gedrang brengen. Ten eerste is competitie gedurende het innovatie partnerschap niet een vereiste. Ten tweede mag een aanbestedende dienst de innovatieve uitkomst van het partnerschap direct inkopen lang nadat de commercialisatie hiervan niet meer afhankelijk is van de eerste gebruikers. Het gebrek aan waarborgen tegen misbruik van deze procedure plaatst serieuze vraagtekens bij haar potentie om innovatie te bevorderen.

In het laatste deel van Hoofdstuk 5 heb ik de keuze van de Europese Commissie in haar 2007 Mededeling voor het marktprijscriterium bekritiseerd. Ik heb betoogd dat het moeilijk, zo niet onmogelijk, is de marktprijs voor de R&D diensten te berekenen door rekening te houden met de huidige waarde van de intellectuele eigendomsrechten die de leverancier behoudt. In de praktijk, worden PCP-leveranciers gevraagd om een prijskorting in hun offertes aan te geven voor het behouden van de intellectuele eigendomsrechten op de ontwikkelde oplossingen. Geen controle van deze indicatie wordt vereist. Deze aanpak ontneemt het marktprijscriterium alle praktische betekenis. Bovendien biedt deze aanpak de mogelijkheid aan innovatie-agentschappen om illegale subsidies te verstrekken. Ik heb in Hoofdstuk 1 en in Hoofdstuk 5 betoogd dat de dichotomie tussen PCP met een staatssteunelement en PCP zonder een staatssteunelement verwarrend is. In plaats hiervan beveel ik aan om te verduidelijken dat PCP een instrument is dat tot het gunnen van een publiek contract kan leiden waarop de staatssteunregels niet van toepassing zijn, of tot het verstrekken van een subsidie waarop de staatssteunregels wel van toepassing zijn. De scheidslijn tussen de twee gevallen kan het 'direct economisch belang' van de aanbestedende dienst zijn, zoals

uitgelegd door het Hof van Justitie van de EU in de Helmutzaak. Een duidelijke verhouding tussen R&D publieke contracten en R&D subsidies kan aanbestedende diensten stimuleren om PCP vaker toe te passen.

Volgens het criterium van 'direct economisch belang' wordt via PCP een publiek contract gegund wanneer de aanbestedende dienst de eindgebruiker van de ontwikkelde innovatie is en wanneer hij gecommitteerd is om commerciële hoeveelheden in te kopen. Een additionele voorwaarde is dat de aanbesteding in competitie plaatsvindt. In dit geval zijn de staatssteunregels niet van toepassing.

Wanneer private consumenten de eindgebruikers van de innovatie zijn en de aanbestedende dienst slechts een publiek belang van indirect economisch belang beoogd met het financieren van de PCP, zal PCP tot het verstrekken van een subsidie leiden. In dit geval zouden de EU staatssteunregels van toepassing zijn.

Tot slot heb ik in dit proefschrift geconcludeerd dat het huidige EU-beleid en wettelijk kader niet optimaal zijn als het gaat om het effectief en breed implementeren van PCP te stimuleren. De belemmeringen voor de effectieve en brede implementatie van PCP liggen vooral in de juridische- en beleidssfeer. Zij kunnen weggenomen worden door middel van additionele richtlijnen en wettelijke aanpassingen.

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Curriculum Vitae

I was born in Romania on 11 October 1978. After obtaining my Bachelor Degree in Law in Bucharest in 2001, I worked as company lawyer at Marsat SA. In 2006 I continued my legal studies at the University of Amsterdam in the Netherlands. I graduated with a LLM degree in 'International and European Law' in 2007. Towards the end of the Master programme, I started an internship at the Hague Institute for the Internationalisation of Law. I was subsequently offered a permanent position as legal officer. In this position I did research on various topics of private and public international law. I discovered my passion for research. When the opportunity to initiate a research career came along, I embraced it. I joined in 2008 the T.M.C Asser Institute in the Hague, as PhD researcher.

A year later, in 2009, I realised how important for my research it was to gain practical insights into the field of public procurement law. That is why I decided to join Corvers Procurement Services BV as legal procurement consultant. I continued my PhD research at eLaw@Leiden at Leiden University. In this new position I provided legal advice on a wide range of procurement aspects, involving innovation and sustainability. I also participated as legal expert in EU funded research projects related to sustainability and innovation aspects in public procurement. In 2013 I became an EU independent expert on pre-commercial procurement.

With regard to these topics, I regularly published and gave presentations. In 2009 and 2010 I continued to enrich my knowledge of public procurement law. I followed specialisation courses in the area of European and International Procurement Law in the US and the Netherlands.