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Abstract

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JEL codes: O18, R15, R50, R58

Keywords: regions, Innovation systems, system problems, intermediaries, Spain, Multiple Factor Analysis

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Abstract: Interaction is a central feature of well-functioning and integrated Regional Innovation Systems. However, it does not necessarily occur in an automatic fashion, denoting the existence of various system problems that may block learning and other crucial innovation processes. "Intermediaries" are organizations that encompass an increasing role in overcoming these problems. Still, they have not been adequately framed and assessed. The paper meets this need and presents a number of developments. First, we identify and categorize intermediaries according to some specific Innovation System problems they tap into, while we also include them in a novel intermediary component. Second, we operationalize sets of quantitative variables that permit new preliminary assessments. This methodology also permits new empirical insights that help framing more specific policy tools. The empirical analysis roots on an ad hoc data exploitation stemming from various surveys conducted by the Spanish Official Statistical Institute (INE) and the Spanish Venture Capital Association (ASCRI). We conduct multivariate techniques such as Multiple Factor and Cluster Analysis. The methodology creates a new typology that sorts Spanish regions according to the presence -or absence- of intermediaries when dealing with system problems. We find dissimilar outputs across regions. The latter might demand that their intermediary components are provided with strategic recommendations in response to specific system requirements.

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1. INTRODUCTION

The Innovation System (IS) literature has gained prominence and wide acceptance over the last decades, especially among European researchers and policy-makers (Nelson, 1992 and 1995; Freeman, 1995; Lundvall and Borrás, 1999; Edquist, 1997; Asheim and Isaksen, 2002; Asheim and Gertler, 2005; Doloreux and Parto, 2005; Woolthuis *et al.*, 2005; Tödtling and Trippl, 2005; Rodríguez-Pose and Crescenzi, 2008; Hollanders *et al.*, 2009; Uyarra, 2010; Chaminade *et al*., 2012; Asheim and Parrilli, 2012). A growing number of seminal works recognize the presence of systemic interactions as a key determinant of technological and economic performance[2] (Lundvall, 1992; Cooke *et al.*, 1998; Nauwelaers and Wintjes, 1999; Isaksen, 1999; Kostiainen, 2002; Iammarino, 2005; Hollanders *et al.*, 2009; Parrilli *et al.*, 2010; Nauwelaers, 2011; Chaminade *et al.*, 2012; Asheim and Parrilli, 2012; Martin and Trippl, 2013). In fact, interaction does not necessarily occur in an automatic fashion, denoting the existence of various system problems that might slow down or even block interactive learning and other innovation processes (Lundvall and Borrás, 1999; Tödtling and Trippl, 2005; Smith, 2000; Woolthuis *et al.*, 2005; Metcalfe, 2005; Malerba, 2009; Parrilli *et al.*, 2010; Marzucchi, 2010; Edquist, 2011; Chaminade *et al.*, 2012; Parrilli, 2013).

"Intermediaries[3]" develop towards more sophisticated dynamics in order to help ISs overcome these problems (Nauwelaers and Wintjes, 1999; Bessant and Rush, 2000; Tödtling and Trippl, 2005; Howells, 2006; Acworth, 2008; Parrilli *et al.*, 2010; Cooke, 2011; Nauwelaers, 2011). Intermediaries are *"organizations or bodies that act as an agent or broker in any aspect of the innovation process between two or more parties"* (Howells, 2006: 720) and thus, encompass an increasing role in spurring systemic integration and connectivity. Still, the literature does not frame and assess them rigorously. As a result, the overall aim of this paper is to classify and assess Regional Innovation Systems (RISs) according to the presence –or absence- of intermediary organizations with regards to a number of specific problems. While classic evaluations have frequently focused on firms' technological capabilities to explain regional

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[2] *Several accepted definitions of ISs describe systems as self-motivated environments where interaction occurs spontaneously. ISs are widely understood as "the elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge (Lundvall, 1992); as a system in which "firms and other organizations are systematically engaged in interactive learning" (Cooke et al., 1998); and as "a system of innovation networks and institutions (…) defined by strong, regular, internal interaction promoting innovativeness" (Kostiainen, 2002).*

[3] *Literature has grouped these organizations as: "third parties" (Woolthuis et al., 2005), "knowledge brokers" (Hagardon, 1998), "intermediate organizations" (Bessant and Rush, 1995), "innovation brokers" (Nauwelaers and Wintjes, 1999), "intermediary organizations"(Isaksen, 1999), "innovation intermediaries" (Howells, 2006; Dalziel, 2010; Nauwelaers, 2011), "intermediate agents" (Parrilli et al., 2010), "intermediary agencies" (Uyarra, 2010), "catalysts" (Cooke, 2011; Parrilli, 2013), "intermediate institutions" (Morgan, 1997; Altenburg et al., 1998; Pietrobelli and Rabellotti, 2011), "bridging institutions" (OECD, 1997; Martin and Scott, 2000), "networking partners" (Cooke and Morgan, 1994; Cooke and Leydesdorff, 2006), to name some.*

innovative outputs (Ecotec, 2005; OECD, 1997/2006; UNU-MERIT, 2009), our exploratory approach calls for the assessment of the presence of intermediary categories as new possible ways to explain competitiveness. Within this logic, intermediaries represent and act as *"catalyzers"* that support a closer integration of RISs. This paper also contributes to a literary tradition that evaluates diverse aspects concerning IS performance by the use of econometric techniques (Susiluoto, 2003; Zabala-Iturriagagoitia *et al.*, 2007; Rodriguez-Pose and Crescenzi, 2008; Navarro *et al.*, 2012; Chaminade *et al.*, 2012).

The seminal work continues as follows. In the next section we present the main RISs constituents, their components and functions, together with certain specific problems and descriptions. In the third section we summarize "intermediaries" and their recent evolution. This background leads us to present a new component that aggregates a number of intermediary categories according to the problems they tap into. We will also operationalize several sets of quantitative variables necessary to produce a novel assessment on the relational densities of the categories. In the fourth section we present our variables, our database and the multivariate methodology employed in the study. In section five we present the empirical results and brief policy implications; concluding with the discussion of some research limitations. The last section presents some concluding remarks and draws out the main implications of the paper.

2. INNOVATION SYSTEMS: CONSTITUENTS AND SYSTEM-PROBLEM CLASSIFICATION

ISs consist of two kinds of constituents. In the first place, systems are disaggregated into their main *"components"* (Ingelstam, 2002; Edquist, 2005). These components aggregate organizations with regards to the function they accomplish in the system. We adopt a total of three, as follows:

- The production structure or *"knowledge exploitation"* component, which consists mainly of firms (Cooke and Morgan, 1998; Autio, 1998; Isaksen, 1999; Asheim and Gertler, 2005; Gielsing and Nooteboom, 2006).
- The support infrastructure or *"knowledge exploration"* which consist mainly of universities and research centers Cooke and Morgan, 1998; Autio, 1998; Isaksen, 1999; Asheim and Gertler, 2005; Gielsing and Nooteboom, 2006).
- The *"policy"* component composed of government organizations (Tödtling and Trippl, 2005; Trippl and Tödtling, 2007; Martin and Trippl, 2013).

Complementarily, a number of scholars have focused on the definition of the main functions –or activities- that ISs should deliver (Edquist and Johnson, 1997; Johnson, 2001; Jacobsson and Johnson, 2000; Alkemade *et al.*, 2007; Hekkert *et al.*, 2007; Edquist, 2011). The functions are defined as a contribution of a component to performance of the system, and help scholars gain insights into its structural and institutional factors (Johnson, 2001; Jacobsson and Johnson, 2000; Alkemade *et al.*, 2007; Hekkert *et al.*, 2007; Edquist, 2011). We adopt four main groups of activities that should be carried out by ISs: (a) Provision of knowledge inputs to the innovation process; (b) Demand-side activities; (c) Provision of constituents for ISs; (d) Support services for innovating firms (Edquist, 2011: 1729).

In addition, systemic interaction is presented as a second and crucial constituent of an IS (Lundvall, 1992; Lundvall and Borrás, 1999; Ingelstam, 2002; Tödtling and Trippl, 2005; Asheim and Gertler, 2005; Edquist, 2005 and 2011; Iammarino, 2005; Jensen *et al.*, 2007; Parrilli *et al.*, 2010; Martin and Trippl, 2013). It does however imply that organizations need to dedicate time and other resources to make the most of the system they belong to. In fact, the effort to obtain this information may result in organizations becoming inefficient. However, an excessive inward focus could also provoke various problems that prevent the evolution and growth of organizations and systems (e.g. knowledge lock-ins).

These problems have been defined as *"imperfections that might slow down or even block interactive learning and other activities that are crucial parts of innovation processes"* (Woolthuis *et al.*, 2005; Chaminade *et al.*, 2012). Important as they might be, the IS scholars have provided several typologies[4] (Cooke *et al.*, 1998; 2004; Nauwelaers and Wintjes, 1999; Asheim and Gertler, 2005; Woolthuis *et al.*, 2005; Iammarino, 2005; Metcalfe, 2005; Marzucchi, 2010; Chaminade *et al.*, 2012). First, some of these studies facilitate the theoretical comprehensions on how these problems hinder systemic performance on different layers (Nauwelaers and Wintjes, 1999; Woolthuis *et al.*, 2005; Iammarino, 2005; Asheim and Gertler, 2005; Marzucchi, 2010). Second, Chaminade et al. (2012) conducted an assessment applied to the Thai IS. Their empirical work complements previous typologies and presents novel insights into estimating mismatches between innovation policies and problems in ISs.

Following Marzucchi (2010), two main macro-categories of system problems were established. The first pertain to those related to *"learning processes and accumulation*

4 These typologies are classifications or types of problems which constitute a very valuable mean to facilitate empirical assessments.

of capabilities" (i.e. lack of human capital in firms), and the second concerns problems that affect the *"structure and configuration"* of the system environment as a whole (i.e. lack of infrastructural investment). This study focuses on the first category. In doing so, we follow Nauwelaers and Wintjes (1999), in order to introduce a number of *"innovation barriers"* or more simply, *"gaps"* (Parrilli *et al.*, 2010; Alberdi *et al.*, 2014), that prevent these *"learning processes"*. First, *"Human resource"* gaps (a) occur when firms lack qualified managerial resources or competences (Bessant and Rush, 1995 and 2000[5]; Hagardon, 1998). Second, (b) *"openness and learning[6]"* gaps occur when firms need to develop external *"antennas"* or networks (Burt, 1992; Hagardon, 1998). Third, (c) the *"technological gap"* can be described as the lack of technological capabilities of private firms as a consequence of their lack of links with R&D centers and universities (Martin and Scott, 2000; Iammarino, 2005; Parrilli *et al.*, 2010; Dalziel, 2010). Last, (d) *"financial gaps"* occur when the *"policy component"* has not developed tools to help firms overcome financial difficulties (Murphy y Edwards, 2003; Beck and Demirguc-Kunt, 2006).

In a nutshell, the review of these gaps and their connection with the working of specific categories and the diversity of intermediaries is the core message of this contribution. The original aim is to identify the cohesion and effective working of the ISs based upon the proactive role played by such organizations, and later assemble different typologies (or even trajectories) of RISs in the context of Spain.

3. EVOLUTION OF INTERMEDIARY ORGANIZATIONS: BEYOND TRANSFER

The existence of system problems may hinder innovation. In addition to these problems, firms also need to overcome difficulties such as uncertainty or the lack of appropriability of the results of innovation[7] (Lundvall and Borrás, 1999; Nauwelaers and Wintjes, 1999; Bessant and Rush, 2000; Tödtling and Trippl, 2005; Acworth, 2008; Nauwelaers, 2011; Jalonen and Lehtonen, 2011). These difficulties reinforce their lack of will to invest in innovation and thus, an important number of firms might miss opportunities to expand their knowledge frontiers. In this context, public sectors aim to support private activity by funding the production of basic and applied research. New knowledge and technological outputs are often described as public goods that private

5 The authors name these as "managerial gaps" (Bessant and Rush, 1995 and 2000).

6 Some authors name these gaps as "structural holes" (Burt, 1992, 1997 and 2004; Hagardon, 1998).

7 A number of authors describe eight factors that create uncertainty in the innovation process, such as: technological uncertainty, market uncertainty, regulatory uncertainty, social and political uncertainty, acceptance and legitimacy uncertainty, managerial uncertainty, timing uncertainty, and consequence uncertainty (Jalonen and Lehtonen, 2011).

firms can absorb in a trouble-free process. On the contrary, this process is not automatic. Public investment produces a discontinuity or *"market failure*[8]*"* between new outputs and markets (Nelson, 1959; Arrow, 1962). Knowledge outputs need to be *"transferred"* into commercial opportunities. The process of knowledge transfer is also a resource-consuming one that justifies the origin of innovation-bound intermediation (Bessant and Rush, 1995 and 2000; Howells, 2006; Parrilli *et al.*, 2010; Nauwelaers, 2011).

The *"market failure"* demands that private firms update their skills to overcome their specific *"technological gaps"* and remain competitive. However, empirical evidence shows that *"technological gaps"* rarely occur in isolation (Nauwelaers and Wintjes, 1999; Woolthuis *et al.*, 2005; Parrilli *et al.*, 2010; Chaminade *et al.*, 2012). These gaps often come together with a wider set of *"human resource", "openness and learning"* or *"financial gaps"*. As well as absorbing new technologies, firms also need to build new managerial, strategic, financial and commercial competences and networks to expand their competitive edge.

System problems become a field of opportunity for the intermediary outlook. However, intermediaries need to adapt from a "*narrow/market"* towards a *"wider/system"* service-provision scheme. Helping firms overcome these gaps requires managing knowledge flows not only through research and education, but also among industrial and government sectors, turning straightforward intermediation into a more and more multilateral and dynamic function (Altenburg *et al.*, 1998; Howells, 2006; Muller and Doloreux, 2007; Acworth, 2008; Nauwelaers, 2011). All in all, new technological, industrial and institutional schemes provoke intermediary organizations to evolve progressively towards a more extensive *"catalytic"* role (Parrilli, 2013).

Nevertheless, their adaptation is not an easy process, bringing to the fore a number of tensions. First, intermediary organizations have grown in a somewhat *"anarchic"* way, becoming too numerous and important to remain ignored (Muller and Doloreux, 2007; Nauwelaers, 2011). Second, and due to rapid changes in innovation environments, their services are sometimes incoherent; while other times invisible or even overlapping. These tensions have gained the attention of a number of scholars. First, Howells (2006) reviews and synthesizes the main literature strands on innovation intermediation. His

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8 Neoclassics claimed that market mechanisms may fail to lead to an optimal and Pareto-efficient allocation of resources to innovative activities, and the State has to intervene to correct these inefficiencies (Nelson, 1959; Arrow, 1962). Due to the –private- underinvestment in research and innovation, governments ought to support the production of knowledge, either through subsidies or through own production in public organizations such as universities (Lundvall and Borrás, 1999).

originality renders his seminal work as a reference in the field[9]. The author presents a working typology for intermediary organizations, and frames their roles and functions through various qualitative empirical findings. Similarly, Nauwelaers (2011) explains the expected impacts of intermediation and discusses policy implications for regional authorities. She summarizes the contrasted features of innovation intermediation by opposing more traditional *"linear"* and systemic-evolutionary frameworks (Ibid: 471). In the line of Howells (2006), it is claimed that intermediaries care about the need for innovation of companies (particularly SMEs), but also have a broader mission[10].

These are essential contributions for the development of a new literature strand focused on intermediation, which might also constitute an important input to develop more effective ISs. Still, the role of intermediaries has not generally been well-grounded theoretically (Howells, 2006: 718), and some simplistic assumptions and *"umbrella definitions"* remain (Nauwelaers, 2011). Thus, identifying, defining and assessing intermediary performance and their influence on firms' competitiveness is an urgent need that calls for academic consensus. In this regard, the paper aims at making a particular contribution. First, we provide frameworks and figures to facilitate the categorization and assessment of the intermediary system. Second, we provide an adapted definition for intermediary organizations. Third, we conduct an empirical assessment set out to categorize –Spanish- regions based on the presence or absence of intermediary categories when looking at the above-specified gaps on the basis of the assumption that they support the integration of the RIS and its effective working.

Table 1 presents a novel categorization of intermediary organizations set out to nurture simplicity and precision in the identification of intermediary profiles. It introduces four complementary intermediary categories. Each of these categories specializes in specific gaps, creating "pairs". The table establishes the predominating profiles that span specific gaps according to their knowledge base and specialization (Burt, 1992; Bessant and Rush 1995 and 2000; Hagardon, 1998; Nauwelaers and Wintjes, 1999; Martin and Scott, 2000; Murphy and Edwards, 2000; Beck and Demirguc-Kunt, 2006; Muller and Doloreux, 2007; Dalziel, 2010; Parrilli, 2013). The table also presents the system components where these gaps and intermediary categories meet up. It provides a number of benefits. In terms of identification, it permits listing and labeling system

9The author claims that the interest in the role of intermediaries has emerged from a number of complementary research fields over the last 20 years. These include: (a) literature on technology transfer and diffusion; (b) innovation management; (c) the systems of innovation literature; (d) research into service organizations or KIBS firms; while in practice there are overlaps between these main groups (Ibid: 717).

10Nauwelaers claims intermediaries have a broader mission which is to facilitate fluidity in the Innovation System (Ibid: 474).

problems along with specific intermediary categories. These labels help prevail over fuzziness by systematizing intermediary categories. Last, in terms of role definition, the table facilitates conducting logical and systematic functional and structural interpretations.

Second, and building on previous studies (Howells, 2006; Nauwelaers 2011) and their evolutionary rationales, intermediaries will be defined as a system of complementary organizational categories that shape, pilot and ensure systemic integration, by reducing the complexity of transactions, enabling institutional change and promoting crucial learning dynamics among components, organizations and entrepreneurs; across political, economic and social innovation-relevant levels.

Third, Table 1 will facilitate a novel empirical assessment on the activity performed by a number of intermediary categories in Spanish regions. The assessment will be, to our best knowledge, a pioneering practice that leverages on the use of quantitative variables to provide information of the activity performed by these categories. This evolution led us present a brief but comprehensive typology, while it also provides a productive ground for future theoretical and empirical developments.

Table 1: Categorization of intermediary organizations

Cat.	Gap	Description of the gap	Components involved	Predominating profile	Empirical evidence
Cat. 1	Human resource gap	Lack or poorly developed management capabilities of private firms (Bessant y Rush, 1995 y 2000; Nauwelaers and Wintjes, 1999).	Knowledge exploitation component	Knowledge Intensive Business Service Organizations (KIBS)	Bessant and Rush 1995 and 2000; Hagardon 1998; Nauwelaers and Wintjes, 1999; Muller and Doloreux, 2007.
Cat. 2	Openness and learning gap	Lack of antennas to the outside (Nauwelaers and Wintjes, 1999).			Burt, 1992; Hagardon, 1998; Nauwelaers and Wintjes, 1999; Muller and Doloreux, 2007.
Cat. 3	Technological gap	Lack of technological capabilities (Nauwelaers and Wintjes, 1999; Parrilli *et al.*, 2010; Dalziel, 2010).	Knowledge exploration and Knowledge exploitation components	TTAs, technical advisory groups, business and trade associations.	Nauwelaers and Wintjes, 1999; Martin and Scott, 2000; Parrilli et al., 2010; Dalziel, 2010.
Cat. 4	Financial gap	Lack of financial capabilities (Nauwelaers and Wintjes, 1999; Murphy and Edwards, 2000)	policy and Knowledge exploitation components	Venture capitalists, Banks, business angels.	Nauwelaers and Wintjes, 1999 ; Murphy and Edwards, 2000; Beck and Demirguc-Kunt, 2006.

4. VARIABLES, DATA AND METHODOLOGY

a. PRESENTATION OF THE VARIABLES

Building on the categorization of intermediaries and gaps introduced (Table 1) we now turn the attention to the operationalization of quantitative variables as a means to conduct empirical assessments. Each category will be assessed thanks to a set of explanatory variables that will proxy their presence with regards to the gaps. Table 2 provides intermediary categories together with indicators, their units of measurement, sources and time periods. The variables we chose and adapted stem from a classification formulated to describe RISs that standout due to the active presence of intermediaries.

Our choice of these particular variables builds on several previous approaches that deal with the assessment of innovation and efficiency-related aspects of ISs. Particularly, we focus on the work of several authors that employ indicators to evaluate and present RIS typologies (Susiluoto, 2003; Navarro and Gibaja, 2009, 2012; Buesa *et al.*, 2002; Buesa and Heijs, 2007; Martínez-Pellitero, 2002 and 2007; Iammarino, 2005; Zabala-Iturriagagoitia *et al.*, 2007; Chaminade *et al.*, 2012). Additionally, we introduce a set of supplementary variables, such as AGR, IND and SERV, which provide an intuitive reference and attest the quality of the results fed back by the analysis; albeit they have no influence whatsoever over its core empirical findings. First, AGR represents the relative importance of "agriculture" in the regional economies under assessment. The second (IND) and the latter (SERV) represent the importance of "industrial" and "service" organizations respectively[11].

We also present Figure 1, which completes previous theoretical frameworks in a number of ways. First, it locates the gaps in or between the system components where they are produced. Accordingly, it also locates the intermediary categories in or between the system components where their activity is developed, which adds simplicity. Second, intermediary categories are included in an *"intermediary component",* producing a new system component that helps highlighting the importance of their *"catalytic"* role. The existence of commonalities in the purpose and activity performed by these categories suggested the possibility to arrange them together. Third, Figure 1 presents a space for future developments where new –currently unobserved- gaps and intermediary categories could be settled together, permitting a holistic approximation to the matter of intermediation. Fourth, the novel notion of a system of intermediary organizations could also facilitate the coordination and evaluation of their profiles and missions over time and space-based requirements. On the whole, Figure 1 simplifies understanding and enhances the possibilities to explore the performance of RISs by setting appropriate boundaries across intermediary categories, system problems, and the components and agents they liaise with.

11 Figure 2 (chapter 5) will back up the predictable opposition between "industry/service" oriented and "agricultural" regions. We expected intermediaries would agglomerate in industrial and service-oriented regions.

TABLE 2: VARIABLES EMPLOYED IN THE STUDY					
COMPONENT OF THE MODEL	CODE	INDICADOR	UNIT	SOURCE OF INFORMATION	PERIOD
CAT. 1	C11	Private companies that have implemented non-technological innovation betterments: marketing innovations.	Percentage	Innovation in companies´ survey. Spanish Official Statistical Institute (INE)	2008-2009
	C12	Private companies with an internet connection and a website		Survey on ICT. Usage and e-commerce in companies. Spanish Official Statistical Institute (INE)	2011-2012
	C13	Private companies that have implemented non-technological innovation betterments: organizational innovations.		Innovation in companies´ survey. Spanish Official Statistical Institute (INE)	2008-2009
CAT. 2	C21	Private companies that have cooperated with associated Spanish companies or other Spanish market sources in some of their innovating activities			
	C22	Private companies that have cooperated with associated international companies or other international market sources in some of their innovating activities			
CAT. 3	C31	Private companies located in science and technological parks			
	C32	Private companies that contracted R&D services to organizations and institutions belonging to Spanish "exploration components "			2008-2010
	C33	Private companies that have cooperated with sources belonging to Spanish "exploration components" in some of their innovating activities			
CAT. 4	C41	Public loans addressing private companies´ innovative activity	€ per thousand people		2010
	C42	Public subsidies addressing private companies´ innovative activity			
	C43	Total venture capital operations	Per hundred thousand people	Spanish Venture Capital Association (ASCRI) Statistics about R&D activities 2010	2005-2011
SUPLEMENTARY VARIABLES (SUP)	*AGR*	*Employed population by branch of activity, sex and AC: Agriculture*	*Thousands of employed population into thousands of working age population*	*Survey on Adult Population Involvement in Learning Activities. Spanish Official Statistical Institute (INE)*	*2012*
	IND	*Employed population by branch of activity, sex and AC: Industry*			
	SERV	*Employed population by branch of activity, sex and AC: Services*			

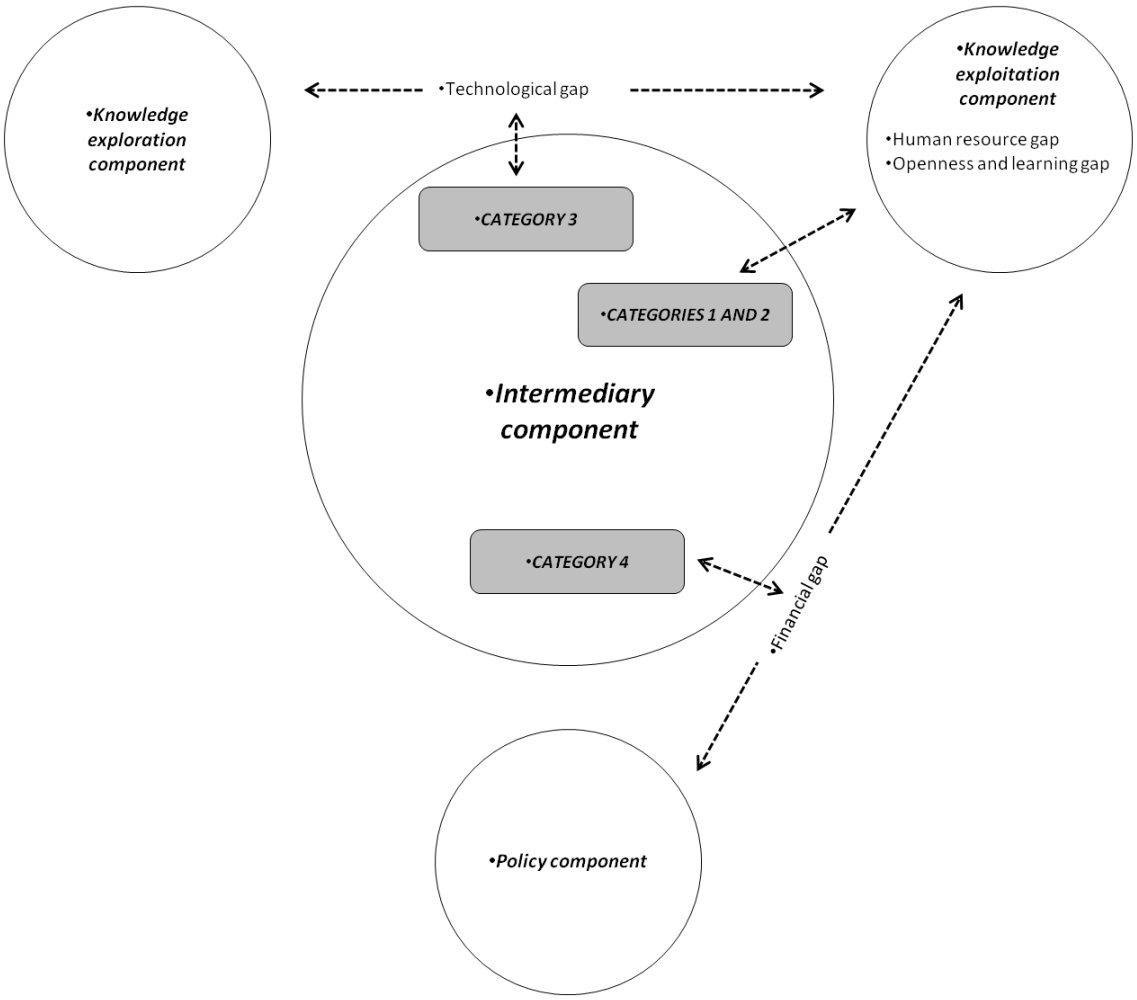

Figure 1: Intermediary categories along with system problems and the fundamental components of RISs.

It is important to underline that the current state of the art prevents direct evaluation of the performance of intermediary organizations, demanding that a number of achievements are made. A fundamental problem that needs to be brought forward is the excessive –path dependent- foci of both international (Ecotec, 2005; OECD, 1997/2006; UNU-MERIT, 2009) and national (Spanish) (INE) statistics on both *"firms"* and their *"technological capabilities"*. This constitutes the main stress of questionnaires in most surveys focused on development and innovation. It implies that most employed indicators are based on a firm-based input-output dichotomous perspective which limits systemic assessment in a number of ways. First, (a) IS scholars are not able to carry out accurate diagnoses if the evolutionary perspective is not assimilated. Second, and as a consequence of the former, (b) IS policy design is always limited to data availability, which might also limit the outlook of policy making, leveraging on a very narrow approximation of the real dynamics of the system (Edquist, 2011; Chaminade *et al.*, 2012). Economic growth cannot be explained solely in terms of the strategies and

performance of firms. Thus, the overall influence of intermediaries and other organizations has regularly been overseen and currently cannot be observed by the use of specific variables.

However, a number of variables may constitute a –beta- approximation to assess their presence, as presented in Table 2. Category 1 assesses the existence of Knowledge Intensive Business Service (KIBS) helping firms improve their *"managerial resources"* (Bessant and Rush 1995 and 2000; Hagardon 1998; Nauwelaers and Wintjes, 1999; Muller and Doloreux, 2007). A number of indicators (C11:C13) proxy external help provided by KIBS. We claim that *"private companies that have implemented non-technological innovation betterments, as marketing innovations* [12] *"* (C11); or *"organizational innovations"* (C13), shall have demanded and contracted services from external and specialized –category 1- intermediaries. On the other hand, those *"private companies with an internet connection and a website",* shall have also demanded and contracted external help to implement these innovations. Put together, these indicators are intended to proxy intensive collaborations between private firms and this category of intermediary organizations; but fail in the assessment of other important characteristics that remain veiled. Future approximations could complete the current view by adding variables which would help interpret not only the presence, but also the quality of the services provided by intermediaries with regards to these gaps.

Category 2 assesses the existence of KIBS companies facilitating firms *"learn from others and develop antennas"* in *"exploitation components"* (Burt, 1997; Hagardon, 1998; Nauwelaers and Wintjes, 1999; Muller and Doloreux, 2007). In order to do that, we add two new indicators (C21:C22) that proxy external help provided by KIBS. We claim that *"private companies that have cooperated with associated Spanish companies or other national market sources in some of their innovating activities"* (C21), or *"international companies"* (C22), shall have demanded and contracted services of external and specialized intermediaries oriented to facilitate firms' engagement in networks. Of course, these indicators fail to explain whether private firms' participation in these networks originated as a consequence of collaborating with intermediaries explicitly, or for other reasons such as higher *"social capital"* levels in the Autonomous Community (AC), or even pure chance. Thus, future approximations would aim to grasp these insights through the incorporation of new complementary variables.

[12] *The quotations stand for the actual questions in the surveys, translated into English.*

Category 3 is represented by a set of indicators (C31:C33) that proxy the existence of Technology Transfer Agencies, technical advisory groups, business and trade associations (…) facilitating firms to incorporate *"technological options and adapt state of the art to their own situation"* (Nauwelaers and Wintjes, 1999; Martin and Scott, 2000; Parrilli et al., 2010; Dalziel, 2010.). A high percentage of *"private companies located in science and technology parks"* (C31), frequently locate their headquarters close to collaborating intermediaries, such as trade associations, R&D companies, university science parks and the like. On the other hand, a high percentage of *"private companies that contracted R&D services"* (C32), and a high percentage of *"private companies that have cooperated with sources belonging to Spanish exploration components in some of their innovating activities"* (C33) provide a good approximation to ascertain the presence of intermediary profiles facilitating firms to adapt technological options within their own possibilities. Of course, new variables could improve future approximations by adding new indicators that would help us add essential information such as the profile of specific organization these companies contract or collaborate with, or the novelty of the results of these collaborations.

Category 4 assesses the existence of venture capitalists, banks or business angels facilitating firms *"overcome financial difficulties"* of RISs (Nauwelaers and Wintjes, 1999; Murphy and Edwards, 2000; Beck and Demirguc-Kunt, 2006). We employ three complementary indicators to measure this (C41:C43). The number of *"public loans"* (C41), the amount of *"public subsidies"* (C42) and the *"total venture capital operations"* (C43), provide good insights to evaluate the existence of these intermediary profiles. Nevertheless, new indicators could facilitate sounder information such as, the public or private nature of these organizations or the percentage of loans granted compared to the aggregated demand.

To finish this section, we claim this is still a very thin and preliminary estimation. First, Figure 1 puts together system problems and intermediary categories that mainly deal with firms' purview. This view could be completed with important interactions *"between" and "in"* other components that, to this point, have been overseen both by literature and policy makers (Isaksen, 1999; Nauwelaers and Wintjes, 1999; Tödtling and Trippl, 2005; Woolthuis *et al.*, 2005; Edquist, 2011; Chaminade *et al.*, 2012; Martin and Trippl, 2013). Secondly, our assessment is not intended to be complete and finalistic, as the current state of the art prevents the use of important variables that would improve analyses.

b. PRESENTATION OF THE DATA

The data we gathered for the empirical analysis is based on *ad hoc* exploitations sourced from various studies conducted by the Spanish Official Statistical Institute (INE). The special condition of an indicator employed in Category 4 demanded new data sourced from the Spanish Venture Capital Association (ASCRI). Table 2 gathers all sources of information employed in the assessment of our unit of analysis (Spanish ACs).

Our data is gathered in a matrix (appendix 2) whose rows correspond to Spanish ACs, while its columns stand for four separated sets of continuous variables that have been grouped under the names of *"Cat1","Cat2","Cat3","Cat4",* and relate to the intermediary categories introduced.

c. METHODOLOGY

Multiple Factor Analysis (MFA) (Escofier and Pagès, 1990; Abdi *et al.*, 2013) allows integrating heterogeneous groups of variables (*each intermediary category under assessment*) describing the same observations (*Spanish ACs*[13]) (Abdi *et al.*, 2013). We chose this technique because it is tailored to handle multiple data tables that measure sets of variables collected on the same observations. It provides each datatable (i.e. "Cat 1") with a set of partial factor-scores for the observations that reflect their specific "view-point" (Abdi *et al.*, 2013). It also helps to reduce the dimensionality of the whole dataset. The procedure will return an integrated image of the observations as well as the relation among the groups of variables (Navarro and Gibaja, 2009; Alberdi *et al.*, 2014). Each dataset needs to be *normalized*[14]. The second step is to merge the dataset and form a unique matrix; then, a global Principal Component Analysis (PCA) is performed on that matrix. Finally, the individual datasets are projected to the global picture to assess the existence of communalities and discrepancies (Abdi *et al.*, 2013). In this final projection, the final position of each Spanish AC in the global analysis would be the *barycenter* of its position for the four *"gaps"* or *"categories"* being considered. Secondly, we will complete our empirical study by performing a cluster analysis of the results of the MFA. Cluster analysis is the task of grouping a set of objects in such a

[13] *We refer to seventeen Spanish ACs. Nomenclature of Territorial Units for Statistics (NUTS-2), by regional level. We chose this level of disaggregation because the European subsidies that are provided to ACs are based on the NUTS-2 classification. For this reason, both design and implementation of corrective measures destined to overcome functioning problems within RISs would need be implemented under the coordination and supervision of autonomous governments. In order to get more information with regards to this issue:"NUTS-2 is employed as a basis for distributing cohesion funds, using eligible population, regional and national prosperity, and unemployment as variables for calculating the financial amounts corresponding to each country". (Pavía y Larraz, 2012, pp. 131).*

[14] *Technically, it is done by dividing all elements by the square root of the first eigenvalue obtained from its PCA (in other words, it is done by weighting each variable of the set j by* $1/\lambda_1^j$*, denoting* λ_1^j *the first eigenvalue of factor analysis applied to set j. (…) MFA weighting normalizes each of the clouds by making its highest axial inertia equal to 1, see Escofier and Pagès (1990).*

way that those in the same group (called a cluster) have more similarities to each other than to those in other clusters. Thus, this analysis will help us classify Spanish ACs into homogenous groups.

In terms of data analysis, the outputs below stem from the analysis carried out using R (R Development Core Team, 2011) and the FactoMineR package (Lê *et al.,* 2008; Husson *et al.,* 2011; R Development Core Team, 2011).

5. A TYPOLOGY FOR SPANISH RISS

a. REPRESENTATION OF ACS AND INTERMEDIARY CATEGORIES

We accomplish a MFA with the four groups of variables summarized in Table 2 and the Spanish ACs. The correlation circle (Figure 2) displays the positions of these variables regarding the two latent factors. The first factor, measured along the horizontal axis explicates 57.94% of the variance. The second factor is represented along the vertical axis and explicates 17.51% of the variance[15]. The first axis is correlated to variables belonging to the four groups. It will oppose four clouds of ACs. Figure 3 presents the position of the Spanish ACs regarding the two factors displayed. From right to left, we first find an isolated community: the Basque Country. Afterwards, we find a small group constituted by Navarre, La Rioja, Cataluña, Madrid and Aragon. Thirdly, we find another group formed by Valencia, Castile Leon, Galicia, Cantabria and Asturias. Finally, we find a last group formed by Extremadura, Andalusia, Murcia, Balearic Islands, Canary Islands and Castile La Mancha.

Both the Basque Country and the fist small group of communities show high coordinates on the fist axis, which is characterized by a positive association related to high density levels of intermediary categories over the gaps. Thus, we can infer that these ACs have better performing intermediary organizations when compared to other communities evaluated. Symmetrically, the performance of intermediary organizations in the remaining communities fades away as they get closer to the left margin of the figure, which leads us to intuit that the presence of well-functioning intermediary organizations could be correlated to economic development and to the overall innovative capabilities of the regions under assessment (Navarro and Gibaja 2009; Navarro and Gibaja 2012).

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[15] *Together, these two dimensions gather around 75% of the variance, meaning we lose 25% of the information as a consequence of reducing the complexity contained in the database. Thirteen dimensions are reduced into two latent variables which are represented by the horizontal and vertical axes of the visual outputs of the study.*

The second axis (Figure 3) also provides distinct clouds of individuals. Starting at the top of the figure, we first find Cataluña in a solitary and outstanding position. Secondly, we find a group that congregates Navarre, Madrid, La Rioja and Aragon, followed by a second group that includes most of the communities of the study. In fact this last group gathers all the remaining communities except for the Basque Country and Asturias, which are found at the bottom of the figure. The smaller variance of the axis makes it more complex to find a pattern for these observations. We could state that Cataluña, Navarre, Madrid, La Rioja and Aragon are somewhat separate from the rest as they are the highest ranking communities with regards to measures from indicators such as *"non technological innovation betterments"* (C11 & C13). On the other hand, in the case of the Basque Country and Asturias we find a better observation of the variables that contribute negatively to the second factor, particularly in the case of *"private organizations located in science and technology parks"* (C31).

All in all, Figure 3 shows that the Basque Country and Navarre standout in the *"high relational density level of their intermediary categories"* (Axis 1). On the other hand, the second axis demands for more attention. This axis opposes the presence of category 1 and category 3 intermediary organizations. Communities at the top of the figure (such as Cataluña) would be best represented by the high density of Category 1 intermediaries; whereas communities at the bottom (such as Asturias or the Basque Country) would be represented by higher densities of Category 3 intermediaries.

Supplementary variables named: *"AGR", "IND"* and *"SERV",* go hand in hand with the interpretation of the analysis. These variables are placed in the quadrant that one would intuitively find them; though the greater influence of the first axis (57.94%) provokes *"IND"* to be placed in the first quadrant instead of the second, as expected. These variables help us explain that the second axis also distinguishes between *"service-oriented"* (Cataluña), and more *"industry-oriented"* (Asturias, Basque Country) RISs.

b. GLOBAL DISPLAY OF THE GROUPS

We present the *communalities* and *factor loadings* in order to show the quality of the representation of the variables employed in the MFA (Table 3). The communalities represent the proportion of the variance of a variable that is explained by common factors. High communalities guarantee a high conservation of their variance and thus, good representation in the figures. Additionally, the *factorial matrix* contains the linear correlations between the variables of the analysis and the factors. These correlations are

also called *factor loadings* of the variables in the factors (Buesa *et al.*, 2002; Buesa and Heijs, 2007, Martínez-Pellitero, 2007).

Table 3: Commonalities and Factor Loadings of the variables

	COMMONALITIES	FACTOR LOADINGS	
	Dim.1 + Dim.2	Dim.1	Dim.2
C11	0.81498239	0.3784845	0.81959249
C12	0.48167784	0.6913652	-0.06076192
C13	0.84454743	0.6841268	0.61361059
C21	0.91486877	0.9387117	-0.18354569
C22	0.96064323	0.9798625	0.02264289
C31	0.44603961	0.2383429	-0.62388483
C32	0.84276922	0.8628028	-0.31359302
C33	0.87256262	0.8668231	-0.34810962
C41	0.89482693	0.8472242	0.42075903
C42	0.83674684	0.8928522	-0.19890154
C43	0.35246347	0.5927930	-0.03255637

Table 3 leads us to present Figure 4 which shows the quality of the representation of each group within this general picture (Escofier and Pagès, 1990). In this output, each group is represented by one point. Two main interpretations can be made. Firstly, it aids the presentation of the correlation circle (Figure 2). Categories 2 and 4 have more influence over the first factor *"high relational density levels of the intermediary categories*" than the others (Escofier and Pagès, 1990). On the contrary, the second factor is mainly due to Categories 1 and 3. The position of the latter on axis 1 shows these categories are not as strongly correlated to this factor as Categories 2 and 4. Secondly, this picture helps us evaluate the orthogonal projection of the cloud of groups. In this cloud, two groups are close to one another if they induce the same structure upon individuals. Category 1 is far from the others, meaning the relational density levels of the intermediaries represented under this label is weakly related to the overall density levels of the rest of the categories. The closest groups are Categories 2 and 4, meaning that these sets are almost *homothetic.*

c. CLUSTER ANALYSIS

We finish our empirical study presenting the results of the cluster analysis[16] performed from the findings of the MFA, which helps us classify ACs in homogeneous groups. The analysis presents four groups of ACs that reveal dissimilar relational density levels of their intermediary categories (Figure 5). The features of the groups are summarized in the following titles:

- **Group 1: Active, industry-oriented intermediary categories:**
  - Basque Country.
- **Group 2: Active, service-oriented intermediary categories:**
  - Aragon, Madrid, La Rioja, Catalonia and Navarre.
- **Group 3: Moderately active intermediary categories:**
  - Cantabria, Galicia, Castile Leon, Valencia and Asturias.
- **Group 4: Inactive (or inexistent) intermediary organizations:**
  - Canary Islands, Balearic Islands, Castile La Mancha, Extremadura, Andalusia and Murcia.

The present typology classifies Spanish regions according to the presence -or absence- of intermediary organizations. It displays similarities and differences with regards to the capacity of the latter to tap into the gaps. The resulting Spanish map (Appendix 3) reveals a strong north (center and east) –south outline that resembles other maps from previous studies focused on Spanish RISs (Coronado and Acosta, 1999; Martínez-Pellitero, 2007; Buesa *et al.*, 2002; Buesa and Heijs, 2007; Zabala-Iturriagagoitia, 2007; Navarro and Gibaja, 2012). This is an outstanding aspect of our investigation as it shall correlate *"higher density levels of intermediary categories"* with other aspects measured by these studies as the *efficiency* or, more broadly, the *innovative capabilities* of RISs. All in all, the presented conceptual and empirical foundations constitute a step towards the improvement of the diagnostic capabilities that might empower innovation policy intervention.

In general terms, the Basque Country stands out for its performance and its economic development. It represents the most integrated region according to the indicators we employ in the analysis. The comparative development of the managerial capabilities of

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[16] *We conduct an algorithm for hierarchical classification by calculating an incremental sum of squares (Ward´s method) and Euclidean distances as part of the observations of the study. Cluster analysis builds on the results of the MFA. Thus, the typology of regions depends mainly on the first factor of the study, which represents high percentages of inertia (57.94%). However, the second factor also has significant inertia (17.51%) and consequently, it also influences the classification.*

their firms and their intensive participation in networks represent important assets. The latter is also supported by higher R&D expenditures and the presence of financial support to spur innovation projects, which translate into habitual collaborative practices between universities, research centers and their medium and high-tech firms and industries. Intermediaries could focus on the improvement not so much of the quantity, but particularly on the quality of the relationships between agents, so that the R&D investment returned greater results. For that to happen, we need go beyond superficial policy statements like *"universities need to collaborate with firms"*, and actually develop new tools that empower scholars and policy-makers to design and spur *"smart networks"* depending on the clusters to be fostered and the underlying expectations and visions. While the *"intermediary component"* reveals good practices and high network densities, intermediary organizations still face great challenges. Importantly, the existence of interactions could only be considered a departing point to assess which networks shall be activated to drive *"smart strategies"*. Otherwise, the lack of analysis on the latter, or even the reinforcement of existing ones could also lead the region to dangerous lock-in situations, particularly in the case of its oldest industries and clusters (Morgan, 2013).

Aragon, Madrid, La Rioja, Catalonia and Navarre constitute the second group of regions. These regions show quite high comparative levels of integration, but represent less prominent positions. Their *"intermediary components"* also reveal good practices and high network densities, with particular reference to the intermediaries that deal with *"human resource"* and *"inter-firm networking"* competences. Due to the lower presence of industry, intermediary organizations could also focus on fostering new collaborations between universities, research centers and service organizations.

The rest of the regions are aggregated in groups 3 and 4. Due to their lack of integration and prominence, we claim that the RISs of these territories are at a very early stage or just do not exist (Alberdi *et al.*, 2014; Zabala-Iturriagagoitia, 2007). Consequently, the challenge faced by intermediary organizations is even greater when compared to the rest of the regions. To this regard, we observe two different scenarios. First, communities like Cantabria, Galicia, Castile Leon, Valencia and Asturias comprise a first subgroup with moderately active *"intermediary Components"*. Second, the remaining regions (i.e. Canary Islands) could lack the presence of intermediaries. Thus, while the first subgroup demands a strategy that could drive intermediaries to activate networks with special attention to the individual visions and strategies of their RISs, the second subgroup could demand that policy makers and private sectors deepen their

conversations to foster new sets of *"intermediary categories"*. This strategy would require extra levels of leadership and good coordinating capabilities among the multiple layers of governance from policy representatives.

To finish, while the final projections of our analysis could be similar to previous developments in the Spanish context (Coronado and Acosta, 1999; Martínez-Pellitero, 2007; Buesa *et al.*, 2002; Buesa and Heijs, 2007; Zabala-Iturriagagoitia, 2007; Navarro and Gibaja, 2012), differences are found in two aspects: 1) The element that helps identifying the typology (i.e. intermediaries); 2) The methodology and policy-making implications when we study *"partial analyses"*[17] of each of the categories and compare them. These analyses bring about quite different, complementary and more detailed information inputs that could return essential insights to design specific and effective problem-based innovation policies. The development of this information is reserved for future research. It is also important to underline that the methodological insights of this work may also be beneficial for other countries and regions that tackle the analysis of ISs from a quantitative perspective (Susiluoto, 2003; Hollanders *et al.*, 2009; Chaminade *et al.*, 2012).

6. CONCLUDING REMARKS

The article presents a new typology that classifies Spanish regions according to the presence -or absence- of intermediary organizations associated to a number of system problems thanks to the use of quantitative variables. While classic evaluations have frequently focused on firms' technological capabilities to explain regional innovative outputs (Ecotec, 2005; OECD, 1997/2006; UNU-MERIT, 2009), our exploratory approach calls for the assessment of the presence of intermediary categories as new possible ways to explain competitiveness. In order to do so, we have presented a number of frameworks and figures. First, we categorize intermediaries according to some specific problems they tap into, while we also include them in a new RIS *"intermediary component"*. Second, we operationalize sets of quantitative variables that permit new empirical assessments. All in all, our method brings forward certain benefits that help overcome the *"fuzziness"* that surrounds intermediaries (Nauwelaers, 2011; Howells, 2006).

The empirical analysis roots on an *ad hoc* data exploitation stemming from various surveys conducted by the Spanish Official Statistical Institute (INE) and the Spanish

[17] *"Partial analyses" -or "superimposed representations"- represent each region viewed in terms of each of the gaps and intermediary categories assessed and its barycenter (Abdi et al., 2013).*

Venture Capital Association (ASCRI). We conduct multivariate techniques such as Multiple Factor and Cluster Analysis. We find dissimilar outputs for the regions. The latter might demand that their *"intermediary components"* are provided with specific strategic recommendations in response to dissimilar system requirements. However, while some general guidance is provided, the development of *"partial analyses"* is reserved for future work. Together with other inputs, this information could facilitate the design of specific innovation policies for each region under assessment.

On the whole, the study follows a promising path towards the construction of more sophisticated policy tools and evaluations (Susiluoto, 2003; Zabala-Iturriagagoitia *et al.*, 2007; Rodriguez-Pose and Crescenzi, 2008; Hollanders *et al.*, 2009; Navarro and Gibaja, 2012; Chaminade *et al.,* 2012). In doing so, we also identified certain limitations. First, the lack of systemic perspective prevents the assessment of interactions *"between" and "in"* other components that, to this point, have been overviewed both by literature and policy-makers. Second, data availability is limited (Iammarino, 2005; Zabala-Iturriagagoitia, 2007; Asheim and Parrilli, 2012; Chaminade *et al.,* 2012) and neglects the importance of crucial –innovation related- organizations, such as intermediaries. Thus, the assessment we have given is not intended to be complete and finalistic, as the current state of the art prevents the employment of certain variables that would improve the analysis thanks to direct observation. Last but not least, longitudinal analyses would contribute to assess the influence of time over the behavior and functionality of intermediary categories.

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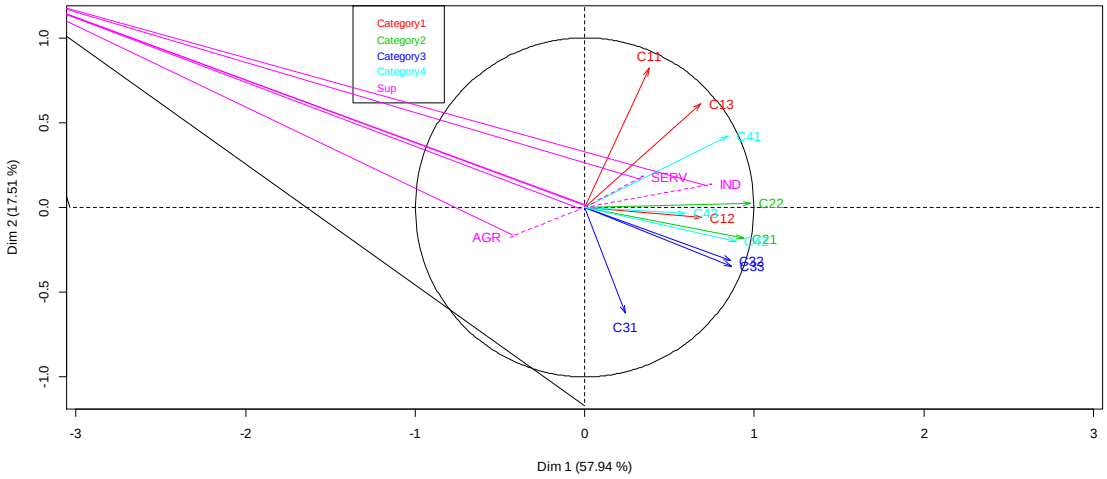

Figure 2: correlation circle

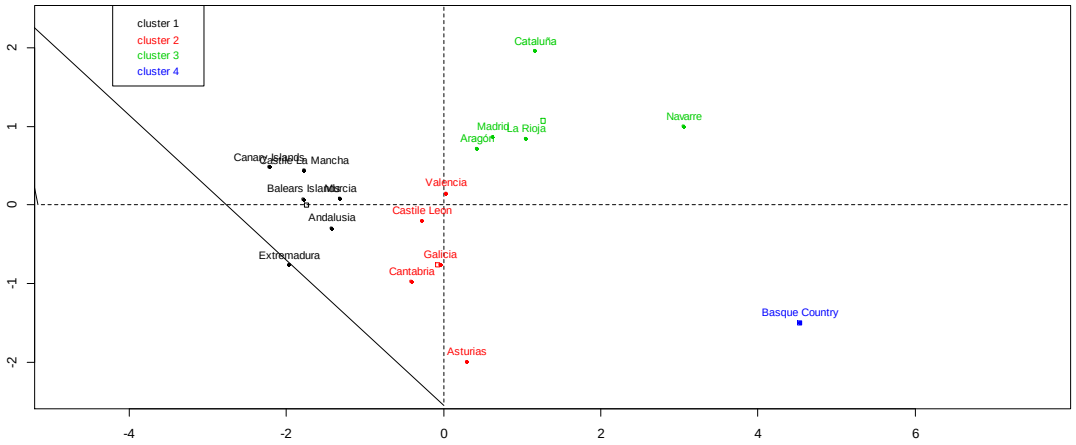

Figure 3: individual factor map

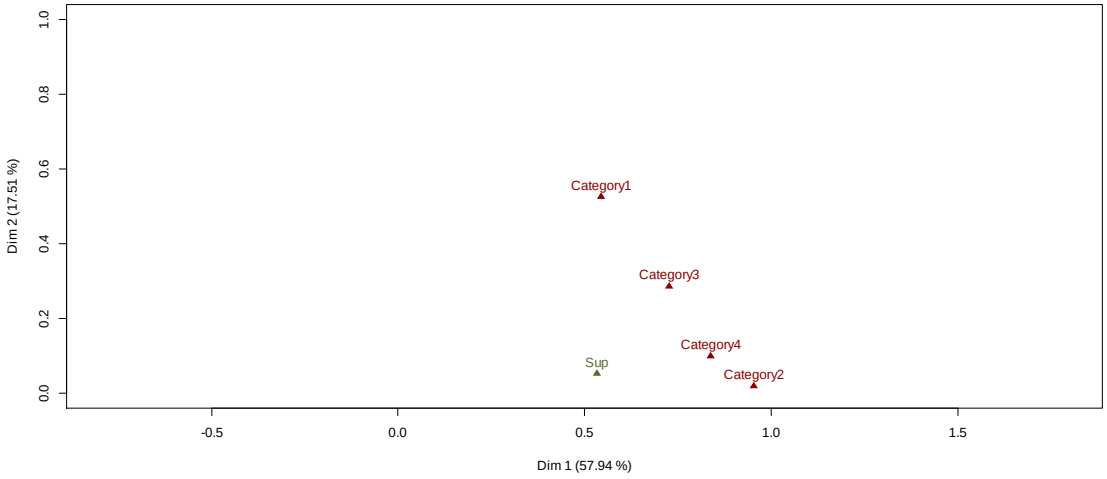

Figure 4: representation of groups of variables

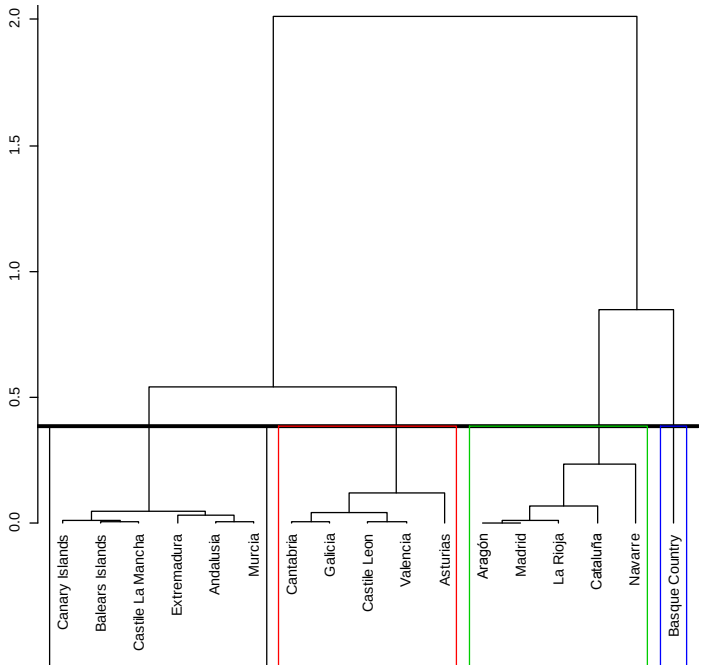

Figure 5: cluster dendrogram

Appendix 1: System problems and policy tools. Own modification of SMEPOL project: Nauwelaers and Wintjes, 1999- Table 8.2.				
	Human resources gap[18]	Openness and learning gap	Technological gap	Financial gap
Proposed definition	-Using qualified resources in firms; investing in training.	-Learning from others; developing antennas to the outside.	-Screening for technological options. Adapting state-of-the-art to own situation.	-Getting capital when markets prefer secure investments with short term return.
Policy tools	-Foster exchange of codified and tacit knowledge. -Foster intra-firms nodes for co-operation.	-Foster a more collaborative spirit and more strategic orientation.	-Provide bridge between firms and technological resources. -Provide "accessible technology". -Finance firms to access technology centers.	-Coach firms in linking to finance sources. -Foster specialization by combining technological support and finance. -Support the formation of sector-specific venture capital funds.

[18] *We include "strategy & organization" barriers into the category "human resources". We consider that the formalization of innovation strategies and the recognition of difficulties in commercial orientation of technological projects are intimately bounded to the qualification of resources in firms. This is why we believe it to be simpler and clearer to label these categories under a single category named: "human resource gap".*

Appendix2: database (standardized)

	CATEGORY 1			CATEGORY 2		CATEGORY 3			CATEGORY 4			SUP		
	C11	C12	C13	C21	C22	C31	C32	C33	C41	C42	C43	AGR	IND	SERV
Andalusia	-0.35	-1.11	-0.33	-1.06	-0.95	1.45	-0.88	-0.85	-0.26	-0.48	-0.08	0.08	0.09	0.11
Aragon	0.63	-0.33	0.98	0.09	0.08	-0.47	0.64	0.34	0.4	-0.38	-0.14	0.06	0.18	0.10
Asturias	-1.68	1.38	-1.24	0.59	0.12	1.56	0.48	0.45	-0.54	-0.04	0.37	0.04	0.15	0.11
Balear Islands	0.25	0.75	-0.9	-1.17	-0.91	0.65	-1.43	-1.37	-0.92	-0.83	-0.95	0.01	0.07	0.12
Canary Islands	-0.14	-0.76	-0.94	-1	-0.95	-1.31	-1.23	-1.32	-1	-0.84	-1.08	0.03	0.05	0.11
Cantabria	-1.3	0.38	-1.32	0.12	0.15	-0.55	0.14	0.2	-0.51	-0.33	-0.08	0.03	0.16	0.11
Castile Leon	0.03	0.08	-0.39	-0.18	-0.04	0	0.05	0.11	-0.46	-0.1	-0.39	0.07	0.16	0.09
Castile La Mancha	-0.02	-2.06	-0.3	-0.9	-0.87	-0.74	-0.71	-0.97	-0.75	-0.24	-0.64	0.07	0.17	0.09
Catalonia	1.83	1.15	2.08	0.13	0.45	-0.62	-0.25	-0.41	1.07	-0.05	0.71	0.02	0.19	0.13
Valencia	0.97	-0.33	-0.07	0	-0.06	0.15	0.95	0.11	-0.38	-0.1	-0.8	0.04	0.17	0.11
Extremadura	-2.08	-1.61	-1.35	-0.68	-1.16	-1.18	-0.63	-0.69	-0.84	-0.82	1.19	0.11	0.11	0.07
Galicia	-0.35	-0.19	0.11	0.22	-0.25	1.05	0.05	0.98	-0.76	-0.26	-0.34	0.08	0.16	0.10
Madrid	0.93	0.6	0.29	-0.13	0.54	-0.27	-0.54	-0.25	1	0.53	0.5	0.00	0.10	0.19
Murcia	-0.22	-0.37	0.27	-1.08	-1.05	0.44	-0.52	-0.6	-0.7	-0.56	-0.8	0.14	0.13	0.11
Navarre	0.84	1.03	1.34	1.27	1.94	-0.69	0.81	0.71	2.47	1.05	2.65	0.04	0.25	0.10
Basque Country	-0.05	1.25	1.01	2.53	2.33	1.76	2.8	2.63	1.22	3.4	1.08	0.01	0.21	0.14
La Rioja	0.72	0.09	0.76	1.25	0.63	-1.23	0.27	0.92	0.97	0.06	-1.2	0.05	0.24	0.10

Appendix 3: Map of the relational density of intermediary categories

Appendix 3: The different colors represent the group that each Spanish autonomous community pertains, with regards to the empirical analysis performed

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