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## **Innovation and Creative Industries: An exploratory exercise**

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### **Abstract**

This paper undertakes a comparative analysis of the innovative performance of firms operating in creative industries (CIs). Utilizing a particularly rich dataset on young firms from ten European countries it explores potential differentials in various innovation indicators between creative and non-creative industries. At a second stage of analysis a set of regression models are employed to examine the factors that are likely to affect the innovative performance of young firms, emphasizing on the potential determinants of innovation within CIs. Our findings indicate that firms in CIs outperform firms in non-CIs in terms of product innovation and R&D activities, but not in terms of process and organizational innovation. The regression results for CIs firms highlight the role of founders' characteristics, firms' technological effort and networking activities in the introduction of radical product innovation as well as R&D investment.

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**Abstract:** This paper undertakes a comparative analysis of the innovative performance of firms operating in European creative industries (CIs). Utilizing a particularly rich dataset on young firms from ten European countries it explores potential differentials in various innovation indicators between creative and non-creative industries. At a second stage of analysis a set of regression models are employed to examine the factors that are likely to affect the innovative performance of young firms, emphasizing on the potential determinants of innovation within CIs. Our findings indicate that firms in CIs outperform firms in non-CIs in terms of product innovation and R&D activities, but not in terms of process and organizational innovation. The regression results for CIs firms highlight the role of founders' characteristics, firms' technological effort and networking activities in the introduction of radical product innovation as well as R&D investment.

## **1. Introduction**

During the last decades radical changes in the production and consumption patterns of goods and services, primarily driven by knowledge-based technological advances, have drawn attention to creative people, creative products and creative industries as essential components of the creative economy. The key element underlying these concepts is creativity which may be approached in various ways highlighting artistic, scientific, technological and economic dimensions or processes (UNCTAD, 2010). Irrespective of the way it is interpreted, creativity is considered to be closely related to the generation of new ideas, originality and innovation. As such, its role is crucial in many knowledge-intensive sectors of the economy. In this respect, creativity is conducive to defining the scope of creative industries (CIs) for which the research and policy interest is increasingly growing.

Contributing to growth, job creation and internalization, CIs are widely recognized as a highly dynamic part of many economies which seems to be more resilient to economic recessions relevant to other sectors (UNCTAD, 2010). Indeed, in times of financial and economic crisis, these industries become even more attractive as a source of potential employment and entrepreneurial endeavour (Henry & De Bruin, 2011). The nature of innovation in the CIs has attracted little analysis until recently. Although a number of studies are indicating useful approaches to the management and broader organization of innovation and the types of innovation relevant to these industries, empirical studies are still missing (Sunley et al., 2008; Camelo-Ordaz et al., 2012; Lee & Drever, 2013; Lee & Rodríguez-Pose, 2013).

The present paper attempts to fill this gap by exploring different aspects of the innovative performance of firms in CIs as compared to those in non-CIs, along with potential determinants of innovation in these industries. Utilizing a unique dataset of approximately 4,000 young firms across ten European countries, a systematic empirical analysis is

conducted in two stages. First, CIs firms are compared to non-CIs firms in terms of various traditional innovation indicators such as product, processes and organizational innovation, and R&D intensity. At a second stage, employing a set of regression models for the total sample and for the CIs group, we assess the effect of creative enterprises on innovation, and we explore potential determinants of the innovative performance of young CIs firms, considering key factors, such as firm and founders characteristics and networking activities.

This work contributes to the relevant literature in several ways. First, it adds to the empirical research on CIs which, despite the increasing interest on these sectors, remains limited, especially as concerns the contribution of CIs to innovation. Second, utilizing a particularly rich dataset, it addresses the under-researched question of whether firms active in the creative industries outperform non-CIs firms in terms of innovation. Even though this issue is of considerable research and policy interest, large-scale studies undertaking comparative analyses of CIs in an integrated and systematic way are scarce (Lee & Rodríguez-Pose, 2013). What is more, this paper investigates a series of key innovation determinants, which have been extensively studied in other industries, but they are largely unexplored in the context of young firms in CIs (Camelo-Ordaz et al., 2012).

The paper is laid out as follows. Section 2 reviews the literature regarding definition, interpretation and measurement issues on innovation in the creative industries. The sampling method, dataset and variables used in our empirical models are described in Section 3. Section 4 presents and discusses the results of the empirical analysis, while some concluding remarks are provided in the last section.

## **2. Exploring and measuring innovation in CIs**

Innovation and its role for economic growth at both micro- and macro-levels have been investigated in numerous studies motivated by research and/or policy interest. Throughout the innovation literature one may come across a wide range of definitions and types of innovation referring to the introduction of novel products, services, technologies, processes and so on. In most such typologies creativity, irrespective of the way it is interpreted, possesses a prominent place among the key ingredients of innovation, while the interlinkages between creativity and innovation have been widely pinpointed in theoretical and empirical studies (Okpara, 2007; Lee et al, 2002; Stolarickô & Florida, 2006). This close relationship may be a reason for a number of studies assuming creative firms, by default, inherently innovative (Camelo-Ordaz et al., 2012). However, within the literature on CIs, empirical evidence testing related assumptions is rather limited and fragmented. In this respect, interpretation, definition and measurement issues referring to innovation in the context of CIs may be particularly relevant (Miles & Green, 2008).

In fact, despite the huge literature on innovation, what should be considered as an innovation and what should not remains in some aspects an issue of ongoing debate. In various innovation surveys and studies (e.g. Community Innovation Survey-CIS) the definition of innovation has been broadened to encompass not only product or technology innovation but also other forms of innovation concerning new schemes and practices in organization, management or marketing (OECD, 2006). However, the particularities of CIs raise additional issues that make identifying and measuring innovation within these industries an even more difficult task. The special nature of creative products or services grounded by 'content', 'experience' and 'user-centered' approaches, along with organizational structures related to micro-businesses, project-work and informal networks are some of the features that particularly apply to CIs distinguishing them from other

traditional industries. Such features have considerable implications for the innovation process and innovation output within CIs, where apart from typical forms of innovation in products or processes, new or different types of novelties are acknowledged (Miles & Green, 2011; Stoneman, 2007; HKU, 2010).

Along these lines, it is argued that innovation in CIs “encompasses not only scientific innovation but also hidden innovation, such as innovative processes hidden from classical innovation measures; soft innovation; or design processes as drivers of user-centred innovation” (HKU, 2010). Castañer and Campos (2002) attempt to elaborate the notion of *artistic* innovation revealing two significant aspects in which art enterprises innovate, namely content and form. Galenson (2006) also refers to the artistic innovation exploring the differences in the methods used by conceptual and experimental innovators. Handke (2004) emphasizes on content creativity as a form of innovation being distinguished from humdrum innovation, a concept used by Caves (2000). Based on specific case-studies from CIs, Miles and Green (2008) identify several forms of hidden innovation which are not captured by patent applications and are realized in non-scientific and non-technical areas. Such forms usually refer to changes to business models and organizational set-ups, original combinations of existing technologies for new purposes, and on-the-job innovation, with recognition of lower levels of innovation in the distributive phases of production (Brandellero & Kloosterman, 2010).

In a quite different context, focusing on innovation in products that primarily impacts upon sensory perception and aesthetic appeal, Stoneman (2007, 2009) distinguishes between two main types of soft innovation. The first type is innovation in products that typically offer appeal to the senses or the intellect (aesthetic appeal) and are not generally considered functional in nature. Such products include music, books, fashion, art, films, video games etc. and are to be found particularly in CIs.

The second type of soft innovation is related to aesthetic innovations in industries the products of which in addition to their functionality also exhibit aesthetic characteristics that affect our senses e.g. the appearance of furniture or a personal computer, the sound of a car exhaust, the touch of a rug or a cloth, the taste of meal etc. Many new products of this type do not typically belong to creative industries and offer both soft and functional innovation characteristics, for example a new model of portable computer will offer improved hard disk capacity, increased ram memory, more autonomy, smaller weight etc. but also new colours, new shape, design, sounds etc. Stoneman (2009) argues that since soft innovations are not a result of formal R&D or cannot be patented, traditional indicators are of little use. However, the second type of soft innovation may to some extent be captured by the OECD concept of marketing innovation which involves significant changes in product design or packaging, product promotion and pricing. It is worth noting that soft innovation as well as hidden innovation, even though they are particularly relevant for CIs, they may apply to other industrial sectors as well.

Despite the fact that, in general, there seems to be some consensus on the idiosyncratic characteristics of innovation in CIs, with the exception of few works based on case-studies (e.g. Miles & Green, 2008), the existing empirical literature uses primarily traditional indicators to measure innovation in CIs. This approach while may fail to capture and measure all forms of innovation in this sector, it is advantageous in that it enables comparative analyses in innovation performance between creative and non-creative sectors (Müller et al, 2008). Using a large sample of UK firms, Chapain et al. (2010) employ different innovation indicators, namely product innovation, process innovation and an intellectual property protection index, to investigate the innovative performance of creative sectors. They find that creative industries overall display levels of innovation above the national average for all used indicators.

Lee and Rodríguez-Pose (2013) using also UK data provide evidence according to which CIs are more likely to introduce entirely new products than firms in other sectors, but they find no overall link with innovation more generally. Following a similar approach but examining firms located in London, Lee and Drever (2013) provide no evidence that London's creative industries are more innovative than other sectors. However, both studies emphasize on *creative occupations* as a more important driver of innovation. Focusing on small creative enterprises, the empirical analysis of Camelo-Ordaz et al. (2012) indicates that intrapreneur's previous experience in developing and commercializing creative products and services, together with an entrepreneurial value system, constitute characteristics that positively affect a firm's innovation performance.

Despite the *direct* contribution of CIs to innovation as examined by the above studies, the literature also highlights their *indirect* contribution, considering CIs as supporters to other sectors' and actors' economic value and innovation. Creative industries are characterized by their cross-sectoral scope and benefit particularly well from the growing demand for high-quality services and customized solutions. The creative industries sector plays a special role as creative input provider in the innovation system by offering itself as partner to diverse industries supporting the development of new products and services as well as manufacture and marketing (Kimpeler and Georgieff, 2009). The studies of Müller et al. (2008) and Kimpeler and Georgieff (2009) provide empirical evidence from Austrian firms, suggesting that most creative enterprises support innovation by demanding new technology, especially ICT, and by helping their customers to innovate. Specifically, almost half of all examined firms in creative industries are found to support their customers from the manufacturing industry in introducing innovations. The authors conclude that creative industries in Austria are typical cross-cutting industries, which due to their specific situation act with particular flexibility in different markets and for different client segments.

### **3. Data and variables**

#### *3.1 Defining the creative industries*

Creative industries are at the crossroads of arts, culture, business and technology and can be defined as those economic activities that strongly rely on individual creativity, skills and talent and in principal produce intellectual property in contrast to material goods or immediately consumable services (UNCTAD, 2008). A review of the policy literature indicates that although several questions and issues regarding the definitional coherence of CIs still remain open, there is increasing consensus on which sectors should or should not be included in the creative industries group. However some debates still exist about the activities that should be considered to belong in the 'core' of the creative or cultural industries (Flew and Cunningham, 2010).

In order to identify firms active in the CIs we use a sector classification approach following more or less the more recent NESTA report (Bakhshi et al., 2013). In particular, we use a 'narrow' definition of CIs following the categorization proposed by the NESTA report and a more 'broad' one where we add two more sectors in our sample of creative firms (see Table 1): engineering activities and related consultancy, and research and experimental (R&D) activities. We have decided to include them in our analysis as both activities exhibit many features of individual creativity (Miles and Green, 2011). In addition, several empirical studies consider these two sectors as creative ones suggesting that they show many similarities with the rest of the creative industries regarding the role of creativity, skills and individual talent as well the role of producing intellectual property as a base of commercial value creation (Müller et al., 2008; Lazzeretti et al., 2009; Lazzeretti et al., 2008; Boix et al., 2012).

*Table 1 around here*

### 3.2 Data

Our empirical analysis is based on the AEGIS dataset<sup>1</sup> which includes information on approximately 4,000 firms. It was created through a large-scale survey in 2011 aiming at the empirical investigation of knowledge-intensive entrepreneurship in Europe.

The survey was carried out in ten European countries, nine of which are members of the European Union (Czech Republic, Denmark, France, Germany, Greece, Italy, Portugal, Sweden, United Kingdom) and one is a candidate member (Croatia). The countries were selected strategically in order to include the largest four economies and some of the medium and small economies in the EU. The survey targeted a large number of sectors spanning the categories high-tech and low-tech manufacturing and knowledge-intensive services (KIBS).

The study's initial population of companies was drawn from the Amadeus database focusing on newly established firms i.e. companies that were up to ten years of age. The originally selected population was supplemented from additional data sources, namely Kompass and Dun & Bradstreet, in order to reach the pre-selected targets of sample stratification per country and sector combination.

The population extracted from all available data sources included 202,286 newly established firms with reported primary activity in the pre-selected sectors. To ensure the criterion of firm newness some screening questions were put in the introductory part of the questionnaire in order to screen out:

- firms that were just new legal entities, i.e. companies that have resulted from some kind of legal transformation of already existing firms

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<sup>1</sup> The AEGIS dataset was developed in the context of the FP7 AEGIS (Advancing Knowledge-Intensive Entrepreneurship & Innovation for Economic Growth and Social Well-being in Europe) project (contract number: 225134)

- subsidiaries of existing firms and firms that had resulted from a merger, an acquisition or a joint venture

The survey questionnaire was filled in during a telephone interview with one of the firm founders. All interviews were conducted in the ten corresponding native languages by 174 different reviewers. The average response rate of the survey was 31.2%, but rates ranged within countries from 19.5% in the UK to 63.9% in Croatia.

The sample firms are independent young entities founded between 2001 and 2007 with an average age of 7.1 years. All firms have been in operation at least 4 years, and therefore it can be assumed that they have managed to exceed the critical three-year survival threshold. The majority of them (63.6%) are micro firms i.e. they employ up to 9 full-time persons. 88.4% can be qualified as small firms because they employ less than 50 persons, while at the same time only a very small share of them can be regarded as large or very large firms (0.28%).

### *3.3 Measures*

#### *3.3.1 Dependent variables*

Innovative performance in the creative sectors has been captured through different approaches. One way is to apply the traditional innovation measures based on the methodological recommendations of the OECD and Eurostat provided in the 'Oslo Manual' (2005). To our knowledge these standard innovation measures are used in the majority of empirical studies trying to link innovation and creative industries. Another way is to capture the specificities of innovation in creative enterprises by developing separate indicators measuring types of innovative activity that cannot be gauged by typical innovation measures (see Miles and Green, 2008). In this paper the definition and measurement of innovation performance dimension is based on fairly standard variables similar to those employed in the Community Innovation Survey (CIS) coordinated by Eurostat. Taken together they

capture various aspects of innovation performance, including product, process and organizational innovation, and methods of intellectual property protection. In doing so we are able to directly compare innovation performance of creative and non creative firms.

Product innovation is measured with a variable capturing the degree of novelty of product innovation that had occurred in the three years previous to the survey. More specifically we measured the radicalness of product innovation as an ordinal variable taking the values of 1 (= no innovation); 2 (= new-to-firm); 3 (=new-to-market); and 4 (= new-to-world product innovation).

Process innovation is captured by three items: innovation in manufacturing processes, innovation in delivery and distribution methods and innovation in supporting activities for firm processes. It is a binary variable (yes/no) indicating as innovative a firm that has exhibited at least one of the three abovementioned processes innovation methods during the last three years.

Organizational innovation is operationalized using two variables: adoption of improved management systems and changes in the organization's managing structure. It is a binary variable (yes/no) indicating an organizational innovation when a firm has applied at least one of the two aforementioned changes in the last three years.

Finally, we also use R&D expenditure as a measure covering the input side of the innovation process. It is gauged using a continuous variable, namely, the average percentage of firm sales spent on R&D during the last three years.

### *3.3.2 Independent variables*

Existing studies provide input on various factors either internal or external to the firm that can affect its innovative performance. Internal factors include first of all the knowledge, skills and expertise brought into the firm by its workforce and the founding team, obtained

through earlier experience, education, training etc. Firms require an adequate stock of qualified manpower to sense new market and technology opportunities and absorb new knowledge that might be turned into innovative products and services.

#### *Skills of workforce*

The inability to recruit high quality staff (e.g. engineers, scientists) can be a serious impediment to a firm's subsequent growth and innovation (Romijn and Albaladejo, 2002). Firms can further enhance their human capital stock over time by offering internal and external staff training.

The following variables reflect the quality of the venture's human capital, and particularly educational qualifications and emphasis on employee training.

*University degree:* a continuous variable measuring the percent (over total full-time employment) of employees with a university degree.

*Employee training:* this is a single Likert-type question (1: Strongly disagree; 5: Strongly agree) asking respondents to indicate their firm's emphasis on systematic, internal and external, personnel training

#### *The founding team's characteristics*

*Educational attainment.* The level of educational attainment of founders may be an important factor for innovation (Shane, 2000). Through formal education founding team members acquire skills that help them recognize opportunities in the business environment and increase their ability to absorb new ideas and thus effectively seize new opportunities. For each individual member of the founding team we measure educational attainment using an ordinal variable taking the values: 1 – elementary education; 2 – secondary education; 3 – Bachelor degree; 4 – Postgraduate degree; 5 – PhD degree. We average across team members to derive an overall measure of founders' education.

*Prior working experience in university or research institute/lab.* Innovative activities imply a certain level of specific know-how. Prior work experience in a scientific working environment appears to be conducive to innovation. Public science base can be found useful both in nurturing fruitful ideas that later on may be turned into important innovations in a business context and in maintaining networking relations with previous employers that can be of great value to the new firm (Romijn and Albaladejo, 2002). Founding teams with previous work experience in the R&D function (e.g. prior work experience in university or research institute) will impact on a firm's ability to grow and be innovative and may be in part substitute for a firm's lack of a track record. This is because this type of knowledge is required to appraise the potential of competing research streams, to develop R&D strategies, to organize and coordinate research projects and to orchestrate research resources towards the development of more valuable capabilities (Lynskey, 2004; Arvanitis and Stucki, 2012). We measure the prior working experience in academic environment as the number of founders in each team who had previously held such a position.

*Founders' age.* Investments in innovation are typically long-term and pay-offs are not really visible at the time of the investment. Innovative activities would therefore be associated with the founding team's risk behaviour. A significant proxy for the risk behaviour of founders is considered to be their age (Arvanitis and Stucki, 2012). Literature review suggests that the founding team's age is generally negatively related to entrepreneurial success. Younger founders are considered more comfortable with ambiguity and uncertainty and thus less risk averse than older ones (Hambrick and Mason, 1984; Wiersema and Bantel, 1992). Younger founders may be more prone to undertake novel and unprecedented strategies (Goll et al., 2008), while it is widely accepted that as people grow older they become less flexible in terms of change and take fewer risks. Age is averaged across founding team's members.

*Founders' gender.* Risk-taking is also affected by gender as women are generally considered to be more risk averse than male entrepreneurs (Jiannakopoulos and Bernasek 1998; Eckel and Grossman, 2002). We measure gender diversity within founding teams using the Blau's index (1977). This index takes values between 0 and 1. A higher index indicates more mixed teams in terms of gender. Taking into consideration that the grand majority of founding teams in our sample are dominated by male founders increased gender heterogeneity indicates the presence of female founders in the team.

*Team diversity in terms of expertise.* There is a stream of research that suggests diversity, i.e. heterogeneity or variety within a team, is considered beneficial for achieving desirable outcomes (Harrison and Klein, 2007). The key idea is that teams whose members are dissimilar in terms of the information type they possess be it knowledge, functional background or experience are likely to outperform homogeneous teams (Argote and Ingram, 2000). Founding teams with diversity in terms of knowledge and expertise may increase the information for problem solving, foster the team's ability to interpret the new firm's internal and external environment from different angles and thus enhance the ability of the group to find effective solutions to problems (Watson et al., 1993). As a consequence, team heterogeneity may create synergistic effects based on the founders' specific cognitive and human capital resources and foster innovative performance. Empirical evidence also suggests that when both technical and commercial skills are combined within the founding team young technology-based firms enjoy highest growth and innovative performance (Colombo and Grilli, 2005). For each founder we measured main areas of expertise (i.e. technical/engineering; general management; product design; marketing; finance; and other). More than one answer was possible for each individual. Because we are interested in the *diversity* of experiences among team members, we calculated Blau's (1977) index ( $1 - \sum p_i^2$ ), where  $p_i$  is the fraction of team members with experience  $i$ .

*Founding motives.* The importance of factors regarding the perception of opportunities deriving from technical change and new market needs as determinants (two items) for the formation of the venture are measured using a Likert-type scale (1: Not important; 5: Extremely important). Founding motives related to exploiting technology or market changes in the external environment are revealing that founders early enough (since firm foundation) have the ability and skills to scan the business in order to sense and seize new opportunities. This is an important prerequisite for innovative activity.

#### *Firm's internal technological effort*

The innovative capability of firms is also dependent on knowledge generated from internal sources (in-house R&D) and their ability to offer products or/and services with novel characteristics. Both variables are measured with single items using a 5-point Likert scale.

#### *Firm characteristics*

*Firm size* is measured by the natural logarithm of full-time employees. Larger firms are generally expected to devote more resources to innovation projects than smaller ones.

Competing on international markets requires competitive advantages. Thus, the *export orientation* of a firm would have a positive correlation with its innovative activity (Roper and Love, 2002). *Sales in international markets*, is a continuous variable measuring the percentage of sales obtained in international markets in the last three years. It reflects the degree to which a firm pursues opportunities beyond domestic markets.

#### *External sources of innovation*

Due to their liability of newness and smallness it is important for young firms to use external sources of knowledge and networking activities in order to identify innovative opportunities and complement their limited resource base with additional resources and new knowledge.

Networks have been found important for firms to create competitive advantages (Dahl and Pedersen, 2004; Littunen, 2000). Common goals may be shared by network members

regarding markets, market shifts and customer needs, and the establishment of best practice techniques in advertising and promotion. Incentives for participating in networks can also be of a more strictly economic nature such as financial assistance in the form of loans or fund seeking. To operationalize the different underlying dimensions of networking capability we first used items related to market processes such as collecting information about competitors, accessing distribution channels, exploring export opportunities, advertising and promotion. To capture the technology side of networking capability we employed variables assessing networks' impact on the development of new products/services, the management of production and operations, as well as on easy access to skilled personnel. Finally, to grasp the economic and more generic value of networking, we used variables relating to networks' help in obtaining business loans, attracting funds or getting legal support.

*Knowledge acquired from external open sources* is operationalized using three items: knowledge sourced from trade fairs, conferences and exhibitions and from scientific journal and other trade or technical publications.

As already mentioned networking and knowledge seeking intensity from open sources are both measured using two multi-item, Likert-type scales. Confirmatory factor analysis confirmed the uni-dimensionality of each scale.

#### **4. Empirical Results**

Our empirical analysis unfolds in two stages: First, we explore any differences in various innovation measures between firms in creative and non-creative industries, and also across the various sectors within the CIs. Then we apply different regression models to identify factors that are more likely to affect the innovative performance of newly established firms in Europe.

#### *4.1 Innovation performance of creative firms*

Tables 2 and 3 present the comparative descriptive results of various innovation indicators for creative and non-creative firms using both the narrow and broad definition of CIs, as discussed in Section 3. Results in Table 2 suggest that creative firms appear to be more innovative than non-creative ones in terms of sales of new services as a percentage to total sales, while no or a small difference in favour of non-creative firms is found with respect to the share of new goods to total sales. These findings are not surprising given that CIs, as defined in Table 1, include almost exclusively service firms. Although it is advocated that creative industries are typically investing less in R&D compared to other sectors (e.g. Miles and Green, 2008), the creative firms of our sample appear to outperform their non-creative counterparts in terms of R&D expenses. This finding, however, is in accordance with relevant evidence highlighting the greater engagement of CIs firms in internal R&D activities compared to firms in other industries (Chapain et al., 2010), and, in particular, firms in knowledge-intensive industries (Müller et al., 2008; Kimpeler and Georgieff, 2009).

*Table 2 around here*

In line with previous research findings (Muller et al., 2008; Chapain, 2010) our results in Table 3 also suggest that creative firms are more frequent product innovators than non-creative ones.

*Table 3 around here*

The difference in innovation activities between the two groups of firms appears to be even larger in terms of their intellectual property (IP) protection methods. In particular, a significantly larger proportion of firms in CIs appear to protect their intellectual property using either formal (patents, trademarks and copyrights) or informal methods (secrecy, lead-time advantages on competitors and complexity of design). Even though, some studies argue on the relatively limited use of IP protection methods in creative sectors (e.g. HKU,

2010; Miles and Green, 2008), Chapain et al. (2010) provide evidence on considerably greater use of formal and informal such methods in CIs compared to other industries. On the other hand, our descriptive results suggest that the sample firms active in the CIs appear to be less frequent process and organizational innovators than firms in other sectors. These findings are in line with related empirical evidence indicating that CIs firms are less likely to introduce process innovations compared to firms operating in non-CIs (Lee and Rodríguez-Pose, 2013; Lee and Drever, 2013).

Focusing on comparisons within CIs, Table 4 presents the shares of firms that account for different forms of innovation in each creative sector. Being largely consistent with relevant evidence (Chapain et al., 2010; Muller et al., 2008), we find Computer programming as the most innovative creative sector with reference to all innovation indicators but one (formal IP protection), followed by either the Publishing or the Advertising sector. Architecture, on the other hand, appears to considerably lag behind especially in product innovation and formal IP protection methods. This finding is in accordance with related studies pointing to Architecture as the least innovative creative sector in terms of any type of innovation (Muller et al., 2008).

*Table 4 around here*

#### *4.2 Determinants of innovation in young creative firms*

Tables 5 to 7 present the results from the econometric analysis intended to identify potential determinants of the innovative performance of young firms in Europe. Results in Table 5 concern the total sample where a dummy for CIs (first row) is included in all models to test the effect of the creative sectors on alternative innovation indicators<sup>2</sup>. Tables 6 and 7 report the results for product innovation and R&D intensity respectively, focusing on firms in CIs. Descriptive analysis in Section 4.1 points out that firms in CIs appear to outperform firms

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<sup>2</sup> The relevant dummy variable is constructed using the broad definition of CIs. The use of a respective dummy based on the narrow definition of CIs yields almost identical results.

in other industries in terms of product innovation and internal R&D. Thus, it is of particular interest to further explore the determinants affecting these innovation measures in young creative firms. To control for country effects, country dummies are included in all models<sup>3</sup>.

In Table 5 the reported results concern four models corresponding to four alternative innovation measures, namely product, process and organizational innovation, as well as the percentage of sales spent on R&D. Since product innovation is gauged using a categorical ordinal variable, as described in the data section, an ordered probit model is employed to estimate the effects of predictor variables on the probability to produce product innovation of different degrees of radicalness. For the purposes of our research only the results for the most radical form of product innovation (new-to-the world) are reported. The models for process and organizational innovations are estimated using probit regressions since both corresponding dependent variables are binary. In all cases (ordered probit or probit models), the average marginal effects are estimated and reported. Finally, an OLS regression is applied for the R&D intensity model, where a continuous dependent variable is used.

*Table 5 around here*

Results in Table 5 enable us to test in a way the findings from the preliminary comparative analysis in section 4.1. In fact, operating within a creative sector is found to significantly increase the probability of introducing a radical product innovation and also has a positive effect on R&D investment. On the other hand, the effect of the CI variable on the probability of introducing a process or organizational innovation is found negative and not statistically significant. Apparently, the preliminary findings indicating product innovation and R&D intensity as the innovation measures in which firms in CIs perform better (relative to firms in non-CIs) are confirmed. These results are in line with empirical findings provided by Lee and

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<sup>3</sup> The relevant results are omitted in the tables for presentation reasons.

Rodriguez (2013) which suggest that creative firms appear to play a significant role in introducing *original* product innovation, but not process innovation. However, our results offer only partial support to Lee and Drever (2013) who find no evidence that London's creative industries are more innovative than other sectors considering both product and process innovation.

Examining in turn other potential determinants of young firms' innovative performance, we find that both internal and external sources of innovation appear to play a significant role on most innovation measures used (Table 5). This implies that, in general, irrespective of the way it is approached/measured, innovation of young firms should be explored on the grounds of both internal factors (firm and founders' characteristics, personnel skills and firm's technological effort) and external factors.

Focusing on determinants that affect at least three innovation indicators, we identify firm size, all founders' characteristics except gender, firm's ability to produce novel products and the two examined factors external to the firm as the most influential. All estimated effects are found positive apart from those referring to the founders' educational attainment impact on process innovation, and the founders' prior R&D working experience on organizational innovation. In the former case, the negative effect of founders' education on process innovation may indicate that formal education systems due to their various limitations often fail to transmit specific knowledge or help in the development of competencies and skills needed to introduce, for a example, a new method of production. In some aspects, high educational levels may indeed restrict creativity and the capacity to innovate (Lampel et al., 2000). Following a similar rationale, working experience in a University or research institute may provide research-related knowledge and management skills but it may prove unhelpful, or even detrimental in the development of specific skills required for introducing organizational innovation.

The picture does not seem to change in any significant way if we focus on the results for product innovation of newly established firms in CIs (Table 6)<sup>4</sup>. To explore the effects of different sets of explanatory variables five models have been estimated. Sector dummies are included in all models with Architecture assumed to be the reference sector. Confirming the relevant preliminary finding and being consistent with relevant empirical evidence from probit regressions (Müller et al., 2008) we find that all sectors show a higher probability to produce a radical product innovation relevant to Architecture.

*Table 6 around here*

The firm and founder characteristics appear, in general, to play a highly significant role in introducing radical innovations in the CIs. In particular, larger firms with high export intensity are more likely to introduce a radical product innovation relevant to their smaller counterparts with no export orientation. Confirming our expectations, founder characteristics referring to educational attainment, University working experience and motives related to opportunities identification are found to exert a positive effect on the likelihood for the young CIs firms to innovate in a radical way. Notably, the effect of diversity in terms of expertise is also found positive and highly significant in all models. This finding highlights the importance of team heterogeneity in terms of knowledge, skills and expertise for firms' growth and innovative performance, as suggested by both theoretical and empirical evidence (e.g. Argote & Ingram, 2000; Colombo & Grilli, 2005)

On the other hand, despite the evidence on a negative relationship between the founders' age and innovative performance of small firms (e.g. Alasadi and Abdelrahim, 2008; Kangasharju, 2000) and more specifically of small firms in CIs (Camelo-Ordaz et al., 2012), the effect of the age variable, though negative in sign, is not found statistically significant.

Importantly, the negative effect expected for the founders' gender is confirmed by our

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<sup>4</sup> Results for firms in CIs are obtained using the broad definition of CIs. However, the use of the narrow definition of CIs does not alter the results in any substantial way.

results, suggesting that due to the relatively high risk aversion characterizing female entrepreneurs (e.g. Eckel and Grossman, 2002), CIs firms whose founding team involves more women are less likely to produce a radical innovation.

Focusing now on employees, the skills of workforce obtained from University studies are found to positively affect the likelihood for a CIs firm to innovate radically, while skills from training appear to be insignificant in most cases. Thus, the evidence emphasizing on human capital as a driver of product innovation (e.g. Romijn and Albaladejo, 2002) is partially confirmed. In addition, the firm's technological effort as captured by in-house R&D and ability to produce novel products/services results in increased likelihood for a CI firm to introduce radical product innovations. As regards external sources of innovation, being in the same line with existing evidence (Müller et al, 2008), CIs firms which are drastically involved in various networking activities are found to be more likely to introduce a radical product innovation. On the other hand and contrary to the respective finding for the total sample (Table 5), knowledge from external open sources does not seem to play a relevant role for the product innovation of young firms in CIs.

Results on R&D intensity presented in Table 7 reveal quite different sources of innovation for CIs. In this case, size does not seem to play a significant role, while sales in international markets are positively correlated with R&D expenditure in all models. Both factors referring to employees' skills are found statistically significant in model 2, but these effects disappear once the founders' characteristics are included in the model, probably due to interrelationships that may exist between these groups of variables. Contrary to product innovation, for R&D activities in CIs, founders' age appears to play a significant role, suggesting that the younger the founders, the higher the percentage of sales they invest on R&D, assuming thus greater risk. Also, confirming relevant empirical evidence (Arvanitis and Stucki, 2012), firms whose founding teams include a large number of persons with prior R&D

working experience to have larger R&D expenses. Even though this factor is found significant for product innovation as well (see Table 6), in the case of R&D, the respective effect appears to be much stronger, in terms of both statistical significance and magnitude. Similarly to product innovation, founders' motives referring to the detection of market and technology opportunities are also found to have a strong positive effect on the percentage of sales spend by CIs firms on R&D.

*Table 7 around here*

On the other hand and contrary to the results for product innovation, diversity measures of founders' expertise and gender do not seem to matter for the R&D activities undertaken by young CIs firms. In addition, the technological effort of the firm and the external sources of innovation are found to be significant determinants of the R&D intensity of CIs firms. Interestingly, open knowledge sources, while, as already mentioned, are not important for product innovation (see Table 6), in the case of R&D appear to play a highly significant role. Finally, looking at the sector dummies, we observe that firms operating in the R&D sector invest the highest percentage of their sales on R&D activities, as expected, followed by the Computer programming sector.

## **5. Concluding Remarks**

Despite the fact that creative industries (CIs) have been attracting lots of attention among scholars in recent years, existing theoretical and empirical studies exploring the nature and sources of innovation in CIs are limited and rather fragmented. In particular, it appears that research attempting to measure and explain innovative activities and performance of creative vs. non-creative firms is constrained to a small number of case-studies, studies on specific countries or small-scale surveys. This paper contributes to the literature by using a particularly rich dataset of about 4,000 young firms from ten European countries in order to explore potential differentials in the innovative performance between CIs and non-CIs firms.

A comparative analysis of these two groups of firms is conducted at a first stage with respect to various innovation indicators. At a second stage, we assess the contribution of CIs firms to innovation and we explore potential determinants of innovation within CIs based on a set of regression models.

A number of key findings are derived. First, CIs firms are found to outperform non-CIs firms in terms of product innovation and R&D intensity, while small or no differences are dictated in favour of non-CIs firms in the cases of process and organizational innovation. Using a narrow or broad definition of CIs does not seem to change the comparison results in any significant way. However, it must be noted that the specific sectoral structure of our sample, where some creative sectors are underrepresented (e.g. design and performing arts) may play a relevant role for obtaining the specific results.

Intra-CIs comparisons yield also interesting results which seem to confirm the high degree of heterogeneity that the creative sector is frequently reported to exhibit (e.g. Henry and De Bruin, 2011). With regard to most innovation measures considered in this paper, Computer programming is found to be the most innovative sector followed by the Publishing, and Advertising sectors. Architecture, on the other hand, appears to considerably lag behind in terms of most innovation indicators. This finding suggests that any policy measures targeted at the creative industries should take into account the substantial heterogeneity of this sector meaning that policy makers should consider the specific innovation conditions that prevail within different creative activities.

Importantly, the contribution of CIs firms to product innovation, as well as to R&D investment is highly confirmed by our empirical findings. Moreover, our findings for CIs firms highlight the role of founders' characteristics, firms' technological effort and networking activities in the introduction of radical product innovation as well as R&D investment. This suggests that the policy agenda for EU's economic growth and competitiveness should be

underpinned by a more balanced industrial mix taking into account the innovation capacity of creative industries and not just favoring hard technologies and services.

Our empirical analysis is based on standard measures of innovation to enable consistent comparisons between creative and non creative firms, which is a primary objective of this study. Although traditional measures are used extensively to capture innovation in the CIs, it is also widely acknowledged that there are important innovation forms which may not be captured by standard measures of product or process innovation (HKU, 2010; Stoneman, 2009; Miles and Green, 2008). The terms of *soft* and *hidden* innovation are usually referred to as innovation forms which have been empirically explored only in the context of case-studies in specific CIs (Miles and Green, 2008). On the other hand, it is worth mentioning that many forms of innovation described as soft or hidden may apply not only to CIs but also to other more traditional industries (Stoneman, 2009). In any case it would be interesting for future research to take into account new innovation measures both in terms of functional and aesthetic innovation. In this way the development and empirical testing of more robust innovation measures in the creative industry will better inform and guide policy initiatives.

Another issue that merits further research concerns the role of creativity-based aspects of the firm, founders or workforce in explaining innovative activities and performance of young CIs and non CIs firms. Capturing and incorporating such dimensions would probably reveal additional factors that may constitute important sources of innovation in CIs making also more meaningful the comparisons between CIs and non-CIs firms. Indeed, there exists some empirical evidence showing that creativity dimensions of a firm play a significant role in process innovation, market novelties and in-house R&D in CIs (Müller et al., 2008), while the effect of founders' creative background on the innovative performance of small firms in CIs does not seem to be so clear (Camelo-Ordaz et al., 2012).

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Table 1. Distribution of creative industries (CIs) firms by sector

Domain/Sector	Number of firms	NACE Rev. 2	
		Code	Description
Publishing	166	58.11	Book publishing
		58.13	Publishing of newspapers
		58.14	Publishing of journals and periodicals
		58.19	Other publishing activities
		58.21	Publishing of computer games
		58.29	Other software publishing
Computer programming & consultancy	445	62.01	Computer programming activities
		62.02	Computer consultancy activities
		62.09	Other information technology and computer service activities
Advertising, Market Research & Public Relations (PR)	186	73.11	Advertising Agencies
		73.12	Media representation
		73.20	Market research and public opinion polling
		70.21	Public relations and communication activities
Media, Arts & Photography	87	18.20	Reproduction of recorded media
		59.11	Motion picture, video and television programme production activities
		59.12	Motion picture, video and television programme post-production activities
		59.20	Sound recording and music publishing activities
		60.10	Radio broadcasting
		60.20	Television programming and broadcasting activities
		90.01	Performing arts
		90.03	Artistic creation
		74.20	Photographic activities
Architectural activities	61	71.11	Architectural activities
Specialised design & Translation activities	74	74.10	Specialised design activities
		74.30	Translation and interpretation activities
<b>Creative Industries (narrow definition)</b>	<b>1019</b>		
Engineering activities	212	71.12	Engineering activities and related technical consultancy
R&D activities	67	72.11	Research and experimental development on biotechnology
		72.19	Other research and experimental development on natural sciences and engineering
		72.20	Research and experimental development on social sciences and humanities
<b>Creative Industries (broad definition)</b>	<b>1298</b>		

**Table 2.** Innovative performance of CIs firms vs. non-CIs firms (I)

	Narrow definition of creative industries			Broad definition of creative industries		
	Creative (n=1019)	Non-Creative (n=2980)	t-statistic	Creative (n=1298)	Non-Creative (n=2701)	t-statistic
Sales of new goods (%)	27.4	28.8	-1.066 (0.286)	26.9	29.2	-1.830 (0.067)
Sales of new services (%)	34.6	26.4	6.724* (0.000)	35.6	25.0	8.966* (0.000)
R&D intensity (%)	15.4	11.5	5.495* (0.000)	16.2	10.6	7.983* (0.000)

Notes: Figures show average values for CIs and non-CIs firms. P-values are reported in parentheses. \* There is a statistically significant difference in the mean values between CIs and non-CIs firms at 1% level of significance.

**Table 3.** Innovative performance of CIs firms vs. non-CIs firms (II)

	Narrow definition of creative industries			Broad definition of creative industries		
	Creative (n=1019)	Non-Creative (n=2980)	Chi-Square statistic	Creative (n=1298)	Non-Creative (n=2701)	Chi-Square statistic
Product innovation	68.5%	61.9%	14.084* (0.000)	67.1%	61.9%	10.097* (0.001)
Process innovation	62.5%	67.6%	8.622* (0.000)	62.0%	68.3%	15.514* (0.000)
Organizational innovation	56.3%	59.6%	3.416 (0.065)	55.6%	60.3%	7.949* (0.005)
Formal IP protection	44.5%	31.4%	56.698* (0.000)	41.5%	31.5%	28.046* (0.000)
Informal IP protection	59.4%	49.9%	27.506* (0.000)	49.2%	58.7%	25.346* (0.000)

Notes: Figures show firm percentages with respect to the number of firms in creative / non-creative industries. P-values are reported in parentheses. \* There is a statistically significant difference in the percentages between creative and non-creative firms at 1% level of significance.

**Table 4.** Comparisons in innovation measures among sectors within CIs

<b>Sector</b>	<b>Number of firms</b>	<b>Product Innovation</b>	<b>Process Innovation</b>	<b>Organizational Innovation</b>	<b>Formal IP protection</b>	<b>Informal IP protection</b>
Publishing	166	67.5%	63.3%	53.0%	57.8%	55.4%
Computer programming & consultancy	445	75.7%	67.2%	61.8%	44.9%	69.7%
Advertising, Market Research & PR	186	70.4%	62.9%	56.5%	43.5%	60.2%
Media, Arts & Photography	87	54.0%	47.1%	41.4%	42.5%	40.2%
Architecture	61	42.6%	62.3%	54.1%	24.6%	32.8%
Specialised Design & Translation	74	60.8%	50.0%	50.0%	32.4%	48.6%
<b>Creative Industries (narrow definition)</b>	<b>1019</b>	<b>68.5%</b>	<b>62.5%</b>	<b>56.3%</b>	<b>44.5%</b>	<b>59.4%</b>
Engineering	212	60.4%	60.4%	51.9%	53.8%	23.1%
R&D	67	67.2%	59.7%	56.7%	64.2%	55.2%
<b>Creative Industries (broad definition)</b>	<b>1298</b>	<b>67.1%</b>	<b>62.0%</b>	<b>55.6%</b>	<b>58.7%</b>	<b>41.5%</b>

*Notes:* Figures show shares of firms with respect to the number of CIs firms in each sector.

**Table 5.** Determinants of innovation in young firms

	Ordered Probit regression	Probit regressions		OLS regression
	<b>Product Innovation</b>	<b>Process Innovation</b>	<b>Organizational Innovation</b>	<b>R&amp;D intensity</b>
Creative Industries	0.028***	-0.014	-0.025	3.858***
<i>Firm characteristics</i>				
Size	0.022***	0.053***	0.073***	-0.243
Sales in international markets	0.001***	0.000	0.000	0.110***
<i>Skills of workforce</i>				
University degree	0.019***	0.016	0.025**	0.220
Employee training	0.008	0.049***	0.066***	0.281
<i>Founders' characteristics</i>				
Age	-0.006	-0.026***	-0.030***	-0.807*
Educational attainment	0.017***	-0.029***	0.022**	2.201***
Prior working experience in University or research institute/lab	0.046***	0.019	-0.059**	9.288***
Founding motives	0.016***	0.029***	0.026***	1.813***
Team diversity in expertise	0.063***	0.124***	0.047*	2.294**
Gender	-0.042**	-0.011	-0.027	-2.636
<i>Firm's internal technological effort</i>				
In-house R&D	0.013***	0.000	0.002	
Ability to produce novel products/services	0.038***	0.017**	0.018**	2.066***
<i>External sources of innovation</i>				
Networking activities	0.016***	0.063***	0.074***	1.190***
Knowledge from open sources	0.016***	0.007	0.015*	1.011***
Log likelihood	-4035.585	-1767.464	-1967.454	
LR test ( $X^2$ )	592.03***	472.12***	384.17***	
R <sup>2</sup> adjusted				0.1695
No of obs	3226	3226	3226	3226

Notes: Average marginal effects are reported. Country dummies are included in all models. Three, two and one asterisks correspond to  $p < 0.01$ ,  $p < 0.05$  and  $p < 0.1$ , respectively.

**Table 6.** Determinants of product innovation in young creative firms

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<i>Firm characteristics</i>					
Size	0.045***	0.050***	0.040***	0.036***	0.035***
Sales in international markets	0.001***	0.001***	0.001***	0.001***	0.001***
<i>Skills of workforce</i>					
University degree		0.048***	0.037**	0.034**	0.038**
Employee training		0.035**	0.024	0.013	0.007
<i>Founders' characteristics</i>					
Age			-0.011	-0.005	-0.005
Educational attainment			0.025**	0.020**	0.018*
Prior working experience in University or research institute/lab			0.028	0.033*	0.032*
Founding motives			0.048***	0.032***	0.025***
Team diversity in expertise			0.085***	0.078***	0.074***
Gender			-0.078*	-0.072*	-0.074*
<i>Firm's internal technological effort</i>					
In-house R&D				0.019***	0.015**
Ability to produce novel products/services				0.046***	0.043***
<i>External sources of innovation</i>					
Networking activities					0.028**
Knowledge from open sources					0.011
<i>Sector dummies</i>					
Publishing	0.139***	0.157***	0.193***	0.160***	0.156***
Computer Programming	0.170***	0.182***	0.193***	0.159***	0.167***
Advertising, Market Research & PR	0.116***	0.131***	0.161***	0.130***	0.127***
Media, Arts & Photography	0.096***	0.136***	0.148***	0.117**	0.113**
Specialised design & Translation	0.103**	0.135***	0.168***	0.138**	0.137**
Engineering activities	0.103**	0.110***	0.132***	0.119***	0.123***
R&D	0.177***	0.186***	0.205***	0.154***	0.161***
Log likelihood	-1663.267	-1452.935	-1305.533	-1282.45	-1277.616
LR test ( $X^2$ )	149.07***	144.17***	206.39***	252.56***	262.22***
Number of obs	1286	1123	1034	1034	1034

Notes: Average marginal effects are reported. Country dummies are included in all models. Three, two and one asterisks correspond to  $p < 0.01$ ,  $p < 0.05$  and  $p < 0.1$ , respectively.

**Table 7.** Determinants of R&D intensity in young creative firms

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
<i>Firm characteristics</i>					
Size	0.241	0.724	0.392	0.245	0.247
Sales in international markets	0.163***	0.159***	0.165***	0.162***	0.157***
<i>Skills of workforce</i>					
University degree		1.876*	-0.360	-0.425	-0.040
Employee training		2.571**	1.750	1.500	0.632
<i>Founders' characteristics</i>					
Age			-1.734**	-1.557*	-1.549*
Educational attainment			1.424*	1.322*	1.129
Prior working experience in University or research institute/lab			3.451**	3.689**	3.492**
Founding motives			2.912***	2.402***	1.538**
Team diversity in expertise			-1.737	-1.860	-2.385
Gender			-4.971	-4.780	-4.863
<i>Firm's technological effort</i>					
Ability to produce novel products/services				1.992***	1.603**
<i>External sources of innovation</i>					
Networking activities					2.954***
Knowledge from open sources					1.361**
<i>Sector dummies</i>					
Publishing	0.362	1.181	3.159	2.011	1.463
Computer Programming	5.117*	6.517**	5.753*	4.639	5.286*
Advertising, Market Research & PR	-5.161*	-3.244	-3.290	-4.471	-4.994
Media, Arts & Photography	-1.427	-1.047	-0.954	-2.143	-2.541
Specialised design & Translation	-4.858	-3.000	-1.379	-2.459	-2.589
Engineering activities	-2.706	-2.187	-2.378	-2.715	-2.495
R&D	23.099***	25.555***	23.128***	21.548***	21.930***
R <sup>2</sup> adjusted	0.147	0.175	0.191	0.199	0.212
F statistic	13.320***	12.910***	10.400***	10.480***	10.570***
Number of obs	1286	1123	1034	1034	1034

Notes: Average marginal effects are reported. Country dummies are included in all models. Three, two and one asterisks correspond to  $p < 0.01$ ,  $p < 0.05$  and  $p < 0.1$ , respectively.