

**SME collaborations with Knowledge Intensive Services:
an exploratory analysis of the impact of innovation vouchers**

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Abstract

This study analyses the effects and dynamics behind a new type of innovation policy for Small and Medium Enterprises (SMEs): innovation vouchers. This policy is aimed at encouraging SMEs to collaborate with universities and with organizations offering Knowledge Intensive Services (KIS).

Despite its innovativeness and growing diffusion, the innovation voucher has received only limited attention in the literature.

After reviewing the literature on R&D collaborations and innovation vouchers, the paper conducts in-depth analysis on two innovation voucher programs in the Lombardy region (Italy). The analysis is based on 7 case studies of SMEs that have benefitted from this policy. The results highlight how innovation vouchers have influenced the development of innovation projects and technological collaboration in SMEs. The paper concludes with discussion on the effectiveness of the voucher policy, its limitations and policy implications.

Keywords

Innovation voucher; Open innovation; Innovation policy; R&D collaboration; SMEs

Introduction

Research and Development (R&D) activities are a key competitive factor for firms and countries (e.g. Mansfield, 1991; Gambardella, 1995; Henderson and Cockburn, 1996; Van Looy et al., 2011). Recently, a wide set of studies have shown the positive impact of R&D collaborations on innovation output, and many authors talk of a new ‘Open Innovation paradigm’ (e.g., Shan et al. 1994, Chesbrough, 2003, Chesbrough 2012, Nieto et al. 2013) and of an increasing role of social networks (Liebiskind et al. 1996, Powell et al. 1996). For this reason policy-makers devote significant resources to stimulating R&D investments and R&D collaborations (e.g. Romer 1990; Adams, 1990; Park, 1995; Segerstrom, 2000; Verspagen, 2004; Loikkanen et al., 2006).

Public subsidies are especially addressed to Small and Medium Enterprises (SMEs) because these tend to rely more on traditional collaboration within their vertical chain rather than exploring new opportunities and technologies with the help of universities, public research organizations or firms offering Knowledge Intensive Services (KIS), such as R&D services, engineering services, testing and prototyping¹ (Cohen et al., 2002).

A policy that has increasingly been adopted in many countries and regions to foster innovation and to create links between SMEs and such organizations is the innovation voucher.

The innovation voucher is a credit note that provides financial aid to SMEs for performing innovation projects with the help of external qualified partners, with which the voucher can be spent (e.g. Cornet et al., 2006). Innovation vouchers seem to be well received by SMEs (Koskenlinna et al., 2007). However, whilst the voucher policy has drawn the attention of

¹ For a more precise definition of KIS, see for instance OECD (2006). Another term widely used to identify these organizations is Knowledge Intensive Business Services (KIBS).

scholars in other sectors (e.g., education and health), only a few attempts have been made to assess vouchers in the context of innovation.

This paper aims to highlight the potential and the limits of innovation vouchers by examining the experiences of firms that have used this policy in the Lombardy Region (Italy).

In the next section we introduce the literature on collaborative R&D and innovation vouchers. Then we describe the research methodology and we present the case studies. Finally, the effects of innovation vouchers, their limits and policy implications are discussed.

1. Literature Review

1.1 R&D Collaborations

It is widely acknowledged that knowledge and technologies developed outside the boundaries of a firm are extremely important because they result in improvements in patenting activity (Jaffe, 1989; Adams et al., 2003; George et al., 2002), development of new products (Un et al., 2010), and increased sales from innovative products (Cohen et al., 1998; Abramovsky et al., 2005).

Although many firms have introduced an Open Innovation approach (Chesbrough, 2003; Laursen and Salter, 2004; Edquist, 2005), approximately 70% of firms do not have R&D collaborations (e.g. Belderbos et. al, 2004; Un et al., 2010). Large firms, such as Procter & Gamble (Dodgson et. al., 2006) or Cisco (Gassman, 2006), are more likely to have ties with university research (Link and Rees, 1990) because their absorptive capacity (Cohen and Levinthal, 1990) allows them to effectively combine internal and external knowledge (Barge-Gil, 2010; Kim et al., 2005). Conversely, SMEs typically have difficulties in devoting resources to innovation projects because of their limited size (Buijs, 1987; Freel, 2000). Only few SMEs rely on organisations providing KIS as partners in their innovative projects (Zeng

et al., 2010; Tether and Tajar, 2006; Santoro and Chakrabarti, 2002): they prefer to collaborate with suppliers and customers (Doloreux, 2004).

However, SMEs may have a “comparative advantage at exploiting spillovers from university laboratories” because the rates of return on R&D can be greater for SMEs than for larger firms (e.g. Acs et al., 1994; Link and Rees, 1990). This may be related to the fact that SMEs are not able to cover the spectrum of technology required for their innovation, or their innovation may be so discontinuous that it cannot justify internal R&D activities (O'Regan and Kling, 2011).

The attitude of relying on external knowledge sources and the selection criteria among the existing KIS are affected by several managerial and relational factors. The existence of an open innovation policy at the corporate level (Laursen and Salter, 2004) and the engagement of managers in facilitating external relationships (Asakawa et al., 2010) are key factors in increasing the impact of collaborations on business research performance. In addition, familiarity and trust are critical aspects in the selection of partners (Sherwood and Covin, 2008; Sala et al., 2011) because the collaboration requires the sharing of tacit knowledge (Nonaka and Takeuchi, 1995). SMEs that attempt to exploit external R&D services find it difficult to articulate their needs and to assess the returns to cooperation (Gittell and Kaufman, 1996). Furthermore, returns may not occur for a long time, thus preventing SMEs from entering into new collaborations or purchasing more knowledge intensive services (Izushi, 2003).

For these reasons, most SMEs continue to rely on informal networks and suppliers, and they do not consider the potential benefits that might be generated by KIS (Hussler et al., 2010).

In this regard, past public policies intended to foster innovation and collaborations in SMEs have been only partially effective. One reason could be that policy-makers encouraged the diffusion of academic research results instead of helping SMEs to access and use external knowledge (Hussler et al., 2010). Another reason could be that traditional policies had

inherent problems for SMEs related to the size of the projects and administrative burdens (Anderson, 2000).

Innovation vouchers have been introduced to try to overcome these limitations.

1.2 The innovation voucher

The innovation voucher is a credit note based on public funds which allows SMEs to buy Knowledge Intensive Services to develop innovations. The tool is thus intended to create an easy and immediate link between SMEs and organizations providing such services.

The first initiative was launched in Limburg (Netherlands) in 1998. The vouchers were worth 2,654€ and were assigned to local SMEs to purchase three days of research in a large local company. Ten years later the European Commission (2009) surveyed 25 voucher schemes from 21 European countries/regions (Table 1).

Table 1: Overview of voucher schemes in Europe

Source: authors' elaboration on European Commission (2009) data

(here table 1)

The schemes ranged from 500€ to 25,000€ and allowed purchasing “proof of concept”, technical development, testing, design and technology exploration. Some were devoted to consultancy services, Intellectual Property (IP) protection services, and training.

Efforts were made to reduce administrative burdens: application forms ranged from 1 to slightly more than 7 pages and time for approval from less than 5 days to slightly more than 3 weeks. Normally, only public or semi-public bodies (e.g., universities, public research labs and organisations) could be selected by voucher recipients; however, in a few cases, there were no restrictions on the type of provider. Almost all governments required approval of service providers (European Commission, 2009).

The policy has been adopted also outside Europe: for instance, in Kentucky (USA) in 2001 and in Alberta (Canada) in 2009. However in these cases the vouchers were worth up to 200,000\$ and had a broader impact.

Despite the growing diffusion of innovation vouchers, few studies have addressed this topic.

Positive results were found among recipients of vouchers in Limburg: technical problems were solved and major improvements were achieved in almost all cases (Wintjes, 1999). A study on a sample group from the 2004 Dutch voucher program concluded that most beneficiaries would not have involved external providers in their innovation project without the voucher program (Cornet et al., 2006).

Koskenlinna et al. (2007) reported some problems concerning the implementation process and administrative burdens. They suggested keeping the process as smooth as possible and defining a clear and narrow scope for the collaboration. Later, Dermol and Sirok (2009) found that the level of dissemination by public authorities and the stability of the program over time were important factors in the policy's impact.

Following these studies, we aim to answer three broad research questions (Figure 1). First, we aim to provide evidence about the effectiveness of innovation vouchers in stimulating innovation in not innovative SMEs or increasing the level of R&D investments in already innovative firms (impact of vouchers as an innovation policy). Second, we want to shed light on the role of vouchers in fostering new or ongoing SMEs' collaborations with KIS (impact of vouchers as a collaboration policy). Finally, we explore the role of different implementation mechanisms of the innovation voucher, for instance by considering the role of governments in approving and signaling a list of eligible providers. Recommendations on these aspects might help policy-makers in designing these policies.

Figure 1: Conceptual framework

(here figure 1)

2. Data and methodology

As in other studies on innovation vouchers (e.g. Wintjes, 1999), the novelty of the topic, the limited number of firms involved, and the need to understand a complex phenomenon in which the subject is not easily isolable from the context suggested the use of a qualitative approach based on case studies (Eisenhardt and Graebner, 2007). This approach allowed us to collect comments on the allocation process, the funding mechanism, and the obstacles perceived by the SMEs.

We studied two policies implemented by the Lombardy regional government in 2003 (pilot initiative) and in 2005 (adjusted initiative).

The pilot initiative had a long evaluation procedure conducted over a multi-stage process with a growing amount of funding for each stage to cover the technical assessment, the financial and market analyses, and 50% of the initial investment (Regione Lombardia, 2003). The Regional Administration provided a list of 33 providers of Knowledge Intelligence Services, including service companies, local development agencies, business incubators, university departments, and public research organizations (Table 2).

Table 2: Summary of the pilot initiative

(here table 2)

The adjusted initiative simplified the process by adopting a single-stage process and assigning vouchers on a first-come, first-served basis. Eligible KIS were of the same type as the pilot initiative, but the voucher could be spent with every KIS located in the region provided that it was registered in an online accreditation system (Table 3).

Table 3: Summary of the adjusted initiative

(here table 3)

The research process consisted in two main steps: a set of interviews with policy-makers and with the civil servants who promoted and managed the voucher schemes, followed by the case studies.

In the first step, discussions with the promoters of the initiative made it possible to understand the mechanisms of the two policies implemented, and to collect official documentation and data on applicants and KIS. The interviews were useful for detecting the main concerns that prompted the significant shift from the pilot initiative to the adjusted one.

Furthermore, the civil servants helped in the selection and engagement of beneficiaries, directing attention to different cases according to the complexity of the projects, the size and sectors of beneficiaries. As a result, two of the case studies pertained to the pilot initiative (cases A and B), four to the adjusted initiative (cases D, E, F and G), and one (case C) to both schemes (Table 4).

Table 4: Summary of case studies

(here table 4)

In the second step of the research process, we designed a case study protocol leveraging on insights from the first step and from the literature review in order to improve the consistency of the research process.

In each case study, we conducted face-to-face interviews of approximately 2-3 hours with the founder/owner of the SME and/or his/her delegates related to the collaborative projects. Beyond discussion and data collection on the three research questions introduced at the end of the literature review, for each case we examined in depth the main features of the business

and its major challenges, the past attitude to collaborate with external partners, the innovative attributes of the project and the expected contribution of the external partner.

Furthermore, because the voucher, which is the focus of our research, deals with the collaborative approach in innovation, we took care of collecting information from both side of the collaboration. We gathered qualitative and quantitative data on providers such as their size, assets, R&D activities, services, and previous collaborations with SMEs in order to balance the interviewees' personal perspectives. These additional data were intended to illuminate personal perspectives and to identify whether certain issues arisen during the project might be addressed to the difficulty in identifying and choosing the best partner.

To improve the reliability of the empirical research, we applied structured procedures for data manipulation and analysis and we organized them in a common framework, so to have a better outline of each case study, especially for their attitude to introduce innovation and acquaintance with universities and with organizations offering Knowledge Intensive Services (Yin, 2003).

We concluded the second step of the research process by sharing the main findings of the case studies with policy-makers, the purpose being to understand whether our conclusions fitted with their perceptions and were consistent with the evaluations that led them to change the pilot initiative. In this manner, we triangulated the information provided by civil servants and policy-makers. This improved the reliability of the empirical research (Yin, 2003).

Our study was conducted nearly two years after the conclusion of the program. We were thus able to detect whether further interactions had occurred among SMEs and KIS after the end of the collaboration driven by the voucher.

The following section summarizes the evidence from the case studies and presents the main elements highlighted by the interviewees. The name of the firms and service providers and the names of the interviewees remain anonymous for confidentiality purposes.

3. Empirical investigation

3.1 Summary of case studies

Firm A (pilot initiative)

This beneficiary applied for the voucher to establish a start-up to develop and manufacture a new fire safety system that would reduce the organisational impact and cost of introducing and/or maintaining sprinkler systems. In the first stage, the beneficiary spent the voucher on a technical feasibility and business idea assessment at a business innovation centre dedicated to supporting aspiring entrepreneurs. This was the first time that the applicant had had any contact with this KIS provider, which was selected by the beneficiary on the basis of its reputation and proximity. However, collaboration “was not effective because the partner had few competencies in the business sector” (Firm A owner) and did not contribute significantly to improving the original business idea. During the second stage, the voucher was spent with a local innovation agency that “gave a lot of support in designing the Business Plan and in running financial and market analyses” (Firm A owner). Thanks to this collaboration, the beneficiary was able to address several aspects of the business and speed up his enterprise's establishment, which would have been difficult without the support of the agency.

Furthermore, the beneficiary located his enterprise in the local innovation agency, and collaboration continued after the voucher program ended. The collaboration was still in progress at the time of the interview. As regards the voucher scheme, the beneficiary was rather disappointed with the multi-stage process because of the long bureaucratic procedure involved. In particular, he questioned the limited number of KIS available and the procedure for accessing the second stage.

Firm B (pilot initiative)

This beneficiary aimed to develop a new web service to simplify procurement processes for SMEs. According to the founder of the firm, the voucher program was helpful “in signaling a list of selected KIS”. However, he also said that it was rather difficult to select among the providers because he was not acquainted with any of them: some had high technological competencies, whereas others were more focused on market and financial analyses. After several contacts and interactions, he selected a university consortium because of its proven technological competencies.

The first stage was not useful because, in his opinion, his Business Plan was already finalised. He was more pleased with the second stage, which enabled him to resolve some technical issues, although the financial support was rather limited in comparison with the investment required.

He argued that the voucher had limited effects on that specific project. However, he had been able to assess the university consortium’s capabilities, with the result that collaborations became more intense thereafter.

In his opinion, the amount of the voucher was not congruent with the bureaucratic effort required by a multi-stage process. Some concerns were related to the mechanism necessary to access the second stage: according to the respondent, in many other cases the assessment provided by the provider was conditioned more by the opportunity to keep on working with the recipient than by the technical feasibility of the ideas.

Firm C (pilot initiative and adjusted initiative)

This case study concerns a spin-off of a traditional scissors and knives manufacturer which wanted to develop and commercialize products with unique technological and aesthetic features specifically targeted on particular professional contexts (e.g. wellness clubs or health spas).

The recipient already had a Business Plan, and she was only interested in the financial aid provided in the second stage to buy machinery/equipment to set up the new venture. She applied for the voucher on the advice of a local development agency eligible for the pilot initiative, which was then selected as partner with the sole purpose of managing the process to obtain the second stage funding.

Months later, she was faced with the problem of finding a material suitable for her products in terms of both functionalities and aesthetic features. She had identified several interesting options, but could not afford the tests needed to develop the appropriate solution.

Aware of the adjusted initiative, she applied for a Due Diligence voucher and used it to purchase testing and technical development from a university department. This enabled her to obtain the desired results.

Having experienced both initiatives, she considered the adjusted one more effective and appropriate to her needs, while the multi-stage scheme was too draining and time consuming, and only suitable with larger amount of funding. She believed that this kind of subsidy should address technical problems and development issues as in the adjusted initiative, which had enabled her to achieve technological improvements, to increase the know-how of the firm, and to strengthen its relationship with a university department.

Moreover, she was concerned about the number of KIS available in the pilot initiative, which she considered “rather few and offering limited alternatives” (Firm C owner). By contrast, the wide availability of KIS in the adjusted initiative allowed this beneficiary to select the provider most suitable for her technical problems.

Firm D (adjusted initiative)

Firm D is a manufacturer of flexible hoses for water connections, which it sells worldwide.

At the time, the firm was introducing a new material into some of its products so as to be compliant with forthcoming sanitary equipment regulations in Germany. Although the most

suitable material had been identified, the firm faced an issue in its production process. The development activity required specific competences regarding the new material and appropriate equipment for the testing phase.

Because the firm had no such skills and assets, it asked a university department for technical support, as it had done several times before. The collaboration yielded remarkable results: the new hoses had all the expected mechanical features (i.e., safety and flexibility).

A researcher in the department suggested applying for the Due Diligence voucher, and the interviewee said that he had taken the advice, although the voucher “influenced neither the decision to carry out the project nor the selection of the partner” (Firm D technician).

In any case, he appreciated the seamless process of the tool because “the procedure was simple and immediate compared with others that had prevented him from applying for public funds in the past” (Firm D owner). Although the financial contribution was rather limited compared with the investment, it was “useful to arrange a formal collaboration with the university department” (Firm D technician).

Firm E (adjusted initiative)

This firm manufactures and sells pumps worldwide for applications in a wide range of sectors. The qualified engineering staff in its technical department continuously improves its products and develops new highly-sophisticated pumping systems. Recently, the engineers designed a small and portable trolley pump to smooth the conveyance of must and wine from wine vats to barrels without altering the properties of the product. During realisation of the prototype they sought help from a university consortium, which they have already involved in such kind of activities.

On that occasion, the project manager applied for a Due Diligence voucher. Although it could cover only approximately one-tenth of the investment, he decided to submit the application

because the procedure was effective and immediate, especially compared with other regional programs.

According to the beneficiary, the voucher “is a good way to encourage SMEs to have new relationships (or to enhance existing ones)” with KIS (Firm E project manager). The university consortium was able to assemble and manage a multidisciplinary team (with researchers from different universities) and to support the beneficiary in the application for the IP voucher and all related patenting activities.

Firm F (adjusted initiative)

Firm F is a software house specialized in the development of logistical systems furnishing real-time information about warehouses. Its main product is a virtual 3D warehouse application that allows the management of a real warehouse. The company’s roadmap envisages extending the application’s compatibility with different operating systems (OSX, Linux, Unix, Solaris). It therefore seized the opportunity given by the Technical-Scientific Research voucher to engage a university department. External skills were pivotal for solving certain technical issues and adding new features to the 3D platform. The key criterion in selection of the partner was “prior knowledge about its skills thanks to frequent informal contacts with its researchers” (Firm F project manager).

The project manager appreciated the scheme because of the limited effort required by the administrative steps, and because it makes it possible to assess new providers or to intensify existing partnerships. In fact, the voucher led to further self-financed collaboration devoted to the development other products. According to the beneficiary, the collaboration was also useful for the university department because it had an opportunity to conduct applied research and to finance the activities of a young researcher.

Firm G (adjusted initiative)

Firm G is a spin-off of a large chemicals company established to develop special varnishes that ensure high performance coverings, such as those required in the construction and building sector. The firm develops formulas and tests new varnishes according to customer requirements, whilst the production process is completely outsourced. To expand the company's business base, the founder conceived the idea of applying its expertise with varnishes in the building sector to the naval sector (protection of surfaces immersed in water). For this purpose, he sought to develop a Business Plan to explore the possibility of developing a remotely controlled robot that could apply varnish to a ship's hull.

The beneficiary applied for a Due Diligence voucher and commissioned financial and market analyses from a business innovation centre which supports start-ups. This one was able to prepare a Business Plan and to present it to a venture capitalist. Unfortunately, the idea obtained no investment capital, so that there were no follow-ups.

Due to the firm's limited resources and the non-core nature of the business idea, the beneficiary stated that he "would never have carried out the project without the public subsidy" (Firm G owner). The entrepreneur found the collaboration useful and the procedure easy to follow, but he considered the financial contribution rather limited and questioned why "the amount of money given was the same for all projects independently of their characteristics and potential impact".

3.2 Results and discussion

This section discusses the main evidence from the empirical research. Table 5 summarises the main results from the case studies, referring to the conceptual framework introduced in section 1. The scores represent the authors' quantification of the qualitative judgments expressed by the respondents during the interviews. For each item we ranked feedbacks

provided by respondents from the most positive to the most negative. After that we were able to assign synthetic scores to their opinions. For instance, the respondents of firm F were more positive in their opinions on the usefulness of the voucher for innovation, and the respondent of firm C was the one most supportive with respect to the mechanisms of the second voucher schemes. The intermediate values reflect mixed opinions: for instance, the respondent of firm B appreciated that the first voucher scheme provided a list of selected KIS but stated that it was difficult to select the most suitable one.

By analyzing table 5 by rows it is possible to examine and discuss the issues outlined in the conceptual framework.

Table 5: Summary of the main results (qualitative evaluations from 1 – low - to 5 – high)

(here table 5)

Vouchers as an innovation policy

The first research question investigated during the field research dealt with the role of the innovation vouchers as a scheme to raise innovation level in SMEs by providing financial resources to carry out projects they would not have undertaken without public funding (Scott, 1984; Klette and Moen, 1998)..

Table 5 shows that, five out of seven beneficiaries would have undertaken their projects also without public funding (Innovation without voucher), while only in two cases (C and G) the entrepreneurs relied solely or mainly on the voucher for their innovation processes.

Furthermore, in some cases of the pilot initiative the financial aid was misplaced and not addressed to technical development, whilst in the adjusted one it was rather limited to accomplish significant improvements. As a matter of fact the opinions about the amount of voucher is rather low (Usefulness of voucher for innovation).

As a conclusion, it seems that the voucher is not particularly useful as a mere financial aid

because it may displace private R&D investments or, in most cases, does not encourage them beyond the level that would have been undertaken anyway (Wallsten, 2000; Klette and Moen, 1998).

Nonetheless, other recipients indicated that the project would have taken a longer time or would have had a reduced scale without the voucher. This was the case of Firm E, which could also manage patenting activities of its new product, or Firm F, which was able to move faster in its roadmap. This is consistent with the findings of Hsu et al. (2009), who report behavioral additionality, which can result in project enlargement, strategy formulation, cost-effectiveness and commercialization practice. We summarized this evidence in the following:

Proposition 1: *The innovation voucher has a limited impact as a financial instrument to support the launch of innovation projects; however, it could reduce the time-to-market or enlarge the scope of the development activities.*

Vouchers as a collaboration policy

The second research question of our field research was about the effectiveness of innovation voucher to influence the attitude of SMEs to accessing external knowledge.

Although most beneficiaries had informal contacts with external knowledge sources, only two of them (D and F) had already planned to commit some tasks to a partner before applying for the voucher (Collaboration without voucher in Table 5). The other ones did not take into consideration to exploit know-how and technologies developed elsewhere, but were planning to undertake innovation on their own, which is in line with other works (Zeng et al., 2010; Tether and Tajar, 2006; Santoro and Chakrabarti, 2002). These latter perceived the mechanism behind the voucher –i.e. the engagement of an external partner – as a constraint which forced them to adopt a different approach. Anyway, in some cases they appreciated the contribution made by the partners: as in case E, where the partner suggested and supported the

IP protection, or in case G, where the partner introduced the idea to a venture capitalist. In the cases belonging to the pilot initiative the collaboration was not useful, partly because the recipient could select among a limited set of providers (case A), partly because a portion of the money should be addressed to not technical activities (case B). We summarized this evidence in the following:

Proposition 2A: *The innovation voucher is an effective mechanism to encourage SMEs to adopt an open innovation approach.*

Recalling the conceptual framework (impact of the implementation mechanisms), the previous proposition is affected by certain features of the program format. The recipients of the pilot voucher were not satisfied by the limited choice of possible partners. By contrast, all the recipients involved in the adjusted initiative were satisfied with the opening of the program to all KIS located in the region. However, this was not related to wider opportunities; simply, the scheme allowed them to choose a partner that they already knew as highlighted in table 5 (NEW collaboration activated).

This is consistent with the findings of previous studies (Sherwood and Covin, 2008; Sala et al., 2011), which observe that SMEs face difficulties in assessing the returns of cooperation, and that trust is a key variable in the decision to enter into cooperative R&D collaborations.

We can supplement Proposition 2A with the following:

Proposition 2B: *Even with innovation vouchers, SMEs tend to strengthen existing R&D collaborations rather than exploring new opportunities with unfamiliar organizations.*

Collaborations related to the vouchers, both with previously known partners and newly discovered ones, were pivotal to strengthening the relationships and trust mechanisms among

partners and to identifying areas of common interest and new collaboration opportunities. In fact, four out of seven respondents (Cases A, B, D and F) informed us that follow-up projects were ongoing at the time of the interviews. Furthermore, they told us that these additional collaborations were initiated with own resources. This partially overcomes the limitation pointed out in Proposition 1, since it reveals that innovation vouchers may stimulate private R&D expenditures in the medium term. This is a considerable result since it introduces advancement with respect to findings articulated in previous works. We summarized this result in the following:

Proposition 2C: Innovation vouchers foster follow-up collaborations between the beneficiary and the partner, resulting in additional private investments in innovation.

A key element came to light during the analysis is that these follow-ups projects happened when the voucher was spent both in already known partners both in new ones, as shown in table 5 (FURTHER collaboration). This is an interesting evidence since it would suggest to incentive new collaborations in order to strengthen local networking and regional innovation system (Cooke *et al.*, 1997).

Voucher mechanisms of implementation

The last part of our field research addressed directly the third research question outlined in section 1. We analyzed the implementation process in the two initiatives in order to determine how the manner in which funds are allocated may enhance or prevent firm participation or affect the overall effectiveness of the measure.

Recipients of the pilot initiatives were rather disappointed with the multi-stage approach, as we can see by the low scores connected with Procedures in Table 5. They considered it inconsistent with the amount of financial contribution. Conversely, the procedure of the

adjusted initiative was deemed simple, immediate and suitable for SMEs: even a limited amount of money was useful for beginning collaborations and tackling specific problems. We summarized this evidence in the following:

***Proposition 3:** SMEs prefer limited amount of funds, provided they are granted quickly and with simple mechanisms.*

This is an evidence of how companies ponder public initiatives and which are the key factors they take into consideration when participating to public calls. This is true in general for traditional innovation policies, as brought to attention by previous work (Anderson, 2000), and it strengthens recommendation provided by Koskenlinna et al. (2007) to design voucher initiatives. Anyway, it must be noticed that in many cases we examined SMEs that had already planned to invest their own money: they hadn't significant financial needs and so revealed weak motivation to spend their time to deal with draining procedure.

4. Conclusion

Policies based on innovation vouchers are designed to foster innovation and to encourage SMEs to exploit external knowledge for their innovation activities. Although it is difficult to generalize the results obtained because of the limited set of cases, our analyses provide insights into this new policy and its limits.

First, we found that the voucher was used by SMEs which already spend time and financial resources on innovation activities. The policy is less effective for SMEs less acquainted with innovation and which lack an open innovation approach. This is a weakness of the examined initiatives and a direct consequence of the "first come, first served" approach. Implications for policy-makers are two-fold. First, they could introduce some restrictions on access to the

initiative in order to exclude SMEs that already invest much resources in R&D activities and have ties with Knowledge Intensive Services. Second, they could increase the efforts to engage SMEs less acquainted with innovation by devoting more attention to the diffusion and promotion of the vouchers, for instance leveraging on chambers of commerce or industrial associations to reach the target population.

With respect to the role of voucher in stimulating an open innovation or collaborative approach evidences suggest that policy-makers should devote efforts to make SMEs explore new collaborations instead on relying only on existing partners. Again, this means to introduce some constrains (or incentives) to limit the financing of partnerships already in place that could be supported via other financial mechanism. Policy-makers could also act on some framework conditions so that SMEs could have the opportunity of meeting new providers, compare them and their services.

Despite these limitations, we also found positive effects: in some cases the voucher forced SMEs to adopt a more structured approach to innovation and reduced the time-to-market; in other cases follow-up projects set up with private resources were launched. These are important results for policy-makers, since they prove that vouchers increase the competitiveness of local firms and strengthen the dynamics among actors of the Regional Innovation System, providing grounds for future collaborations. This outcome suggests that the tool should be further developed to go beyond the previous limits and to increase its diffusion. In doing this, policy-makers should not forget the administrative burden: if they want to achieve a wider diffusion and to prompt new attitude towards innovation in a larger portion of SMEs they should keep the process as simple and straightforward as possible, even at the cost of providing a small financial aid per voucher.

We acknowledge some limitations in our work that are simultaneously avenues for further research. First, since our results come from a limited number of case studies, stronger evidence could be obtained by using data from a larger sample of beneficiaries. For instance,

data could be obtained by considering the recipients of measures implemented in different countries or in different years. Furthermore, the results could be improved and expanded in two ways. First, collecting data on firm performances before and after the voucher program (e.g. revenues from new products/services, new customers, etc.). This could help in evaluating the policy and also in commenting on the long-term effects of the collaborations and on future commitments of the parties involved. Second, the introduction of a control group of comparable enterprises, which have not received the voucher, could be useful to estimate different behaviours and the impact of the voucher.

Finally, studies that conduct comparisons between voucher schemes and other policy initiatives with similar objectives would be of interest to policy-makers.

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TABLES and FIGURES

Table 1: Overview of voucher schemes in Europe
Source: authors' elaboration on DG Enterprise (2009) data

Features	Options	Numbers
Geographical level	National	12
	Regional	9
Co-financing	Yes	14
	No	11
Target	Micro	15
	Small	18
	Medium	15
Eligibility criteria	Exclusion of some sectors	3
	Innovation newcomers	6

Table 2: Summary of the pilot initiative

		<i>Amount</i>	<i>Co-financing</i>	<i>Vouchers provided</i>	<i>Provider s</i>	<i>Budget</i>
Stream A	Stage 1	3,500€	0%	51	19	663,000€
	Stage 2	10,000€	25%	32		
	Stage 3	50,000€	50%	9		
Stream B	Stage 1	10,500€	0%	113	23	997,000€
	Stage 2	75,000€	50%	4		
Total				200	33	1,660,000€

Table 3: Summary of the adjusted initiative

	<i>Amount</i>	<i>Co-financing</i>	<i>Vouchers provided</i>	<i>Providers</i>	<i>Budget (Euro)</i>
Technology due diligence	5,000€	25% SMEs 0% single citizen	244	39	1,128,750€
Business Evaluation	10,000€	25% SMEs 0% single citizen	6	3	45,000€
Technical-scientific research	18,000€	50% (only for SMEs)	19	33	180,500€
National patenting	3,000€	0% (only for SMEs)	44	30	132,000€
International patenting	7,000€	0% (only for SMEs)	53		371,000€
Total			366	60	1,857,250€

Table 4: Case studies

Case study (firm)	Pilot initiative			Adjusted initiative			
	A	B	C	D	E	F	G
Size	Small	Micro	Small	Medium	Medium	Small	Micro
Sector	Service	Service	Industry	Industry	Industry	Service	Service
Sub-sector	Safety	ICT	Manufacturing	Manufacturing	Manufacturing	ICT	R&D
Internal R&D/R&D budget	No	No	No	No	Yes	Yes	Yes
Previous collaboration with KIS	No	No	Yes	Yes	Yes	Yes	Yes

Table 5: Summary of the case studies' main results (qualitative evaluations between 1 – low and 5 – high)

Case Study	Pilot initiative				Adjusted initiative			
	A	B	C	D	E	F	G	
<i>Vouchers as an innovation policy</i>								
Usefulness of voucher for innovation	3	3	4	4	2	2	5	3
Innovation without voucher	Yes	Yes	No	No	Yes	Yes	Yes	No
<i>Vouchers as a collaboration policy</i>								
Collaboration without voucher	No	No	No	No	Yes	No	Yes	No
NEW collaboration activated	Yes	Yes	No	No	No	No	No	No
FURTHER collaboration	Yes	Yes	No	No	Yes	No	Yes	No
<i>Voucher mechanisms of implementation</i>								
Procedures	2	3	4	5	5	4	5	4
Providers availability	3	2	3	5	4	4	4	4

Figure 1: Conceptual framework