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Alignment of Innovation Policy Objectives: A Demand Side Perspective

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Abstract:
This study is aimed at a better understanding of the interaction between design of public support for innovation at different levels of policy-making, and firms' innovation activities. How do firms respond to the incentives offered by various policies? We propose an analytical framework to examine the alignment of technology and innovation policy objectives from a demand-side perspective, that is, from the perspective of firms that benefit from policy support. The framework builds on existing policy design frameworks, and proposes that firms' use of the public support relates to their strategies for innovation development in terms of innovation paths and forms of organising interaction with external actors, and their specific technological and market learning loci. We apply this framework empirically using 1998-2000 and 2002-2004 Community Innovation Survey data for France and the UK.

Keywords: Innovation policy; Policy alignment; Innovation stragegies

Jel codes: O30, O31, O38

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1. Introduction

From an evolutionary perspective, economic growth and structural change depend heavily on the process of variety renewal (Schumpeter, 1942; Metcalfe et al., 2006). Hence, technology and innovation policy is concerned not with correcting market incentives, but with designing institutional frameworks and policies that encourage the accumulation of capabilities by different and heterogeneous national actors, in order to generate variety in the learning processes, innovation sources, and business experiments (Metcalfe, 1994). It is aimed at aligning the innovation objectives of different national actors (McGowan et al., 2004; Bodas Freitas and von Tunzelmann, 2008). Since national economies include actors that differ with respect to the innovation sources on which they rely, the learning processes they have mastered, and their motivations to produce and diffuse knowledge, design and analysis of innovation policy requires access to detailed microeconomic and social information (Metcalfe, 1995).

There has been an increase in the scale and scope, that is, the quantity on offer and the diversity of schemes, of public support for innovation and restructuring available to firms. Firms can exploit different types of support that provide a variety of incentives and benefits, and contribute to various innovative processes. In most European countries, local and most national public support for innovation and restructuring comes from regional departments or local private business-to-business services. These forms of support for innovation coexist with centrally designed and implemented, and also European innovation schemes. National policy-makers expect national support for innovation and restructuring – whether locally or centrally designed and implemented – and also European support schemes to be complementary in supporting innovation. How do firms respond to the array of available public incentives for innovation? Do the policies designed and implemented by different levels of policy-making complement, reinforce, or substitute for each other? Are public incentives supporting many different sources of innovation, different learning processes, and multiple firms and systems, or do they address a narrow set of learning processes and innovation sources? Understanding how firms respond to the available supply of public support is crucial for addressing concerns related to coordinated policy-making and alignment of innovation objectives in the system.

There have been some efforts made to address some of these issues. Some studies focus on the coordination of policy initiatives designed and implemented by different policy-making levels; others focus on the evolution, alignment, and misalignment of policy design and policy-making. Analyses of policy initiatives and whether they are coordinated, and of the alignment among policy innovation objectives focus on policy design and implementation not the innovation activities of the actors being targeted and who will benefit from these innovation policies (Grande, 1996; Kuhlmann, 2001; Bodas Freitas and von Tunzelmann, 2008). The perspective of demand for public innovation support can provide some insights into the factors that induce firms to respond to specific policy innovation objectives and to align their innovation strategies in order to benefit from the incentives proposed by different policy actors. A demand perspective is necessary to respond to policy concerns over alignment and coordination of innovation policy, and to identify levels of differentiation and specialisation, and inertia, at different innovation policy-making levels. Combining demand and supply aspects is likely to provide a more complete and more reliable story by taking account of locally induced path-dependencies. This points to the need for a model where firms and policy-makers interact in real time through the exercise of their dynamic competencies and capabilities (von Tunzelmann and Wang, 2003, 2007; Iammarino et al., 2008; von Tunzelmann, 2009).

The present study examines the alignment of policy innovation objectives using a model that includes a demand-side perspective related to the innovation strategies of firms that benefit from public support for innovation. The framework we develop buildings on existing frameworks in order to examine policy alignment from a supply-side perspective, that is, analysis of policy design. We suggest that the way firms align policy innovation objectives is related to their innovation strategies, in particular, innovation development paths and forms of organising interaction with external actors, and their specific technological and market learning loci. We apply this framework empirically by analysing how French and British firms align the variety of forms of local, central, and European innovation support available to them. We exploit firm-level data from the Community Innovation Survey (CIS) of the innovation processes of French and British firms, for the periods 1998-2000 and 2002-2004. Data for the late 1990s and early 2000s allow integration of our demand-side perspective of innovation policy design with earlier evidence on policy design, that is, the supply-side. This empirical exercise will provide insights on how a demand-side

perspective on the alignment of innovation policy complements a supply-side analysis of the design and forms of policy coordination across different levels of policy-making.

The paper is organised as follow. Section 2 reviews the literature on the alignment of innovation policy objectives. Section 3 develops a framework to examine the alignment of innovation policy objectives from a demand-side perspective. Section 4 presents the data and the methodology used and Section 5 presents and discusses the empirical results. Section 6 concludes the paper.

2. Alignment of innovation policy objectives

Alignment of innovation policy objectives is often understood as the integration of incentives for systems that differ in their function (technology, production, finance, marketing, management), resources (types of labour, capital and natural resources), and spatial coverage (local, regional, national, supranational) (McGowan et al., 2004: ch. 3). Although the analytical lens and units of analysis used vary, alignment of innovation policy objectives overlaps with issues related to the coordination of multiple policy-making levels. The examination of coordination of multiple policy-making focus often on different levels of policy-making, their rationale and their overlaps (e.g. Grande, 1996, 2001; Kaiser and Prange, 2004). Studies looking at the alignment of innovation policy objectives focus on the rationale for adaptive policies to encourage innovation and enhance the learning capabilities of heterogeneous firms, and examine whether and how different innovation sources and learning processes are encouraged by different policies (Metcalfe, 1995; Metcalfe et al., 2006; Bodas Freitas and von Tunzelmann, 2008). In both cases, the point of departure is policy design as the expression of alignment and coordination among different levels of policy-making.

Innovation policy coordination is particularly relevant in the European context of multi-layered interconnected levels of policy-making where regional/local, national and European authorities offer several types of public support for technology, innovation and restructuring. In this context, it is important to understand whether these coexisting forms of public support for innovation complement or substitute for each other (Grande, 1996; Kuhlmann, 2001). According to their underlying rationale, the support provided by these different levels of policy-making is expected to provide specific incentives to use particular sources and learning processes, and consequently to be aimed at different types of firms. However, some public

policy studies show that there are coordination problems across and within national economies, across local and national level policy-making (Kaiser and Prange, 2005).[i] Moreover, the extent to which European, national and regional innovation policies complement each other differs across different national economies (Kaiser and Prange, 2004). In other words, the level and type of multi-level governance of innovation differs across countries and, within countries, across policy objectives. These studies focus mainly on policy design and ignore demand for public innovation support and do not provide information about how firms respond to the wide array of public incentives.

The innovation policy literature focuses also on developing frameworks to examine the alignment of innovation policy. For example, Bodas Freitas and von Tunzelmann (2008) develop an analytical framework to compare the alignment of policy innovation objectives across time, in different economies. However, their study focuses on the characteristics of policy-design (the supply-side) and, consequently, on the perspectives of policy-makers rather than firms in the functioning of their innovation systems. Foray and Llerena (1996) discusses how policy knowledge objectives and forms of policy implementation are related to the capabilities of policy-makers, policy-implementers and the firms/organisations being targeted. They argue that specific knowledge objectives and forms of implementation need to be articulated in order to address specific sets of capabilities. However, there are no theoretically developed or empirically derived frameworks that examine the alignment of innovation policy from a demand side perspective and integrate analysis of this alignment from a supply-side perspective.

Other streams of the public policy and innovation literature have tried to integrate the demand-side perspective. Still with a focus on policy design and taking the characteristics of the targeted demand (policy network) as exogenous, the public policy literature argues and shows how the policy objectives and types of responses expected from firms in specific informational and institutional environments need to be addressed with specific policy design and implementation (Sabatier, 1986; Peters, 2000; Blair, 2002, Howlett, 2009). For instance, Bressers and O'Toole (1998) argue that where the objectives of the actors in the target groups are similar, policies tend to provide additional resources; where objectives of the actors are dissimilar, policies tend to rely on regulation. Sabatier (1986) suggests that bottom-up policy approaches are more appropriate in situations where there is no dominant technology, but there is a large number (variety) of actors with no power dependency and a primary interest in the dynamics of different local situations.

Analyses of policy additionality provides insights into the types of firms that are most likely to exploit public support to increase their learning capabilities, and those that are more likely to use it to reduce internal innovation investment (e.g. David et al., 2000; Czarnitzi et al., 2007). These studies focus narrowly on policy additionality and the impact of specific policy programmes rather than on integration in policy design of a demand-side perspective with the characteristics of the policy design and in this manner to provide insights into the alignment of innovation policy objectives in the economy.

In summary, the analytical focus in the existing literature is the supply-side of innovation objectives, with demand considered as exogenous or as a responsive dimension. None of these approaches provides insights into how to identify the forms in which firms respond and align their innovation strategies to benefit from the incentives provided by different levels of policy-making.

Metcalfe (1995, p.33) argues that innovation possibilities are firm specific and vary across time; therefore, the design and implementation of innovation policy that provides incentives for a variety of innovation sources and learning processes must be based on microeconomic and social information. To understand the interaction between policy-makers' supply-side decisions and firms' demand-side decisions in the context of the policies pursued, we need an analysis that integrates the demand for public support with its supply. An examination of the alignment of innovation policy objectives from the demand side requires an examination of firms' innovation objectives in exploiting the forms of public support for innovation designed and implemented by different levels of policy making. A focus on firm strategies provides a better understanding of whether or not available public incentives are promoting different learning and innovation activities and models.

3. From a supply-side to a demand-side framework to examine the alignment of public innovation support

Figure 1 depicts the analytical framework proposed to examine and compare the alignment of innovation objectives from a demand-side perspective, and their interaction with policy-makers decisions. This framework builds on the three-dimensional alignment of innovation policy design model proposed in Bodas Freitas and von Tunzelmann (2008), in which public support is characterised as the types of knowledge and

learning processes addressed, forms of implementation, and types of support (selectiveness of targeted firms). In relation to types of knowledge and learning addressed, it identifies diffusion vs. mission-oriented policies (Vertical vs Horizontal). Horizontal programmes focus on the diffusion of innovation, the integration of new technologies into old products and processes, and on increasing the number of firms involved in using new technologies and in interacting in specific ways in the business-to-business market. Vertical programmes address the development of new technologies and products and of new explicit interfaces in the business-to-business market. The second dimension in the model refers to the level of policy programme implementation: local or central levels of policy design and implementation. The third aspect of Bodas Freitas and von Tunzelmann's analytical model refers to selection among the forms of support provided (i.e. type of public support or incentive provided and type of output). Public support is characterised as general if it provides a general support capacity that allows firms to decide whether to use it for general services or to access information, and as specific if it provides incentives to develop specific capabilities or targets specific technological and industrial environments.

The framework in Figure 1 accounts for the innovation activities and strategies encouraged by each of the three policy design dimensions proposed in Bodas Freitas and von Tunzelmann (2008). Firms with different innovation development strategies and behaviours may have different motives and interests in applying for public support that is aimed at providing particular incentives. In their turn, policy-implementers will target firms and projects that match programme objectives. Most policy programmes provide incentives for particular innovation activities and the development of specific technological or market capabilities. We suggest that firms' use of different innovation support depends on their innovation development strategies, interaction with external actors, and learning locus.

[Insert Figure 1 about here]

The firm's search and innovation development paths may be associated with the forms firms relate with external actors for innovation development strategy (Jensen et al., 2007; Bercovtiz and Feldman, 2007). In addition, the firm's technological and market learning locus might promote a particular innovation strategy

(Pavitt, 1984; Dosi, 1988). The articulation of these dimensions is not random. Therefore, in this paper, we examine the alignment of policy innovation objectives from a demand-side perspective that considers the three axes of the firm's innovation behaviour: search and development for innovation; organisation of interaction with external actors for innovation development, and learning locus. We next examine how these different business innovation strategies and characteristics interact with specific innovation policy objectives.

3.1. Innovation development paths

The literature makes a distinction between the search paths for innovation development: cumulativeness and refinement of existing knowledge (exploitation); and search in the technology space for new and more productive techniques and products with unknown demand (exploration) (March, 1991; Gupta et al., 2006; Greve, 2007). Both types of search involve learning and innovation and may not be incompatible (Greve, 2007; Jensen et al. 2007). Indeed, the intensity of exploration and exploitation activities seems to differ across firms' functions and subsystems (Gupta et al., 2006; Raisch et al., 2009).

This distinction between exploration and exploitation is similar to the dichotomy between vertical and horizontal knowledge objectives in policy design. A focus on the innovation development paths of firms rather than the knowledge objectives of policy programmes permits to account for the fact that exploration and exploitation activities can be coordinated and compatible within the firm (Brown and Eisenhardt, 1997; Raisch et al., 2009).

Exploration and exploitation based innovation development paths involve the search for diverse types of information and knowledge sources (von Hippel, 1988). Firms may invest heavily in developing and accessing advanced technological knowledge and also rely on knowledge and information resulting from internal learning-by-doing, using and interacting. A reliance on technological knowledge advances reveals firms' exploratory efforts to build new competencies and technologies. The development of internal organisational structures that encourage knowledge creation through learning-by-doing, using and interacting allows firms to build on their existing knowledge, to adapt and respond quickly to changes in their market and technological environments (Nonaka, 1994). A strong reliance on exploratory technology knowledge development can result in reduced interest in (horizontal) public support for the adoption of technological or

organisational best-practice, while a heavy reliance on exploitative learning based on experience may discourage firms from applying for (vertical) support to develop new knowledge and technologies (Levinthal and March, 1993; Tripsas and Gavetti, 2000). Vertical and horizontal policy programmes may provide different benefits depending on the firms' innovation development strategies. On their turn, policy-makers will target and choose to grant and provide horizontal and vertical support to firms with different innovation development strategies.

3.2. Organisation and governance of interaction with external actors for innovation development

The literature on transaction costs and firm organisation show when and how standardised markets, customised contracts and collaborations are relevant organisational arrangements for knowledge and technology flows. The appropriateness of these organisational forms depends on the coordination costs, technology uncertainty, and appropriation and financial aspects (Artz and Brush, 2000; Gulati and Singh, 1998). Different capabilities are required to establish and maintain different forms of organisation of interactions with external actors to access and develop technological inputs. Experience with different modes of organisation with external actors may influence the firms' interest in applying for different types of public support.

Engagement in collaboration reflects the firms' understanding that knowledge is distributed across different actors and that cooperation may be required to develop a new technology. In technological contexts characterised by high levels of uncertainty and rapid knowledge development, collaboration allows firms to exploit the different and complementary resources and competencies of external actors and decrease the risks of an internal technology development process (Hagedoorn et al., 2000; Gulati and Singh, 1998; Hoetker and Mellewigt, 2009). Experience in organising collaborative innovation development seems to be associated with strong technological and organisational capabilities (Gulati and Nickerson, 2008). Hence, firms with experience in organising innovation development via collaboration with external actors are more likely to be interested in specific innovation public incentives provided under a vertical policy programme and more able to propose an original knowledge and technology development project that targets the public incentives for

innovation. Policy-makers' and implementers' evaluations of such firms will be high based on their greater potential to disseminate their innovative results broadly based on collaboration (Feldman and Kelley, 2006).

Contracting out parts of technological development to other firms and organisations shows that the technologies and know-how available in the market do not match the specific needs of the firm, and that the firm has taken account of the transaction costs involved in leaving some parts of the development to specific technology providers. Firms that contract out parts of their development have developed the capabilities to search for technology providers, to set contracts that specify required outcomes, to monitor the activities of providers, and to coordinate external and internal innovation development processes and outputs (Gulati and Nickerson, 2008; van de Vrande et al., 2009). The use of contracting to manage interactions for technology development reveals firms' concerns with appropriation of innovation development, which may reduce the motivation to participate in public innovation support programmes (Luukkonen, 2002; Feldman and Kelley, 2006). Firms that prefer contractual arrangements to achieve parts of their innovation development process, signal to policy-makers that they have the capabilities to co-ordinate risky and difficult activities, inability to develop new competences and technologies, and an unwillingness to share their knowledge (Veuglerers and Cassiman, 1999; Cassiman. and Veugelers, 2006).

Reliance on the best practice and technologies in the market for the development of new products seems to be associated with weak concerns about knowledge spillovers, with low technology uncertainty and low costs of coordination (Pavitt, 1984; Gulati, and Singh, 1998). Firms that rely on somehow standardised technology are more likely to respond to general public support for innovation, aimed at raising awareness on best-practices, and support for restructuring and innovation adoption. Firms that rely on the market for technology inputs may find general public support for innovation useful to search and scan technologies, best practice and innovation sources and to upgrade their innovative capabilities (Bodas Freitas and von Tunzelmann, 2008).

3.3. Locus of learning and innovation development: firms' technological and market environments

Firms active in different industries tend to develop specific innovative behaviours through the accumulation of different technological and organisational capabilities (Castellacci, 2008). Firms in different industries,

develop specific technological and learning trajectories, rely on diverse technological and market knowledge bases and exploit specific learning processes (Malerba, 1992). Pavitt (1984) distinguishes four types of industry sectors—*supplier-dominated, scale-intensive, specialised-supplier* and *science-intensive*—based on differences in the sources of technology, user requirements, direction of technological change and means of and possibilities for the appropriation of innovation. Hence, there is some evidence that the innovation strategies and behaviours of firms depend on their technological learning locus. Firms' use of innovation support provided by different levels of policy-making may be uneven across different technological learning loci. Some levels of policy-making may target specific industries and technological contexts, others may provide incentives for specific innovation sources and activities that are more attractive to certain industries and fulfil particular needs. For example, policies to support the search for new technological fields or applications may not be equally of interested to firms in supplier-dominated or science-intensive sectors. Science based and specialised supplier firms, where in-house R&D and design are important technology sources, will be more likely to participate in vertical policy programmes providing specific incentives for innovation via exploration.

Also, the market environment influences firms' behaviour and strategies (Hitt et al., 1997; Simard and West, 2006; MacGarvie, 2006). Participation in the local and international markets is associated with the development of different competencies to produce and market and with specific network links. Interaction with local actors seems particularly important for product customisation and diversity, for firms that concentrate on the local market and technological learning (Maskell and Malmberg, 1999; Rantisi, 2002). For firms that operate in international markets it is important to build international reputation and establish relationships that will enhance their technological and market reputations (Hitt et al., 1997; Salomon and Shaver, 2005; Simard and West, 2006). Motivation to apply for and the likelihood of being granted support from different levels of policy-making may depend on the market in which the firm operates. Local public support might be attractive to firms whose learning locus is the local environment, not only because it has been designed to match the technological and market competences of the local economy, but also because it may provide more opportunity for interaction with existing and new partners, and improve local reputation (Morrison et al., 2000). Transnational innovation support may be associated with participation in international markets and the need to learn, interact and build reputation globally (Laredo, 1995, 1998).

4. Data and Methods

4.1. Data

We apply our framework empirically relying on firm-level data from two waves of the CIS for France and the UK. We focus on policy programmes that provide financial support for innovation, not information and relational services, infrastructure or learning tools. Firms that benefit from financial public support are those that (first) self select by applying for the support and (second) are selected by policy-implementers. The criteria in both cases reflect the design of the policy support, and the innovation strategies of the firms. Public support for innovation benefits firms whose characteristics and capabilities comply with policy requirements and distinguish them. Our data provides information only on whether or not the firm benefited from public support; we do not have information on firms that applied for, but did not receive support.

The CIS asks about the innovation processes in manufacturing firms in France and the UK. For the first period, 1998-2000, the survey covers 3,340 UK manufacturing firms and 4,081 French manufacturing firms. In the second period, 2002-2004, the dataset includes 4,705 UK manufacturing firms and 6,037 French manufacturing firms. In both periods, 405 UK and 1,387 French manufacturing firms responded to the survey. Given some missing observations, our sample is constituted of 393 UK firms and 1,353 French firms.[ii] To avoid problems of endogeneity common in cross-sectional analyses, we use the characteristics of firms' innovation activities in the first period as explanatory variables of the public support they may have received in the second period.

Dependent variables

Our dependent variables are use of public support provided by local government (LOCAL), central government or national agencies (CENTRAL), and European organisations (EUROPEAN). The CIS asks firms whether or not they received public innovation support from different levels of government (local, central including national agencies, and European organisations). These variables are taken directly from the firms' questionnaire responses.

Based on this information, we created a fourth dependent variable (ALIGNMENT), as a categorical variable that differentiates firms according to information on the choice of specific forms of alignment of public innovation support provided by different levels of decision-making. In particular, ALIGNMENT differentiates firms that received no public support, firms that received *only* public innovation support provided by local government, firms that received only support granted by central national government or a national agency, firms that received support from both local and central national levels of government (but not a European organisation), firms that received *only* public innovation support provided by European organisations, and firms that were granted public support from a European and a national local and/or central source. In our regression analysis, the dependent variables provide information on public support for innovation in the period 2002-2004.

Table 1 shows the share of the firms in our sample that received public innovation support from different levels of government, in France and in the UK.

[Insert Table 1 about here]

In both countries, about 20% of firms received support from at least one level of government. However, the likelihood of accessing public innovation support across industrial sectors seems to differ in France and in the UK. Compared to their French counterparts, UK firms active in specialised-supplier and supplier-dominated industries seem more likely to benefit from public innovation support. Also, UK science-based firms seem more likely to use mainly national public support (either or both local and central support), while French science-based firms seem more likely to combine national and European support.

Explanatory variables

According to our analytical framework, firms' motivations to apply for and use different types of public support are associated with the characteristics of their innovation development paths, the forms in which they organise and govern interaction with external actors for knowledge development, and the locus of their

learning processes. Our independent variables are proxies for these innovative behaviour and experience dimensions in the period 1998-2000; our dependent variables provide information on the use of public support in the period 2002-2004.

Three variables characterise the firms' innovation development paths and strategies, all measured in the period 1998-2000. EXPLORATION is a proxy for the intensity of the firm's involvement in widening the search space for innovation and, consequently, their efforts to develop new knowledge and technologies. It is measured by the ratio of firm's total innovative investment on firm's total turnover. EXPLOITATION provides information on the firm's organisational efforts to increase learning and innovative opportunities through learning-by-doing, through improving internal and external communication (learning by using and by interacting). It provides information on whether the firm undertook changes to its marketing or work organisation, and knowledge management strategies. We include the variable NEW-to-market product in order to account for the effectiveness of the exploration search paths in the development of new competences and products. This variable captures information on whether the firm developed a product that was new to market.

We include three variables, measured in the period 1998-2000, to characterise the forms in which firms organise and govern exchanges and interaction with external actors for innovation development. The variable COLLABORATION provides information on whether or not the firm collaborated for innovation development. The variable CONTRACT provides information on the firm's degree of outsourcing of innovation development activities, measured as the ratio of investment made by the firm to acquire external knowledge (extramural R&D and acquisition of other external knowledge) to the total amount the firm invested in internal and external R&D and acquisition of other external knowledge. MARKET is a proxy for the firm's reliance on technologies available in the market. It provides information on whether the firm's product and/or process innovations were developed by other firms and organisations or were developed internally or collaboratively.

We include five variables to characterise the learning locus of firms. Two capture information on the locus of market learning and the other three capture information on the locus of technological learning. INTERNATIONAL provides information on whether the firm's most significant market is the international market.[iii] LOCAL provides information on whether the firm's most significant market is the local or regional

market. The reference category NATIONAL provides information on whether the national market is the firm's most significant market. To capture information on the technological locus of firms' learning, we include information on the firm's industry activity. We control for industry activity using Pavitt's (1984) taxonomy of supplier-dominated, scale-intensive, specialised-supplier and science-based.[iv]

As the greatest users of public support are large firms and spin offs (Laredo, 1998), we include a control for firm size, being a start-up and being part of a group. SIZE is measured by the logarithm of the number of employees. STARTUP is a dichotomous variable that provides information on whether or not the firm is a start-up. GROUP provides information on whether the firm is part of a group or is an independent firm.

Table 2 reports the descriptive statistics of the dependent and explanatory variables. Annex Table A provides the correlation coefficients of the explanatory variables. The correlation coefficients are quite low which shows that multicollinearity is not a problem in our analysis.

[Insert Table 2 about here]

4.2. Methods

Relying on these data we proceed in two steps. First, we examine firms' use of public support provided by different levels of policy-making. Our dependent variables LOCAL, CENTRAL and EUROPEAN innovation support are dichotomous variables that are not mutually exclusive and may be correlated. We apply multivariate probit maximum likelihood estimation method, which allows simultaneous estimation of use of public innovation support provided by different levels of government. The model estimates the probability that the firm benefits from public innovation support provided by different levels of policy-making as a function of the other support and a set of explanatory variables. This method allows simultaneous estimation of more than one binary probit equation with correlated disturbances, and tests for the correlation between dependent variables conditional on a certain number of common explanatory variables (Galia and Legros, 2004, p. 1193). Hence, it provides information on the extent of complement or substitution between the different dependent variables.

Second, we examine how firms align the public innovation support provided by different levels of government. Our dependent variable is the categorical variable ALIGNMENT. Each form of alignment is mutually exclusive, that is, each category identifies firms that chose a specific form of alignment; the categories do not overlap. We estimate the probability of each specific form of alignment relying on a multinomial logit regression model which estimates the probability of each form of alignment in comparison with a base category, which, in our case, refers to no use of public support.

5. Alignment of innovation policy objectives, a demand side perspective

5.1. Characteristics of users of public innovation support provided by different levels of decision-making

Table 3 shows the results of the multivariate probit estimation of firms' probability to be granted LOCAL, CENTRAL, EUROPEAN public support for innovation, for French and British observations separately.

[Insert Table 3 about here]

The results suggest differences in the innovation strategies of firms that benefit from public support for innovation provided by British and French local authorities. British local support is less likely to benefit large established firms active in supplier-dominated industries (Table 3, column 1). French local support is more likely to assist firms that rely on exploration development paths, that launch new-market products, and have experience of collaboration (Table 3, column 4).

Support from UK central national government or agencies attracts large firms with experience in collaboration for innovation (Table 3, column 2). This level of government support seems to privilege science-based and specialised-supplier sector activities. French central support attracts very similar types of firms, except that French central support encourages international learning (Table 3, columns 2 and 5).

European support is exploited mainly by French firms that rely on exploratory strategies and collaboration for innovation development (Table 3, column 6). European innovation support benefits mostly large French firms active in international markets, in science-intensive industries. British firms that use European support

are not significantly different from those that did not receive it. The variables weakly associated with use of only European support are exploitative development and collaboration (at 6% one-tailed Table 3, column 3).

Examining the complementarities among the three types of support, we find some differences between France and the UK. In France, local, central and European support are correlated and complementary. The strongest correlation is between central and European support (0.70), and the weakest is between local and European support (0.49). In the UK, only the correlation between local and central is significant (0.45).

5.2. Firms' alignment of policy innovation objectives

Table 4 show the results of the multinomial probit estimations of the probability that British and French firms undertake different forms of ALIGNMENT of public support for innovation from local, national central and European sources.

[Insert Table 4 about here]

Only local support is associated more with British start-ups, but not of British firms active in specialised-supplier sectors (Table 4, column 1). *Only local* support is less likely to be the strategy of French firms that rely on the market to source technological inputs (Table 4, column 6).

Only central national support is associated with British specialised-supplier firms and science-based industrial activities, but not start-ups (Table 4, column 2). There is weak evidence that large British firms with collaboration experience are more likely to exploit only central sources of innovation support. In France, *only central* national innovation support is associated with firms active in specialised-supplier sectors, with experience in collaborating for innovation development (Table 4, column 7). It is less likely among French firms who mainly use exploration strategies for innovation development.

National support (combined use of local and central support) is associated with French firms that rely on collaborative/shared governance of interaction with external actors for knowledge development and

knowledge transfer (Table 4, column 8). In the UK, *national support* is more likely to be exploited by large firms (Table 4, column 3).

Only European support is associated more with British firms that rely on exploration for innovation development, and collaboration and the market to manage innovation development. Only European support is less likely among British start-ups, firms with a local learning focus, and firms active in traditional supplier-dominated sectors (Table 4, column 4). In France, *only European* support for innovation is associated with large firms, but not those whose learning locus is the local market or traditional supplier-dominated activities (Table 4, column 9).

In the UK, *National* (any level) *and European* public innovation support combined is more likely among firms that undertake exploitation strategies for innovation development, do not rely on markets for innovation development, and whose market learning locus is not the local market (Table 4, column 5). Established firms are more frequent than start-ups in this group. In France, *National and European* is an alignment strategy of firms that rely on exploration for the development of new competences and technologies, and on collaboration rather than contracts to develop and exchange technological knowledge. French firms, whose learning locus is the international market and science-based industrial activity, are more likely to be found in this group as are large and start-up firms (Table 4, column 10).

5.3. Discussion

Our results show that British and French public support for innovation attracts firms with different characteristics and innovation strategies, which suggests that the design of British and French innovation support should be different, especially the design of local support. French local support for innovation encourages exploration for innovation and collaboration for innovation development; British local innovation support focuses mainly on start-ups. French central support provides innovation incentives for firms with a specific learning locus, in particular large science-based and specialised supplier firms, and those that collaborate. Similarly, British central support mostly benefits firms with collaboration experience that are active in the science-based and specialised-supplier sectors.

These results are in line with and complement the literature on the design of innovation policies in France and in the UK in the late 1990s and early 2000s. Bodas Freitas and von Tunzelmann (2008) show that from the late 1990s, most of the differences attenuated among central policy programmes but not local public support. From the mid-1990s, central policy-making was directed towards encouraging new market development and technological developments through open calls ("as well as the development of tools to monitor public business services provision or to support management capabilities of firms" Bodas Freitas and von Tunzelmann, 2008, p.1459). Local support in France and the UK was still quite different, with French local public support based more on financial subsidies for collaboration, technology adoption and research than British local support.

Our results show also that the public innovation support alignment strategies of *only local*, *only central* or only *national support* are associated mainly with British firms with a specific learning locus, and with French firms reliant on certain forms of governing the process of innovation development, and on certain innovation development paths. These results suggest differences in the way that local and central national policy-making is co-ordinated in France and the UK, and how it interacts with European support. In the UK, local and central policy-making seem to be coordinated on the basis of the firm's learning locus, while in France they seem to be coordinated mainly on the basis of their development paths and forms of organisation for innovation. Hence, the combined use of local and central public support is mainly observed among large British firms with more resources and more diverse learning locus, while in France it is mainly observed in firms that rely on collaboration for knowledge and technology exchange. Given the peculiarities of the national public innovation support, the alignment decision *only EU support* allows French firms to align their specific (market and technological) learning locus and provides British firms with the possibility to align their focus on exploratory development paths and on market and collaboration modes of organizing innovation development.

This specific pattern of alignment and coordination of innovation support seems to reflect the underlying rationale for local public support and, consequently, the design of public support in these countries in the late 1990s. In France local support was generally approved by the *Contrat plan État-région* and entailed financial subsidies for advice and technological services to be provided and approved locally. In the UK, the central government (at the time the Department of Trade and Industry) contracted out the provision of a defined set

of services to local policy providers (at that time the Business Links), they include mostly information services and some subsidised consultancy, which could be customised to better address the specific needs of local firms (Bodas Freitas and von Tunzelmann, 2008, p.1455-6).

Our results show that French firms that benefit from national and European support have similar characteristics, which suggests that European support reinforces French national policies. In other words, exploiting French public support for innovation provides learning ladder to apply for European support. British central and local innovation support, focusing on encouraging a specific learning locus rather than specific paths for innovation development or forms of governing external interaction, overlaps less with the European innovation support. The use of European public support seems not to depend on the innovation behaviour of British firms, which may be related to the design of national public support for innovation or the specificities of national industries.

In sum, our results suggest that firms align in their innovation strategies the innovation objectives of different policy-making levels. Thus, an examination of the alignment of innovation policy from a demand-side perspective complements supply-side analysis of policy design by providing information on the incentives and targets of the public support provided by different levels of policy-making, and the patterns of policy coordination.

7. Conclusions

This study focused on achieving a better understanding of the interaction between public support designed and provided by different levels of policy-making, and firms' motivations and willingness to use it to foster their innovation development processes. It adopted a demand-side perspective on the alignment of policy innovation objectives and started by conceptualising an analytical framework to examine this alignment. The framework is in line with existing frameworks examining policy design and proposed that firms' use of public support relates to their strategies for innovation development in terms of innovation paths and forms of organising interaction with external actors, and their specific technological and market learning locus. We applied this framework to analyse how French and British firms align the variety of forms of local, central and European innovation support available to them. We used firm-level data from the Community

Innovation Survey for the periods 1998-2000 and 2002-2004, which allowed us to relate and integrate our demand-side perspective on innovation policy design with evidence from analyses of policy design, that is, the supply-side.

Our empirical evidence suggests that firms coordinate and align the innovation objectives of different levels of policy-making with their innovation strategies. It suggests differences in the design and form of coordination of local and central French and British innovation support. In particular, British local support seems to be aimed particularly at helping start-ups while French local support seems to provide incentives for vertical technological development and motivates firms to rely on exploration for innovation development. Hence, French local support seems to be more vertical in its innovation objectives than the British local support, and to an extent more than French central innovation support. Both British and French central support encourages technological development in certain technological areas through collaboration. This is in line with Bodas and von Tunzelmann's (2008) findings which show also that this difference persists along the period between the 1980s and the early 2000s, and that, in both countries, central support from the mid-1990s became increasingly specific in its objectives, supporting technological development through collaboration.

Our evidence also provides insights into the different 'types' of coordination at different levels of policy-making. In the UK, coordination of local and central policy-making seems to be based on different policy competences to address the specific learning loci of firms, while in France, coordination seems to be related to the competences to address specific innovation development paths and organisational formats.

Our results have some implications for policy. The focus on the characteristics of policy design and the innovation strategies of firms-users of public innovation support provides complementary perspectives on how policy innovation objectives are aligned in an economy. Therefore, to assess and improve the design and coordination of policy-making, policy-makers could focus on translating policy objectives into specific business strategies that can be targeted by policy, and feed back into policy design. This dialectical exercise of translation of policy design characteristics into firms' innovation strategies that could be targeted might allow a better integration of the demand perspective in policy design. Also, the dialectical process of translating policy design into innovation strategies to be targeted by policy design could enable a

reassessment of the intention of policy is to create incentives to reorient firms' behaviour or to reinforce certain innovation strategies. Further research is needed to examine this issue in more detail.

[i] Since the 1990s, several authors have discussed the issue of coordination of policy-making levels and of the erosion of the national policy-making capacity to improve national living standards. Coordination of policy across levels of policy-making in Europe has been limited due to the diversity of regional and national economies (Grande, 2001; Kaiser and Prange, 2004). Following publication of the Lisbon Agenda, European objectives have focused on strengthening efforts to spread best practice and achieve greater convergence towards the main EU goals (Borras and Jacobsson, 2004). However, it is uncertain that best practice is the same in all countries, which may have different political, social and cultural systems. Moreover, is convergence of national innovation objectives possible when national firms are competing in domestic and foreign markets? National authorities are the main mediators across different levels of policy (Kuhlmann, 2001; Kaiser and Prange, 2005).

[ii] The selection bias introduced by panel data suggests that both French and the British manufacturing firms that responded to the survey in both periods were generally large, and more innovative than those that responded in only one of the periods. However, there is no significant difference in the level of public innovation support received from EU or national institutions when local and national levels of government are considered together.

[iiiiii] We reran our models with the variable export intensity instead of International. Results are similar to those for the variable International, shown in this paper and are available upon request from the authors.

[iv] We reran our models with the OECD taxonomy which distinguish industries in relation to the technology intensity of their processes and products: low-tech, medium-low tech, medium-high tech and high tech (Peneder, 2003). Results are similar to those shown in the paper. They are available upon request from the authors.

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Table 1. Share of manufacturing firms by industry activity that benefitted from public support provided by organizations at local, central-national and by European levels, in the UK and France, in 2002-2004.

	UK					France				
	Supplier-dominated	Scale-intensive	Specialised suppliers	Science intensive	Total	Supplier-dominated	Scale-intensive	Specialised suppliers	Science intensive	Total
NO support	89%	84%	66%	67%	325	91%	83%	71%	66%	1112
Only LOCAL	3%	6%	0%	7%	20	2%	1%	1%	2%	18
Only CENTRAL	5%	5%	21%	17%	36	5%	8%	17%	9%	125
Only NATIONAL (local & central)	2%	3%	5%	4%	12	0%	2%	3%	1%	24
Only EUROPEAN	0%	1%	3%	4%	6	0%	2%	2%	4%	25
European & any national	1%	1%	5%	1%	6	2%	4%	7%	18%	83
Any type of support	11%	16%	34%	33%	20%	9%	17%	29%	34%	20%
Total n. firms	116	176	38	75	405	240	736	192	219	1387

Table 2. Descriptive statistics of dependent and explanatory variables.

			Minimum	Maximum	Mean	Std. Deviation
Explanatory Variables						
Innovation development paths /strategies	Exploration	Ratio of total innovative expenditures on total turnover	0	83.57	4.01	9.45
	Exploitation	Proportion of changes undertook in three internal learning efforts: marketing, work organization and knowledge management strategies	0	2	0.30	0.48
	New-market prod	1 if the developed a product new to the market, 0 otherwise	0	1	0.33	0.47
Forms of interaction and organization of technology development	Market	1 if the innovation was developed by other organizations; 0 if the firm developed innovation alone or in collaboration	0	1	0.04	.19
	Contract	Proportion of the investments in extramural R &D activities and in the acquisition of other external knowledge on the total R&D expenditure (i.e. intramural, extramural R &D activities and acquisition of other external knowledge)	0	1	0.09	0.23
	Collaboration	1 of the firm collaborate for innovation development, 0 otherwise	0	1	0.34	0.48
Learning Locus	International	1 if the most significant market of the firm is the international one, 0 otherwise	0	1	0.47	0.50
	National	1 if the most significant market of the firm is the national one, 0 otherwise	0	1	0.44	0.50
	Local	Dichotomous variable, takes value 1 if the most significant market of the firm is the local one, 0 otherwise	0	1	0.09	0.29
	Supplier-dominated	1 if the firm is active in supplier-dominated industries, 0 otherwise	0	1	0.20	0.40
	Scale-intensive	1 if the firm is active in scale-intensive industries, 0 otherwise	0	1	0.51	0.50
	Specialized-suppliers	1 if the firm is active in specialized-suppliers industries, 0 otherwise	0	1	0.13	0.33
	Science-based	1 if the firm is active in science-based industries, 0 otherwise	0	1	0.16	0.37
Controls	Size	Logarithm of number of employees	1.61	11.47	5.65	1.34
	Start up	1 if the firm is a start up, 0 otherwise	0	1	0.04	0.19
	Group	1 if the firm is part of a group, 0 otherwise	0	1	0.84	0.37
Dependent variables						
	Type support	Categorical variable, takes 1 if firm only benefitted from local support, 2 if benefitted only from central national support, 3 if benefitted from local and central national supports, 4 if benefited only from EU support, 5 if benefitted from EU and any national support	0	5	0.58	1.32
	Local	1 if the firm benefited in the second period of Local public support for innovation; 0 otherwise	0	1	0.07	0.25
	Central	1 if the firm benefited in the second period of Central public support for innovation provided by national government or agencies; 0 otherwise	0	1	0.16	0.365
	European	1 if the firm benefited in the second period of European public support for innovation; 0 otherwise	0	1	0.07	0.25

1746 Observations

Table 3. Multivariate Probit estimates of LOCAL, CENTRAL and EUROPEAN public innovation support provided by different decision-making levels.

		UK			France		
		LOCAL	**CENTRAL**	**EUROPEAN**	**LOCAL**	**CENTRAL**	**EUROPEAN**
Innovation development paths	Exploration	0.00879	0.0127	0.0211	**0.00961****	0.00336	**0.0140*****
		(0.0196)	(0.0158)	(0.0197)	(0.00485)	(0.00424)	(0.00438)
	Exploitation	0.0938	0.163	0.362	-0.165	0.188	0.284
		(0.146)	(0.130)	(0.228)	(0.273)	(0.194)	(0.241)
	New-market prod	-0.390	-0.0806	-0.145	**0.223***	0.0637	0.0243
		(0.299)	(0.223)	(0.367)	(0.132)	(0.0974)	(0.126)
Forms of interaction and organization of technology development	Market	0.322	0.154	0.448	-0.133	-0.377	0.157
		(0.344)	(0.329)	(0.497)	(0.354)	(0.277)	(0.300)
	Contract	-0.259	-0.0170	-0.993	-0.171	-0.312	-0.276
		(0.400)	(0.295)	(0.744)	(0.305)	(0.222)	(0.298)
	Collaboration	0.0412	**0.418****	0.572	**0.357****	**0.431*****	**0.432*****
		(0.264)	(0.209)	(0.356)	(0.144)	(0.103)	(0.139)
Learning Locus	International	0.315	-0.160	0.150	0.138	**0.179***	**0.276***
		(0.244)	(0.212)	(0.338)	(0.142)	(0.101)	(0.146)
	Local	0.0653	-0.0656	-3.359	0.0828	-0.235	-0.242
		(0.310)	(0.292)	(179.0)	(0.277)	(0.231)	(0.428)
	Supplier-dominated	**-0.502***	-0.114	-0.500	0.134	-0.111	-0.156
		(0.267)	(0.235)	(0.507)	(0.186)	(0.147)	(0.238)
	Specialized-suppliers	-0.452	**0.773*****	0.359	-0.0961	**0.340*****	-0.0115
		(0.381)	(0.268)	(0.417)	(0.186)	(0.122)	(0.170)
	Science-based	0.000579	**0.521****	0.0657	0.204	**0.280****	**0.498*****
		(0.262)	(0.230)	(0.401)	(0.158)	(0.122)	(0.142)
Controls	Size	**0.203****	**0.204****	0.201	**0.0901***	**0.162*****	**0.230*****
		(0.0993)	(0.0901)	(0.162)	(0.0518)	(0.0412)	(0.0529)
	Start up	**0.909*****	-0.311	-3.741	0.233	0.139	0.431
		(0.342)	(0.476)	(266.0)	(0.289)	(0.241)	(0.288)
	Group	-0.395	-0.394	-0.264	-0.221	0.0795	-0.0480
		(0.280)	(0.242)	(0.457)	(0.195)	(0.167)	(0.247)
	Constant	-2.243***	-2.332***	-3.334***	-2.385***	-2.451***	-3.499***
		(0.493)	(0.455)	(0.880)	(0.307)	(0.248)	(0.358)
	atrho21	0.456***			0.560***		

		(0.131)	(0.0741)
	atrho31	0.304	0.490***
		(0.186)	(0.0860)
	atrho32	0.355*	0.702***
		(0.208)	(0.0794)
	Observations	393	1353
	Wald Test	69.6***	241.7***
	df	42	42
	log Likelihood	-273.1	-982

Note: Robust standard errors in brackets. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

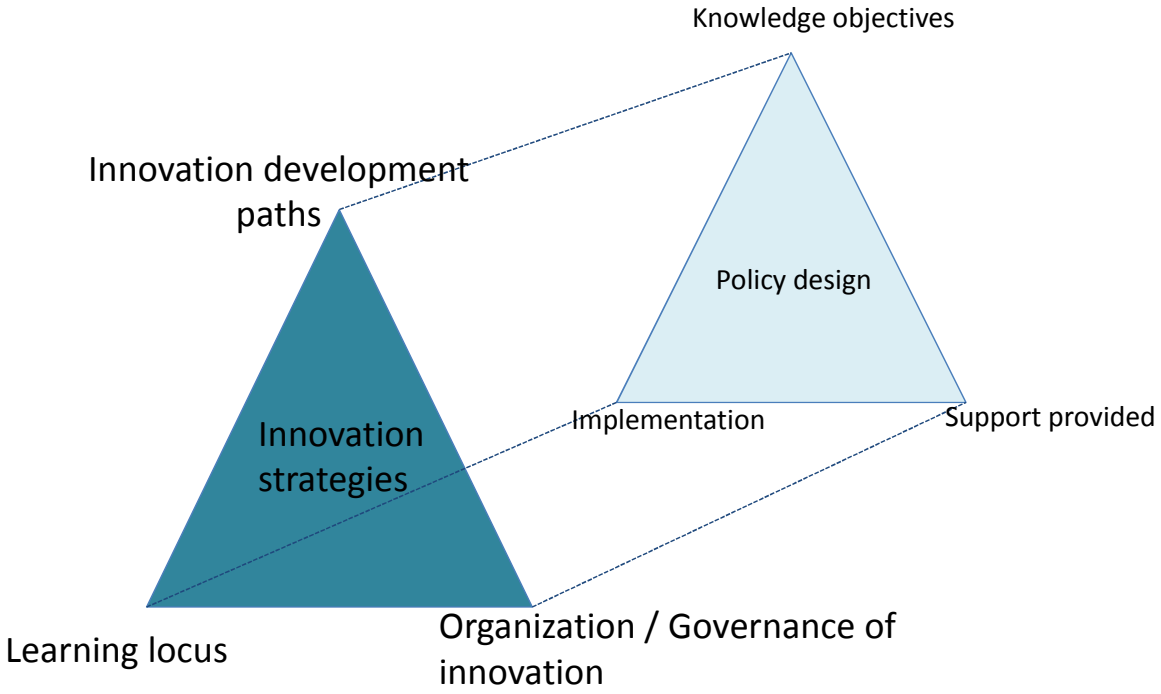
Table 4. Multinomial Logit estimates of different forms of alignment of public innovation support provided by different decision-making levels.

		UK					France				
		ONLY LOCAL	ONLY CENTRAL	NATIONAL (local &central)	ONLY EUROPEAN	NATIONAL AND EUROPEAN	ONLY LOCAL	ONLY CENTRAL	NATIONAL (local &central)	ONLY EUROPEAN	NATIONAL AND EUROPEAN
Innovation development paths	Exploration	0.039	0.039	0.045	**0.106****	-0.080	0.011	**-0.022***	0.004	0.016	**0.024****
		[0.253]	[0.177]	[0.323]	[0.008]	[0.334]	[0.031]	[0.011]	[0.017]	[0.018]	[0.009]
	Exploitation	0.148	0.306	0.112	0.724	**1.177***	-1.483	0.359	-0.868	0.614	0.813
		[0.708]	[0.231]	[0.846]	[0.368]	[0.019]	[1.383]	[0.408]	[0.802]	[0.928]	[0.526]
	New-market prod	-1.599	-0.124	-0.493	-0.389	-0.112	0.843	0.051	0.730	-0.343	0.147
		[0.152]	[0.787]	[0.563]	[0.631]	[0.871]	[0.656]	[0.218]	[0.602]	[0.476]	[0.292]
Forms of interaction and organization of technology development	Market	0.609	0.420	1.180	**2.301****	**-15.386*****	**-14.789*****	-1.463	-0.158	0.080	0.296
		[0.524]	[0.550]	[0.207]	[0.008]	[0.000]	[0.425]	[1.030]	[1.073]	[1.137]	[0.640]
	Contract	-1.276	-0.100	0.106	-3.158	-1.628	-0.301	**-0.854+**	0.259	0.133	**-1.477***
		[0.327]	[0.867]	[0.932]	[0.123]	[0.441]	[1.000]	[0.507]	[0.704]	[0.729]	[0.677]
	Collaboration	-0.215	**0.740+**	0.616	**1.216***	**1.305+**	-0.193	**0.562***	**1.494***	0.572	**1.294*****
		[0.743]	[0.098]	[0.419]	[0.030]	[0.076]	[0.683]	[0.237]	[0.615]	[0.458]	[0.358]
Learning Locus	International	**1.153+**	-0.297	0.021	0.741	-0.048	0.394	**0.453+**	-0.199	0.598	**0.970***
		[0.064]	[0.504]	[0.981]	[0.443]	[0.964]	[0.549]	[0.232]	[0.497]	[0.460]	[0.413]
	Local	0.577	-0.037	-0.243	**-14.568*****	**-14.923*****	-0.126	-1.087	0.704	**-13.738*****	0.560
		[0.481]	[0.956]	[0.844]	[0.000]	[0.000]	[1.136]	[0.737]	[0.839]	[0.575]	[1.150]
	Supplier-dominated	**-1.183+**	-0.012	-0.689	**-15.487*****	-0.612	0.577	-0.334	-1.071	**-14.209*****	0.347
		[0.070]	[0.983]	[0.477]	[0.000]	[0.597]	[0.623]	[0.339]	[1.081]	[0.378]	[0.574]
	Specialized-suppliers	**-15.99*****	**1.652****	0.816	0.682	1.650	-0.758	**0.735****	0.548	-0.272	0.473
		[0.000]	[0.006]	[0.389]	[0.661]	[0.173]	[1.037]	[0.247]	[0.512]	[0.626]	[0.380]
	Science-based	0.014	**1.331***	0.228	0.240	0.130	0.580	0.090	-0.285	0.324	**1.344*****
		[0.985]	[0.012]	[0.783]	[0.788]	[0.922]	[0.635]	[0.288]	[0.690]	[0.539]	[0.305]
Controls	Size	**0.420+**	**0.274+**	**0.519***	0.311	0.784	0.100	**0.184+**	0.143	**0.492***	**0.641*****
		[0.100]	[0.082]	[0.035]	[0.316]	[0.378]	[0.180]	[0.096]	[0.179]	[0.219]	[0.147]
	Start up	**2.082****	**-15.371*****	1.060	**-14.580*****	**-14.893*****	0.435	-0.033	0.514	0.295	**1.099***
		[0.003]	[0.000]	[0.416]	[0.000]	[0.000]	[1.006]	[0.643]	[1.006]	[1.029]	[0.553]
	Group	-0.877	-0.646	-1.077	-0.745	-1.467	-0.528	0.447	-0.011	-0.604	0.453
		[0.180]	[0.232]	[0.277]	[0.545]	[0.391]	[0.767]	[0.419]	[0.740]	[0.794]	[0.710]
	Constant	-4.643**	-4.190***	-5.728***	-6.751***	-8.617*	-4.741***	-4.121***	-5.670***	-6.872***	-9.501***

		[0.003]	[0.000]	[0.000]	[0.000]	[0.049]	[0.992]	[0.562]	[1.140]	[1.593]	[1.211]
	Observations	393					1353				
	Wald Test	10770***					7742***				
	df	70					70				
	log Likelihood	-253.9					-873.0				
	Pseudo R Squared	0.165					0.153				

Note: Robust standard errors in brackets. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 1. From a supply-side to a demand-side approach to examine alignment of innovation policy objectives



Note: Elaborated by the authors

ANNEX

Table A. Correlation coefficients among independent and control variables

	Exploration	Exploitation.	New-market prod	Market	Contract	Collab.	Intern	National	Local	Sup_dom	Scale	Specialized	Science	Size	Start
Exploration	1														
Exploitation.	0.02	1													
New-market	0.27**	0.04	1												
Market	0.02	0.01	-0.13	1											
Contract	0.18**	0.14**	0.14**	0.10**	1										
Collab.	0.29**	.078**	0.42**	0.06*	0.20**	1									
Intern	0.24**	-0.04	0.28**	-0.05*	0.11**	0.3**	1								
National	-0.18**	0.06**	-0.19**	0.03	-0.08**	-0.21**	-0.83**	1							
Local	-0.12**	-0.04	-0.17**	0.04	-0.06*	-0.15**	-0.30**	-0.28**	1						
Sup_dom	-0.13**	-0.01	-0.17**	-0.04	-0.12**	-0.21**	-0.18**	0.17**	0.03	1					
Scale	-0.12**	-0.08**	-0.03	-0.01	0.07**	-0.02	-0.09**	0.04	0.09**	-0.51**	1				
Specialized	0.1**	0.02	0.13**	0	0.03	0.09**	0.15**	-0.11**	-0.07**	-0.19**	-0.39**	1			
Science	0.22**	0.1**	0.11**	0.05*	0.01	0.17**	0.18**	-0.13**	-0.09**	-0.22**	-0.45**	-0.17**	1		
Size	0.21**	0.06*	0.31**	0.02	0.12**	0.38**	0.35**	-0.25**	-0.18**	-0.20**	0.03	0.05*	0.13**	1	
Start	0.01	0.04	0.01	-0.01	0	-0.03	-0.02	0.02	-0.01	0.05*	0	-0.02	-0.03	-0.044	1
Group	0.08**	0.03	0.15**	-0.01	0.06*	0.2**	0.19**	-0.13**	-0.1**	-0.16**	0.05*	0.05*	0.05*	0.45**	-0.03