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Pre-commercial procurement: regulatory effectiveness?

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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](http://www.zyn.com/sbir/Kennedy_%20SBIR.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 section 2(a).

⁶¹³ The SBIR agencies are currently required to find 'a portfolio 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=0fcMUbLUE8bROQWH3ICYAw&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 Moege (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

3.2.3.1 Decentralised 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 business⁶⁴⁴ 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. Metzger, '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 competitions⁶⁵⁶ 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 meet 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.

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 1/2 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 liaison 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. 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 commercialisation 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 are⁷¹⁸:

- (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 al⁷²⁸ 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.

Mowery⁷²⁹ 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 comprehensive 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 counterpart. 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.