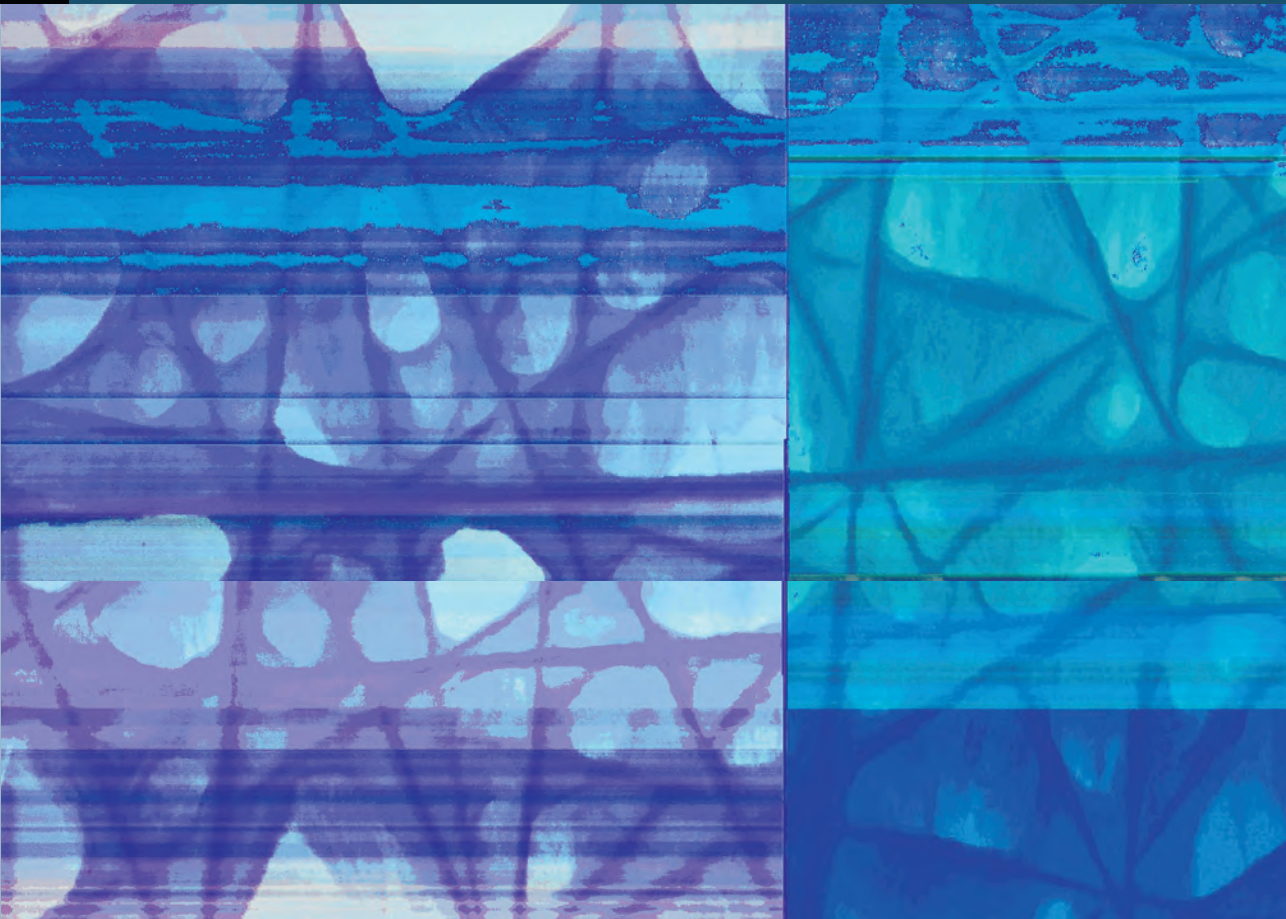


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EUSKO JAURLARITZA



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Eusko Jaurlaritza - Gobierno Vasco
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Donostia-San Sebastián, 1 - 01010 Vitoria-Gasteiz - Álava (Spain)


945 01 90 38 Administrazioa - Administración

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Academic spinoffs and regional development: New insights for future research

Aunque la literatura sobre la transmisión de conocimientos entre la universidad y la industria ha aumentado en las últimas décadas, la contribución de las instituciones de enseñanza superior al desarrollo regional ha pasado desapercibida e, incluso, se ha prestado menos atención a la relación entre las *spin-offs* universitarias y el desarrollo regional. Sostenemos que ha llegado el momento de evaluar los conocimientos actuales sobre el tema y ofrecer directrices para futuros estudios que puedan servir de guía a la hora de tomar decisiones sobre formulación de políticas. Para ello, especulamos sobre cómo las *spin-offs* universitarias pueden contribuir al desarrollo económico regional y estudiar las pruebas existentes de esta relación. Y lo que es más significativo, resaltamos dos importantes corrientes de investigación que pueden contribuir a esta área de estudio: (i) la economía empírica de gestión y (ii) las organizaciones híbridas. Sostenemos que una mejor comprensión de estas dos líneas de investigación puede resultar útil en futuros estudios sobre la contribución de las instituciones de enseñanza superior al desarrollo regional y concluimos indicando algunas directrices de investigación.

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Although the literature on University-Industry knowledge transfer has rapidly expanded in the past decades, the contribution of higher education institutions to regional development has gone under the radar, with even less attention paid to the relationship between academic spinoffs and regional development. We argue that it is time to take stock of the current knowledge on the topic and to provide directions for future research which can guide policy making decisions. To accomplish this, we speculate on how academic spinoffs can contribute to regional economic development and survey the existing evidence on this relationship. More importantly, we highlight two major research streams which can contribute to this area of study: (i) the empirical economics of management and (ii) hybrid organisations. We contend that a better understanding of these two lines of research can prove useful in guiding future research on the contribution of higher education institutions to regional development. We conclude by indicating some of the research directions.

Mario Benassi

*Department of Economics, Management and
Quantitative Methods. University of Milan*

Francesco Rentocchini

*Department of Economics, Management and
Quantitative Methods. University of Milan
Southampton Business School, University of Southampton*

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Palabras clave: Prácticas de Gestión, organizaciones híbridas, emprendizaje universitario, desarrollo regional.

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1. INTRODUCTION

Economic development plays a key role in the agenda of firms and institutions, as it offers firms opportunities for growth, thus making new resources for innovation available. Despite some criticism about the notion of economic growth as a social objective (D'Alisa *et al.*, 2014), scholars have been investigating for a long time the different mechanisms influencing firm growth (Penrose, 1995). From a structural point of view, the growth process is characterised by differences both between – and within – countries. For this reason, the concept of regional development has been utilised to analyse and, possibly compare, different geographical areas around the world (Porter, 2003).

As far as regional growth is concerned, scholars have pointed out that production of new knowledge contributes to explain why some regions perform better than others (Saxenian, 1996). Areas with better educational systems, more innovative clusters of firms and stronger institutions, tend to outperform areas which are poor-

ly equipped to this respect. Anecdotal evidence is abundant. This is for instance the well documented case of Silicon Valley, where private (Stanford University) and public (UCLA) Universities have contributed to superb economic growth since the '60s (Saxenian, 1991). Overall, the existing literature provides ample support for the view that Higher Education Institutions (henceforth HEIs) are crucial in producing and disseminating new knowledge, as well as in supplying the economy with human capital (Bonaccorsi and Daraio, 2007).

Under this perspective, HEIs contribution to economic growth is to a large extent indirect: by accomplishing their mission HEIs would activate a virtuous circle based on the service they provide to companies through human capital creation and the development of basic research (Nelson, 1959). However, in recent years, HEIs' role has changed consistently. HEIs have put a tremendous effort in evolving from the «ivory tower» model, where scientists were mainly focusing on research and teaching activities, to a model where academic engagement with the external environment is equally important (Perkmann *et al.*, 2013). According to the «academic engagement» model, HEIs add a new mission to the traditional ones of research and teaching. The newly defined third mission highlights the role of HEIs as active collaborators with non-academic organisations (Perkmann *et al.*, 2013). Following this approach, HEIs contribute to create new value through formal (e.g. patents and academic spinoffs) as well as informal (e.g. networking with practitioners) activities.

Although the existing literature in the economics and management of innovation has largely covered the relationship between University and Industry (with a focus on the different mechanisms through which this substantiate and the gains and losses implied for the different actors at the micro-level), comparatively less attention has been paid to the relationship between HEIs and regional development. This is even more apparent when one looks at a specific (but largely discussed) mechanism of technology transfer: academic spinoffs.

In this paper we focus on academic spinoffs, defined as companies that commercially valorise results of scientific and technological research of HEIs (Shane, 2004). We review the literature which explores the link between academic spinoffs and regional development. We argue that this association cannot be taken for granted and deserves careful scrutiny for several reasons.

First, evidence about the relationship between HEIs and regional development is quite limited, as quantitative support is only available at the national level. More specific regional data are rare and support is often based on anecdotal and case study evidence. Our work provides a survey of the literature on the relationship between HEIs and economic development, focusing on the existing evidence on the link between HEIs and regional economic growth. Taking stock of the paucity of work on the contribution of academic spinoffs to regional growth, we put forward a

number of mechanisms through which academic spinoffs are expected to contribute to regional development.

Second, we argue that, in order to significantly contribute to regional development, spinoffs should tackle the «liability of newness» problem and be able to grow considerably in a limited period of time. We contend that the survival and growth of academic spinoffs do not necessarily descend from a completely accidental and purely random sequence of events. Our argument is that HEIs need to adopt internal processes that are rather distant from their core set of activities: promoting and supporting successful spinoffs require capabilities that are different from the ones needed to contribute to the existing stock of knowledge and human capital. Following this, HEIs may need to adopt practices which are similar to those put in place inside companies but whose implementation is not always easy. We delve into this topic by relying on the recent stream of the literature dealing with the empirical economics of management. We provide a comprehensive survey of the existing evidence on the role of management practices for performance in a wide array of organisations –private for-profit firms, not-for-profit companies, (public and private) education, (public and private) healthcare and public administration– which can well inform the implementation of similar practices in the HEIs-spinoffs nexus.

Finally, we contend that adoption of managerial practices is an attempt to integrate the market logic into the science logic by the HEIs, which makes HEIs hybrid organisations. Therefore, our work contributes to explore the uneasy coupling of different goals inside HEIs. We agree that promoting academic spinoffs able to support regional growth is not simple, as it requires business competencies and managerial practices. However, in importing business competencies and managerial practices HEIs can pay a price, as the two goals can collide.

The remaining of this paper is organised as follows: section 2 discusses the relationship between HEIs and regional development with a particular focus on the role of academic spinoffs; section 3 reviews the two streams of the literature relative to management practices and hybrid organisations by focusing on their contribution to academic entrepreneurship; section 4 concludes and advances future avenues of research based on the highlighted gaps.

2. REGIONAL DEVELOPMENT AND ACADEMIC SPINOFFS

2.1. Higher education institutions and economic development

The role of Higher Education Institutions for economic development is at the forefront of policy agendas world-wide, as the economic prosperity and social welfare of modern countries depends upon a well-developed knowledge based economy. In our globally competitive economic environment, never before has there been a greater need for a skilled, enterprising workforce, for constant innovation in prod-

uct and process development, for a thriving culture of entrepreneurship, for dynamic leading-edge scientific and technological development and for world class research that attracts investment.

HEIs are a widespread phenomenon worldwide. The 2017 international handbook of Universities, which is published by the International Association of Universities in collaboration with UNESCO, reports more than 18,000 HEIs representing over 180 countries (IAU, 2016). A comparatively lower number (about 12,000 HEIs) is found from the Webometrics Ranking which identifies Universities through publicly available web data.¹

The increasing presence of HEIs worldwide has gone hand in hand with the interest in the academic literature to understand the role that HEIs may play for the economic development and well-being of countries. While there is a rich literature on the relationship between human capital (a byproduct of HEIs) and economic growth, there is comparatively less research on the role of HEIs for development. Some early studies have highlighted that HEIs were an important element for the Commercial Revolution, thanks to the development of legal institutions (Cantoni and Yuchtman, 2014), and for the industrial revolution, via the building and dissemination of knowledge (Mokyr, 2002). Valero and Van Reenen (2016) have offered one of the most comprehensive studies about the relationship between the presence of Universities and growth. The authors find country-level evidence on the role of HEIs for economic growth: doubling the number of universities per capita is associated with a 4% higher GDP per capita. Even more interestingly, the authors exploit the information they have at the regional level and show that the presence of a HEI has positive spillover effects on neighbouring regions. Notably, they find a positive role of the increased supply of human capital and greater innovation on economic growth.

The evidence provided on the role of HEIs on innovation capacity at the local level is in line with consistent and enduring evidence supplied by a rich literature in the economics and management of innovation. Widespread anecdotal evidence in the form of influential case studies is present, ranging from US hi-tech clusters, Italian industrial districts, and «innovative milieux» (local innovation systems) in Europe and elsewhere (Brusco, 1982; Saxenian, 1996; Keeble and Wilkinson 1999). At the heart of this literature lies the idea that (tacit) knowledge is mostly transmitted via face-to-face contacts and mobility of labour. Knowledge is then seen as a local public good which can be more easily retained by co-located agents compared to distant ones. The geographical concentration of innovative activities is then explained via the ability to exploit different spillover mechanisms, mainly research and human capital (Audretsch *et al.*, 2005; Audretsch and Feldman, 2004). Additional contributions show that knowledge spillovers are localised to the extent which some

¹ The most updated version of the ranking (2016.2.1 July) is available at <http://www.webometrics.info/en/node/178>

key underlying mechanisms are localised, namely mobility of skilled workers and co-invention networks (Breschi and Lissoni, 2001; Breschi and Lissoni, 2009). These two mechanisms are central to the relationship between HEIs and external organisations (both industrial partners and public organisations). Notably, Ponds *et al.*, (2010) show that the effect of academic research on innovation at the regional level is mediated by geographical proximity and the networks stemming from university-industry collaboration.

As HEIs seem to play an active role in the geographical concentration of innovative activities, part of the attention from the literature has been diverted to this issue. A first stream of literature highlights the presence of localised knowledge spillovers from university research via patenting activity. Jaffe *et al.* (1993) provide evidence of spillovers from university research in patenting and R&D spending by firms for the US. In an attempt to shed light on the mechanism through which knowledge spillovers from University materialise, Toivanen and Väänänen (2016) investigate whether distance from a technical university is a good instrument in estimating the effect of engineering education on innovation in Finland. The authors find a positive and significant effect: establishing three new technical universities yields a 20 per cent increase in USPTO patents. Finally, Hausman (2012) shows that the US Bayh-Dole act spurred long-run employment and payroll per worker growth of establishments in industries more closely related to local University innovative strengths. Geographical proximity increases this effect: entering and large establishments benefited more from this effect compared to incumbent and small establishments. Evidence on the importance of patenting activity connected to Universities has been found for several countries in Europe as well. Lissoni *et al.* (2008) show that, at least for three European countries (Italy, Sweden and France), academic patenting, i.e. patents signed by academic scientists but owned by a plurality of actors such as Universities, business companies, public organisations, etc., is comparable in size to the patenting activity of US Universities.

A second stream of the literature has focused on the role that the presence of a HEI has for the creation of innovative startups in a region. Drucker (2016) focuses on the US over the period 2001-2011. The author finds a positive role of HEIs education on regional output and entrepreneurship and estimates the localised knowledge effect from HEIs to be close to 100 km. This effect is found to be mainly driven by the presence of postgraduate programs, STEM (science, technology, engineering and mathematics) oriented education and population educational attainment. Other studies show that the presence and number of HEIs at the regional level is positively associated with the creation of innovative start-ups in the area and that the same effect is not present for traditional sectors (Baptista *et al.*, 2011; Fritsch and Aamoucke, 2013). All of the above arguments contribute to explain why HEIs should be seen as hubs that contribute to industrial innovation and foster the creation of knowledge intensive firms in nearby areas (Bonaccorsi *et al.*, 2014).

2.2. Existing evidence on the relationship between academic spinoffs and regional development

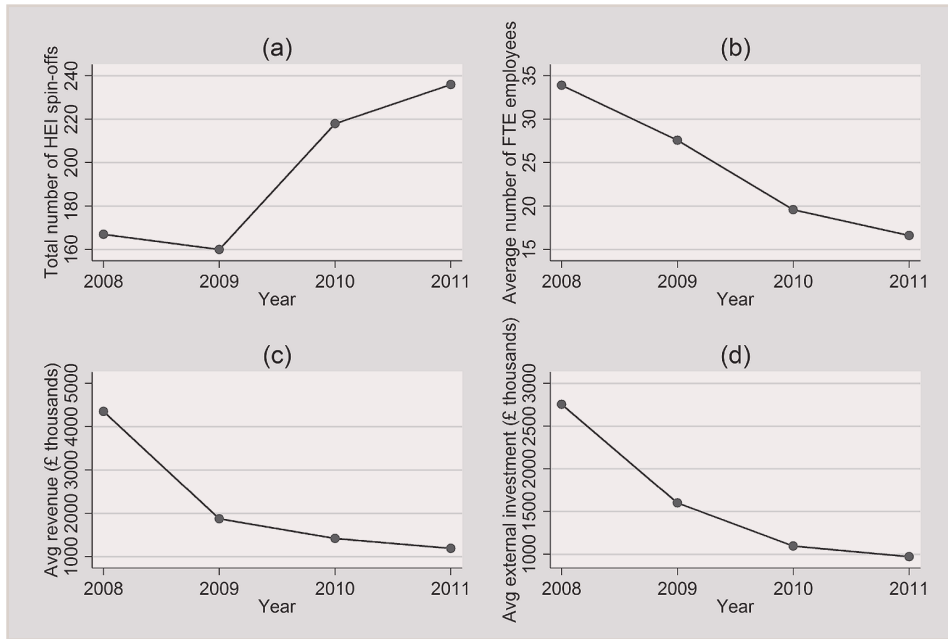
Despite the great interest on the role that HEIs play in country and regional development, an under-investigated question relates to the role played by University spinoffs in regional development. Academic spinoffs –which are firms that commercially exploit results from scientific and technological research of Universities (Shane, 2004)– have been an important area of research for some time now (Rothaermel *et al.*, 2007). Academic spinoffs are a very interesting area of research as they originate from organisations whose direct, primary goals are mainly non-profit oriented (Dasgupta and David, 1994) but, at the same time, they are seen as a way to extract value from scientific research in line with the recent interest in the third mission of Universities (Etzkowitz and Leydesdorff, 2000).

Given the increasing attention that academic spinoffs have attracted in recent years, it is glaringly peculiar that comparatively less research has been devoted to understand whether and how University spinoffs contribute to regional development. Notably, the available evidence is mainly qualitative and has been popularised by the development of high-tech hubs around prestigious universities such as MIT, Stanford, Cambridge and Oxford (Ndonzuau *et al.*, 2002; Shane 2004; Wicksteed, 1985; Lawton Smith *et al.*, 2005). Quantitative evidences on the role of HEIs for regional growth are scant. Vincett (2010) studies USOs in Canada over the period 1960-1998 and concludes that they provide incremental contributions to the national GDP. Similarly, O’Shea *et al.* (2005) shows a positive contribution of academic spinoffs in terms of job creation in the US over the period 1980-1999.

Nevertheless, despite the effort by universities to create a large number of academic spinoffs in the past two decades, academic spinoffs are often companies with below-average size, slow growth and modest profit, thus casting doubts on their contribution to economic development. Fini *et al.* (2016) in a cross-country study (Italy, Norway and the UK) study how institutional changes, namely legislative changes at the national level (IPR legislation) and organisational changes at the university level (i.e. creation of a technology transfer office), influence the number and quality of academic spinoffs. The authors find that institutional changes are more symbolic than substantial and contribute to the quantity but not to the quality of spinoffs generated (which is decreasing). This result is corroborated by the case of the UK where both academics and policy makers have recently criticized the over-emphasis on the creation of academic spinoffs and have suggested that more benefits are to be derived by focusing on the creation of fewer firms, but with higher impact (Lambert, 2003; Harrison and Leitch 2010). Similarly, results from the Higher Education Business Community Interaction Surveys have highlighted the need to go for new venture creation only in cases of remarkable growth potential (HE-BCI 2010). Figure 1 provides graphical support for this statement. Panel (a) shows the increasing trend in the number of academic spinoffs generated in the UK over the

period 2008-2011. Panels (b)-(d) instead provide evidence of the decreasing trend in terms of three performance measures: the average number of employees, the average revenue generated and the amount of external investment. Similar evidence has emerged from studies focusing on other countries: Canada (Bathlet *et alii*, 2011), Norway (Borlaug *et al.*, 2009) and Italy (Iacobucci and Micozzi, 2015).

Figure 1. PERFORMANCE OF UK ACADEMIC SPINOFFS



Source: own computation on HE-BCI data 2008-2011.

The above evidence points to the need to put the University spinoff phenomenon into perspective. For example, in the period 1995-1998, the number of overall start-ups which are new corporate spinoffs is the 13% of the total in selected OECD countries (Denmark, Finland, France, Germany, Italy, Spain, Sweden and UK) while public spinoffs comprise about the 2% of the total number of start-ups (IPTS, 1999). Table 1 provides an overall comparison on the formation of academic spinoffs among selected OECD countries and shows a high variability in the figure with number of academic spinoffs generated per year which varies between 4 (Belgium) and 467 (Germany) over different time periods. The variability in the number of academic spinoffs generated across time and space can be explained, albeit partially, through their sectorial specialisation: most of these spinoffs operate in high-tech sectors, such as life sciences and information technologies (Callan, 2000). This evidence speaks in favour of academic spinoffs as an instrument public institutions use to spur new (hopefully path-breaking) sectors and to the close connection between cutting-edge science and industrial technology (Baptista *et al.*, 2011; Fritsch and Aamoucke, 2013).

Table 1. COMPARISON OF SPINOFF FORMATION ACROSS THE OECD

Country	Institutions	Cumulative number	Period	Number per year	Period
Australia	All	138	1971-99	10	1991-99
Belgium	All	66	1979-99	4	1990-99
Canada	Universities	746	1962-99	47	1990-98
France	All	387	1984-98	14	1992-98
Finland	Public labs	66	1985-99	4.5	1990-99
Germany	Public labs	462	1990-97	58	1990-97
Germany	Universities	2 800	1990-95	467	1990-95
Norway	Public labs	122	1996-98	41	1996-98
United Kingdom	Universities	171	1984-98	15	1990-97
AUTM	Universities	1 995	1980-98	281	1994-97

Source: Callan (2000).

To sum up, there is increasing evidence on the positive role that HEIs have for the economic development at both country and regional-level. The positive effect of the presence and number of HEIs on regional economic growth is likely to be driven by the ability of HEIs to aggregate in a geographically bounded space innovative activities giving rise to high-tech clusters. Quite interestingly, among the several mechanisms of University-industry technology transfer, the role of academic spinoffs for national and regional growth has been rather under-investigated. This comparatively less important role can be explained with the relatively low contribution of academic spinoffs to economic growth compared to private start-ups (Wennberg, Wiklund and Wright, 2011) but it just tells a part of the story. The evidence on the role of academic spinoffs for regional growth is scant and limited to success cases. The next section advances a number of mechanisms through which academic spinoffs can contribute to regional development.

2.3. How can academic spinoffs contribute to regional development?

Academic spinoffs are likely to contribute to regional growth and well-being through a mix of direct and indirect effects. Buildin gupon Rassmussen *et al.* (2016), we envisage three different mechanisms: (i) university-level mechanisms; (ii) spinoff-level mechanisms; (iii) regional spillover mechanisms.

- (i) University-level mechanisms. Here three main types of impacts can be foreseen. First, academic spinoffs can have a direct economic impact on the regional economy thanks to the royalties from licenses and sales of equity.

Bray and Lee (2000) provides evidence from 16 US university spinoff companies on the average annual income from patent license and average value of equity sold. Excluding outliers consisting of million-dollar equity sales, the average value of equity is within the range of income from patent licenses: between \$10,000 and \$250,000. Also, instead of generating revenue through licensing activity or sale of equity, academic spinoffs can contribute to regional economic growth via the sales of (part) of their patent portfolio.

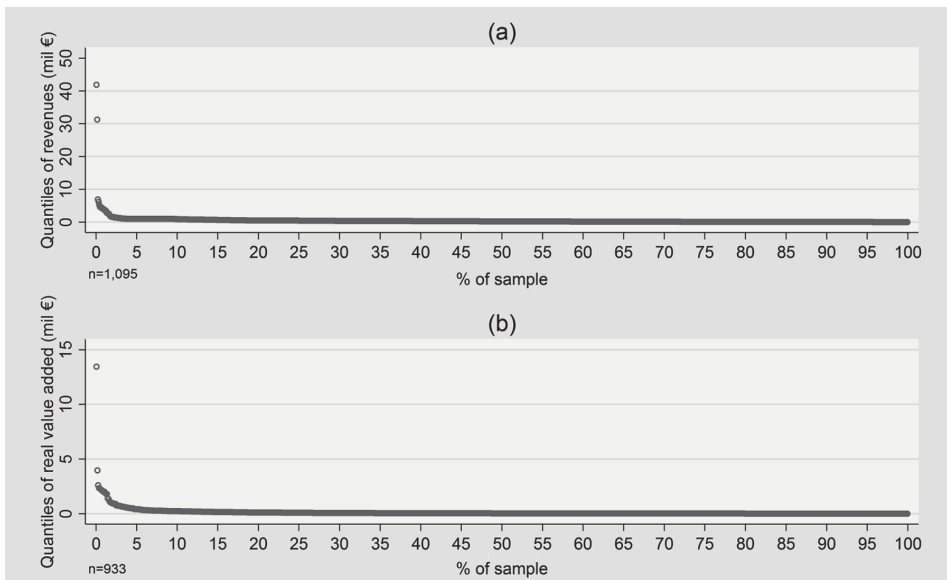
Second, academic spinoffs can exert an indirect economic effect on the regional economy. For example, renowned academic spinoffs can generate research income and enhanced reputation. This is the case for example of the growth of UK Cambridge science-based companies: these firms funded the development of their key technologies via R&D contracts (with both private and public companies) and strategic accumulation of IPRs (Connell *et al.*, 2015). Similarly, it has been shown that the portfolio of academic spinoffs can contribute to generate income for HEIs reputational benefits. Pitsakis *et al.* (2015) call this «the peripheral halo effect» and provide evidence of its importance for UK Universities, where quantity and quality of the academic spinoffs explain about 13% of external funding obtained by them.

Third, academic spinoffs can contribute to the regional economy in an indirect way through research and teaching activities. A growing stream of the literature in the economics of science shows that academic have different motives to create and engage with academic spinoffs. Notably, academic engagement with the external environment has been shown to be influenced by a combination of intrinsic and extrinsic motivations: fundraising, access to knowledge, learning and pro-social behaviour (Lam, 2011; Labory *et al.*, 2017). When the main motivations to run an academic spinoff lie in technology development, attraction of research funding or advancing the societal role of universities, the contribution to regional development is a more indirect one and may be conveyed via research and teaching rather than direct contribution to income generation activities.

- (ii) Spinoff-level mechanisms. A first way through which academic spinoffs can directly contribute to economic well-being at the regional level is evidently through profit and value creation. Contrary to expectations, academic studies find no clear cut results when comparing industry and university spinoffs. For example, Zahra *et al.* (2007) find that in the US company spinoffs outperform academic spinoffs in productivity and return on asset while academic spinoffs do better in revenue growth. Also, Wennberg *et al.* (2011) find that Swedish industry spinoffs outperform academic spinoffs when it comes to survival and revenue growth. Academic spinoffs can also contribute to job creation in the HEIs' neighbouring area. Czarnitzki *et al.*, (2014) investigate the existence of a performance premium (new job creation) for academic spinoffs compared to industry spinoffs for Germany. The authors find that academic spinoffs exhibit

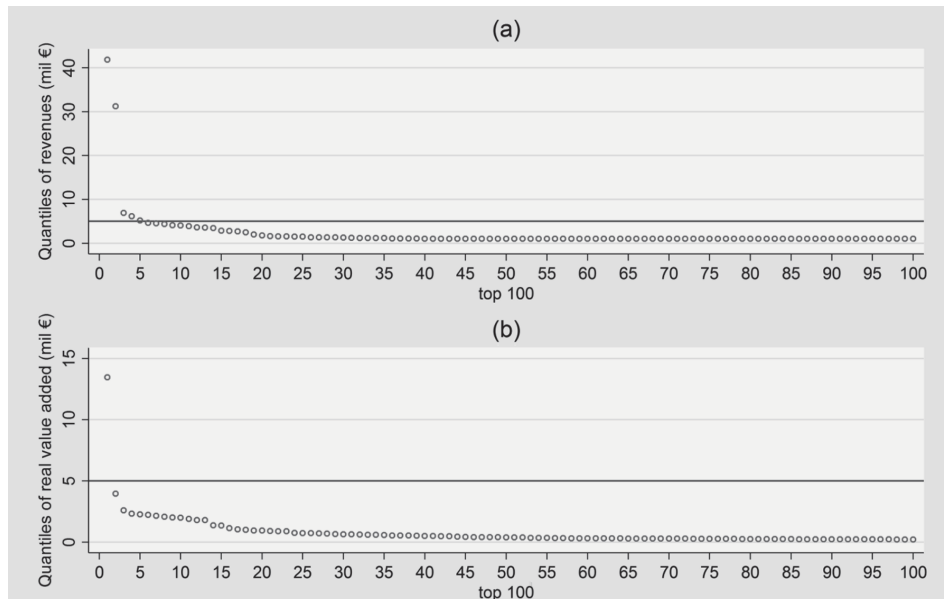
a performance premium of 3.4 percentage points higher employment growth over industry spinoffs. Likewise, in a study of the academic spinoffs based in Oxfordshire (UK), Lawton-Smith and Ho (2006) estimate that academic spinoffs contribute to about 3.5% of the county's employment. Nevertheless, the above evidence is often driven by rare success cases and specific regional contexts as very few companies tend to account for the majority of impacts in terms of profitability, employment creation and survival. Accordingly, the distributions of academic spinoffs' performance measures are well approximated by a power-law distribution which highlights the role played by extreme cases place in the «fat» tails (Crawford *et al.*, 2015). To exemplify the point above, Figure 2 displays the quantiles of performance indicators (revenues and productivity) for a sample of Italian academic spinoffs over the period 2006-2014 (Benassi *et al.*, 2017). Strikingly, only a small fraction of the sample (below 3%) has value of the quantiles above a reasonable threshold value (e.g. 1 million euros in revenues) while the vast majority of companies shows a low performance. To emphasise the point, only two companies report a striking performance with values of the quantiles far apart from the rest. This is apparent from Figure 3 where a similar figure is reported, but for only the top 100 companies in terms of performance. Only four companies have average revenues above five million € and only one has average real value added above 5 million €.

Figure 2. QUANTILE PLOTS OF PERFORMANCE INDICATORS – FULL SAMPLE OF ITALIAN ACADEMIC SPINOFFS OVER THE PERIOD 2006-2014



Source: own calculation on data from Benassi *et al.* (2016).

Figure 3. **QUANTILE PLOTS OF PERFORMANCE INDICATORS - TOP 100 ITALIAN ACADEMIC SPINOFFS OVER THE PERIOD 2006-2014**



Source: own calculation on data from Benassi et al. (2016).

- (iii) Regional spillover mechanisms. The third mechanism through which academic spinoffs can impact on the regional economy refers to the positive spillover effects that these firms can have for (i) the industry they operate in and (ii) their ability to contribute to the clusterisation of economic activities. As far as regional industry spillovers are concerned, academic spinoffs can generate direct beneficial effects for their customers, the suppliers of inputs, as well as indirect effects on other sectors. Customers of academic spinoffs can profit from a better access to research and innovation, particularly high-tech firms (Hausman, 2012). Moreover, a virtuous cycle where new companies attract other companies and skilled human capital attracts more human capital can develop thanks to strong agglomeration effects (Rosenthal and Strange, 2008). Indirect regional effects for other sectors of the economy can come from the presence of a strong local multiplier effect. Every time a local economy creates a new company, additional jobs are created thanks to the increased demand for local goods and services. A recent stream of the economic geography literature has found evidence for the relevance of local multiplier effects. Moretti (2010) estimates that each additional job in the manufacturing in a US city generates 1.6 jobs in the nontradable sector in the same city, with the effect being even larger for skilled jobs (2.5) and high-tech industries (all categories academic spinoffs belong to). Similar results on the effect of local multiplier have been found for Sweden (Moretti and Thulin, 2013). Academic spinoffs can

also be important actors in the clusterisation of economic activities within a region. In fact, they can play the role of intermediaries between HEIs and the industrial regional context by providing links to cutting-edge research and contribute to the creation of strong networks of epistemic communities (Balconi *et al.*, 2004). Academic spinoffs can even play a central role in the establishment of a new industry, as evidenced from the pivotal case of the University of California at San Francisco for the San Francisco biotech industry (Jong, 2006). In fact, this example resonates well with what happened with the US automobile and tyre industries. At the heart of the clusterisation of these two industries in the areas of Detroit and Akron respectively, lies the role played by organisational reproduction and heredity. Successful early entrants of an industry inadvertently provide an optimal training ground for their employees, allowing them to acquire the skills needed to start ventures of their own (Klepper, 2007; Buenstorf and Klepper, 2009).

3. **ACADEMIC SPINOFFS AND REGIONAL DEVELOPMENT: TWO OPEN ISSUES**

Although the channels through which academic spinoffs can impact on regional development are numerous, a fruitful interdependence between academic spinoffs and regional development cannot be taken for granted for two main barriers that academic spinoffs need to face. First and foremost, academic spinoffs, being them start-ups, face the classical problem of «liability of newness» (Stinchcombe, 1965). Liability of newness can make growth of the firm difficult, and possibly leads to mortality. Empirical data support this view. Failure rate among start-ups is reasonably high: about three-quarters of venture-backed firms in the US don't return investors' capital and roughly 35% survive to age 10 (Bureau of Labor Statistics, 2016). Evidence for academic spinoffs suggests that they enjoy lower failure rates compared to start-ups but figures are non-negligible in this case too. The figures range between 13% for Belgium (Macho-Stadler *et al.*, 2008), 20% for Italy (Iacobucci and Micozzi, 2014) and slightly lower rates for US and Canada (Nerkar and Shane, 2003; Vincett, 2010).

From an ecological perspective, it might be argued that a possible solution to the liability of newness problem is in the size of the academic spinoffs' population. The higher the number of academic spinoffs in a given area, the higher the survival rate of academic spinoffs should be. Nevertheless, a significant number of spinoffs in a given period of time should be considered as a necessary, but not sufficient, condition to overcome the liability of newness. Not only a sound number of academic spinoffs should be generated in a given region, but they should also contribute to the regional development with a remarkable growth rate. Academic spin offs with sustained growth rates are likely to make an important contribution to regional development. This is exemplified by the recent literature in economics and manage-

ment focusing on «gazelles», which are companies with great innovation capacity and rapid job growth (Henrekson and Birch, 2008). For example, Jaap *et al.* (2013) found that an increase in the prevalence of gazelles in an industry had a positive effect on subsequent industry growth.

Interactions with other organizations can also reduce liability of newness. External organizations can provide a valuable contribution to the growth of the academic spinoff. Facing several contingencies and unknown challenges, academic spinoffs might not possess all the resources needed to cope with market's requirements (Shane, 2004). External organizations can make these resources available as well as offer a significant contribution from an innovation perspective. As innovation is an effective option to balance risks academic spinoffs face (Cefis and Marsili, 2005), the overall features of external organizations can make a huge difference.

Second, academic spinoffs go through different stages, thus making interactions with different types of organizations most critical according to the life cycle. In the first stages, interaction with research organizations and parent University is fundamental. Founders of an academic spinoff need to discuss and fine-tune their inventions with a community of experts. This stage might take some time and involve several actors, whose contribution may turn out to be crucial.² However, founders of an academic spinoff need more than an invention: they need to develop a suitable business model, which requires time and financial resources.³ Moreover, in order to get financial resources, academic spinoffs need venture capital's support. The industry of venture capital is highly competitive and highly concentrated. United States account for almost 50% of the global aggregate deal value. California accounts for more than 50% of the aggregate value of venture capital deals in the US (Cumming *et al.*, 2010). Although global, the venture capital industry sticks to some simple management rules, such as «fifty miles radius» rule. Venture capital investments are locally biased, and the (maximum) geographic distance between the venture capitalists and their investment makes a difference in driving investment decisions, as well as in investment performance (Cumming and Dai, 2010).

Following the above discussion, the interdependence between academic spinoffs and regional development is intrinsically multifaceted and inevitably subject to change. Direction and speed of change is to a considerable extent dependent upon

² For example, Massimo Marchiori, an Italian mathematician, was a crucial source of inspiration for Larry Page and Sergey Brin –founders of Google–. In fact, Marchiori was the first to propose an innovative algorithm that «many consider to be an inspiration for PageRank, Google's magic formula that sorts Web pages by counting the number and quality of links to each from around the Internet» (Lepido, 2014).

³ The case of Google is still illustrative in this respect «...after the speech, Marchiori returned home in the hopes of realizing his ambitious design. "When I came back to Italy, I asked the university for 20,000 euros to develop a search engine, but instead, they financed a project about the history of copper metallurgy in Italy" he says. Meanwhile, Page got his first \$100,000 check from Sun Microsystems co-founder Andy Bechtolsheim» (Lepido, 2014).

internal processes driving spinoffs origin and evolution as well as the governance factors which rule the relationships with key external organisations.

The next two sections present and discuss two streams of the economics and management literature dealing with management practices and hybrid organisations. These two streams provide fruitful avenues of future research for scholars interested in academic entrepreneurship and regional development.

3.1. Management practices

As for the former, internal processes which HEIs use to deal with academic spinoffs can make a difference. HEIs are to a large extent autonomous in deciding what to do and how to do it. For example, they can decide to offer courses on entrepreneurship or launch bar camps to inspire an entrepreneurial attitude for their members. Similarly, HEIs can set up business incubators to nurture potential entrepreneurial teams, which will provide space (e.g. shared offices and services), training, marketing assistance and, most of the time, support to apply for funding. These internal processes often require an organizational redesign: the creation of a specific unit (e.g. Technology Transfer Office) which signals HEIs' formal commitment towards academic spinoffs. The creation of a specific unit is usually paralleled by new internal procedures and rules to direct HEIs policies about academic spinoffs (Muscio *et al.*, 2016).

Among the different internal processes available to organisations to improve their performance, the literature in management and economics has witnessed a recent surge of interest for the role played by management practices. During the last decade, a number of scholars has stressed that management practices play a key role in explaining the variability in performance of different types of organisations across and within countries. Management practices can be conceived as routines, rules and processes which relate to the deep-seated structure of organisations and that become rooted into the organisational structure and culture (Bloom *et al.*, 2014).

We believe that this stream of the literature can inform well how internal processes influence the generation and performance of academic spinoffs and the contribution of HEIs to regional development more in general. We provide below a summary of the most important insights coming from this recent stream of the literature. In Section 5, we take stock of these results and suggest how scholars interested on the contribution of HEIs to regional development can include the main insights from this literature and develop future research ideas which are relevant for both academics and policy makers.

The evidence on the importance of management practices in driving performance for manufacturing companies is widespread. The above evidence relies on a widely tested survey methodology and a robust measure of management practices which is used to investigate and explain differences in management practices across organisations and countries in different sectors (Bloom *et al.*, 2016). Following this methodol-

ogy, management practices have been grouped in three broad areas: monitoring (how well do organisations monitor what goes on inside them and use this for continuous improvement), targets (do organisations set the right targets, track the right outcomes, and take appropriate action if the two are inconsistent) and incentives (are organisations promoting and rewarding employees based on performance, and trying to hire and keep their best employees) (Bloom and van Reenen, 2007).

Notably, management practices have been shown to be positively associated with an important number of performance measures: productivity, profitability and survival (Bloom and van Reenen, 2007). As far as productivity is concerned, management scores contribute to explain differences in productivity both across and within-countries, specifically a quarter of differences in total factor productivity. The existing literature agrees on the three main factors which contribute to explain good management quality: i) a higher level of competition; ii) more internationalisation (whether the companies is a multinational or heavy exporter) and iii) the ownership type (specifically the absence of primogeniture in family-owned companies). The above evidence relating to the importance of management practices for performance and the main drivers of management quality has been found to be consistent across 34 different countries and evidence on causality of the above relationships is accumulating at a fast pace (Bloom *et al.*, 2013; Bloom *et al.*, 2015b). Similar findings have been found for private companies operating in the services. Maguire (2012) analyses management practices for 126 private firms located in Ireland in non-manufacturing sectors, namely tradable and non-tradable services, wholesale and retail trade. The author confirms the finding for manufacturing companies that higher management scores are associated with better performance but, at the same time, finds some differences. Indeed, compared to manufacturing firms, service companies have weaknesses in target management, lean operations and monitoring while they tend to do better in people management.

The strong evidence gathered on the role of management practices in the private sector can actually be of little support for organisations operating in different sectors, such as healthcare or public education. Notably, individuals operating in not-for-profit contexts or public administrations are likely to be driven also by altruistic and pro-social motivations (Perry *et al.*, 2010).⁴ In such a context, the development of (monetary) rewards or the setting of strict targets (which are both part of management practices as discussed above) can turn out to be detrimental to the productivity of individuals and/or organisations. As a result, some recent contributions have compared the adoption and performance effects of management practices between for-profit and not-for-profit organisations (Delfgaauw *et al.*, 2011; Keller, 2011). For example, Delfgaauw *et al.* (2011) collect data on management practices

⁴ Altruistic motivations relate to promoting the interests of a community, while pro-social motivations refer to «the desire to expand effort to benefit other people» (Grant, 2008 p.49).

for 92 for-profit and 62 not-for-profit organisations (nursing homes and fostering agencies) based in the UK. They find that not-for-profits score lower than for-profits in management practices with key differences due to the presence of incentives. In terms of performance, they show how higher management practices are associated with better outcome in for-profit organisations only. The above debate has driven academic interest towards different areas of no-profit and hybrid situations where both for-profit and not-for-profit organisations coexist: healthcare, secondary education, public administration and higher education.

As long as healthcare sector is concerned, a number of studies provide evidence of the positive role of management practices on performance for public and private (both for-profit and not-for profit) healthcare in the US. McConnell *et al.* (2013) study 597 cardiac units in public and private US hospitals and find a high variability in the adoption of management practices. They also find management practices to be correlated with probability of survival and several process-of-care measures relating to infarction procedures. Similarly, McConnell *et al.* (2009) survey 147 not-for-profit addiction treatment programs in the US and find that higher management scores are associated with the number of days to treatment admission. Finally, Bloom *et al.* (2015b) analyse data for 161 public hospitals in the UK and are able to pin down the casual impact of competition on management quality. Competition is also found to be strongly associated with a wide array of hospital performance measures, ranging from mortality rate from emergency surgery to internal staff retention. Based on the evidence highlighted above, the healthcare sector is characterised by a role of management practices which is very similar to the private sector one with a high variation in management quality; a positive role of management practices on organisation performance and competition as a strong driver of management scores.

When it comes to public administrations the picture becomes less clear-cut. Results from studies which analyse management practices in public administrations show variability in the positive effect of management practices which turn negative under some circumstances. For example, Dohrmann and Pinshaw (2009) collect data for tax administrations across 13 different countries and study the association between management practices and the efficiency and effectiveness of tax collection. Instead of finding a ubiquitous positive role of management practices, they find a positive association for specific practices (proactive demand management, taxpayer segmentation, streamlined operations and performance tracking). Even more relevant is the work by Rasul and Rogger (2016) who analyse 4700 public sector projects in 63 civil service organisations in Nigeria. While they find a positive effect of civil servant's autonomy on performance (measured as project completion rates), the authors reveal a negative correlation between the existence of incentives and target monitoring on performance (an increase of one standard deviation in one of the two lowers the project completion rate by 14%). The authors show that this negative effect is mainly due to two mechanisms. First, civil servants operate in a multi-tasking environment where processing «red-tape» is as important as a more productive

task. Nevertheless, incentive systems can actually lead them to put more effort on the former, thus reducing project completion rates. The second mechanism refers instead to subjective performance evaluation in the presence of incentives or specific targets. The existence of subjectivity in the judgement of civil servant operations may lead them to reallocate effort towards non-productive tasks (e.g. conduct activities to obtain the favour of supervisors), thus reducing project completion rates.

The last area where research on management practices has concentrated relates to education. Bloom *et al.* (2015a) collect data on management practices in 1,800 high schools across eight different countries. The authors show that higher management scores are associated with better pupil performance in standardised school tests. More interestingly, and in line with the results for civil servants outlined above, they reveal the central role played by autonomy: autonomous government schools have higher management scores than regular government and private schools. The gap between the two types of schools (autonomous vs regular and private) is due to the leadership role of the principal and school's governance. The evidence above on the positive role of autonomy and competition on management quality and performance resonates well with the recent evidence on the positive effect of university autonomy and competition on university output, in terms of university ranking and technology (Aghion *et al.*, 2010). Management practices have also been found to affect University's performance. Mc Cormack *et al.* (2014) explore management practices in British Universities and find that higher management scores are associated with better performance both in teaching and research. The effect is mainly driven by the incentives for recruitment and staff retention.

In an attempt to gauge the role of management practices for the development of entrepreneurship at the local level, a recent contribution checks whether management practices play a key role in the creation of academic spinoffs by higher education institutions. Benassi *et al.* (2017) rely on a longitudinal dataset comprising 790 Italian University spinoff companies observed over the period 2006-2014. They also collected information about University management practices relating to spinoffs by administering a structured questionnaire to the key individuals in the academic spinoff's process inside Italian Universities (mostly the head of the technology transfer office and/or their designate). The authors investigate the relationship between management practices which support academic entrepreneurship and the growth of academic spinoffs. They found management practices concerning lean operations, monitoring and target setting to be more diffused than incentives and professional management practices. Altogether, management practices contribute to explain the variation in the performance of academic spinoffs. However, they found some types of management practices (support operations and incentives) to have a positive correlation with the growth of academic spinoffs, whilst other management practices (target and professional management) to be negatively correlated. Table 2 depicts the studies pertaining to management practices and discussed above.

Table 2. RESEARCH ON MANAGEMENT PRACTICES

Reference	Organisation type	Public/private ownership	For-profit (FP)/ Not-for-profit(NFP)	Sector	Details	Countries	Output measures	Main results
Bloom and Van Reenen (2007)	Private firms	Private	FP	Manufacturing	732 medium sized companies	US; France; Germany; UK	Productivity; Profitability; Tobin's Q; Survival rates	1) Management practices are strongly associated with performance measures; 2) Between-country and within-country differences in management scores; 3) A quarter of cross -and within-country TFP gaps are accounted for; 4) Weak product market competition and primogeniture in family-owned firms are associated with poor management practices; 5) Multinational firms are better managed.
Bloom et al. (2016)	Private firms	Private	FP	Manufacturing	11,000 medium sized companies	34 countries	Productivity	
Bloom et al. (2013)	Private firms	Private	FP	Manufacturing	RCT on 17 firms	India	Performance metrics of quality, inventory and output	1) An increase of a standard deviation in the management score increases productivity by 10%; 2) Profits increased on average by \$325,000 in the first year (cost of intervention was \$200,000).
Maguire (2012)	Private firms	Private	FP	Business economic services (tradable and non-tradable services, wholesale and retail trade)	126 companies	Ireland	Productivity, ROCE, sales growth, market share, market capitalisation	1) Higher management score associated with better performance; 2) Compared to manufacturing weaknesses in target management, lean operations and monitoring while do better in people management.

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Reference	Organisation type	Public/private ownership	For-profit (FP)/ Not-for-profit(NFP)	Sector	Details	Countries	Output measures	Main results
Bloom et al. (2015a)	Schools	Both	Both	Public and private education	1,800 high schools	8 countries	Pupil performance	1) Higher management scores are associated with better pupil performance; 2) Autonomous government schools have higher management scores than regular government or private schools; 3) Gap between the two is due to principal leadership and governance.
Bloom et al. (2015b)	Hospitals	Public	NFP	Public healthcare	161 public hospitals	UK	Management quality and hospital performance	1) Casual impact of competition on management quality and hospital performance; 2) Competition negatively associated with mortality rate from emergency heart attack, from all emergency surgery, intention of staff to leave, average length stay in hospital and positively to finished consultant episodes per patient spell; 3) Adding a rival hospital increases management quality by 0.4 standard deviations and increases survival rated from emergency heart attacks by 9.7%

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Reference	Organisation type	Public/private ownership	For-profit (FP)/ Not-for-profit(NFP)	Sector	Details	Countries	Output measures	Main results
McConnell et al. (2013)	Cardiac units in hospitals	Both	Both	Public and private healthcare	597 cardiac units	US	Process-of-care measures, 30-day risk-adjusted mortality and 30-day readmissions for AMI	1) High variation in management practices; 2) Man practices correlated with mortality and process measures.
McConnell et al. (2009)	Substance abuse treatment programs	Both	NFP	Non-profit	147 addiction treatment programs	US	Days to treatment admission; revenues per employee; operating margins	1) Higher man scores are associated with days to treatment admission; 2) Better man practices are present in areas with higher competition.
Rasul and Rogger (2016)	Public sector	Both	NFP	Public service	4700 public sector projects in 63 civil service organisations	Nigeria	Project completion rates	1) 1 SD increase in bureaucrats' autonomy increases performance by 18%; 2) 1 SD increase in incentives/monitoring lowers performance by 14%
Dohrmann and Pinshaw (2009)	Public sector	Both	NFP	Tax administration	13 tax administrations	13 countries	Efficiency (revenue collected per \$ spent) and effectiveness (proportion of taxes payable that are collected)	Major drivers of performance are: 1) Proactive demand management; 2) Sophisticated taxpayer segmentation; 3) Streamlined operations; 4) Rigorous performance tracking.

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Reference	Organisation type	Public/private ownership	For-profit (FP)/ Not-for-profit(NFP)	Sector	Details	Countries	Output measures	Main results
Delfgaauw et al. (2011)	Not-for-profit and for-profit organisations	Both	Both	Nursing home and fostering/ adoption agency industries	92 FPs and 62 NFPs	UK	Evaluation by independent regulator	1) Better man practices associated with better outcomes for FPs; 2) NFPs score lower than FPs in man practices ; 3) Key difference being incentives; 4) Man scores not associated with outcome in NFPs.
McCormack et al. (2014)	Higher Education Institutions	Public	NFP	Public education		UK	Research and teaching performance at the department level	1) High heterogeneity in management scores between and within universities (across departments); 2) Largest difference comes from incentives for recruitment and retention of staff; 3) Higher management score is correlated with better performance (both teaching and research); 4) Target management is not related to performance.
Benassi et al. (2017)	Higher Education Institutions	Public	NFP	Public education	790 academic spinoffs from 42 Public Universities	Italy	Revenue growth	1) Man practices are related to revenue growth; 2) Support operations and incentives management are positively correlated to growth; 3) Target and professional management are negatively correlated to growth; 4) There is some variation across the growth rate distribution.

Source: Authors.

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3.2. Hybrid organizations at HEIs

In the '70's HEIs could be conceived as a homogeneous set, as they would stand apart from other organizations because of their primary mission: producing and disseminating new knowledge. Fifty years later, HEIs have changed their organisation considerably. Besides producing and disseminating new knowledge, HEIs are to various degrees engaged in extracting (part of) the value they produce. Direct engagement in value extraction is a piece of the so-called «Third Mission» (hereafter TM). TM classifies activities related to research (e.g. technology transfer and innovation), education (e.g. continuous education) and social engagement (e.g. voluntary work) (European Commission, 2008). Direct engagement by HEIs in value extraction is deemed to be relevant because «the time when universities could assume that they will be funded, no questions asked, is long past. Entrepreneurship and new ways of engaging will be required at every level to bring in the necessary resources (financial, collaborations, access to facilities, etc.) from different sources. Rich and multiple mutually beneficial engagements with society are essential for all kinds of university in this context, and success in this endeavour can be both profoundly motivating and liberating» (European Commission, 2008; pag.5).

However, direct engagement in value extraction by HEIs is not an easy task. Fostering entrepreneurship through academic spinoffs and bringing in the necessary resources from different sources can turn out to be a quantum leap. HEIs were born for a different reason. Besides producing and disseminating new knowledge HEIs are now being asked to do something radical different from their historical mission. TM is the adoption of an «idea and behaviour that is new to the organization's industry» (Daft, 1983). TM equals to a technological change that force HEIs to be (also) innovative.

From an organizational viewpoint this can pose a serious dilemma: how to design and structure an organisation that at the same time must fulfil opposite, often-conflicting requests. On one side, a large part of HEIs will still be dealing with «business as usual»; on the other side, there will be a smaller part dealing with rather new challenges. In fact, the so-called TM not only implies several possible different domains. It also brings about rather new task environments (Thompson, 1967). Scholars frame the dilemma in terms of mechanistic versus organic structures (Burns and Stalker, 1961). The mechanistic structure emphasizes rules and regulations, is appropriate for stable industries, is marked by precise definition of member function and is highly hierarchical. The organic structure is more appropriate to new industries, promotes new ideas and is characterized by flexibility, a fluid definitions of function and interactions that are both lateral and vertical. Organic structure fosters innovation. Mechanistic structure fosters efficiency. Since innovation and efficiency are both needed, organizations try to design their structures to take advantage of both. Following March's (1991) seminal contribution, organizations need to both exploit their existing capabilities and to provide for sufficient exploration to avoid being selected out by changes in markets and technologies. In March's view, «The

basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, devote enough energy to exploration to ensure its future viability» (1991, p. 105).

Two main approaches to solve this dilemma have emerged so far. First approach follows the classical organizational design recipe: differentiating internal structures while assuring integration. Positions characterised by high information complexity and reciprocally interdependent should be grouped together in order to minimize coordination costs. This could be the case of an internal office at HEIs dealing with academic spinoffs. Second approach suggests organizations to be ambidextrous. Ambidexterity is defined as «the ability to simultaneously pursue both incremental and discontinuous innovation...from hosting multiple contradictory structures, processes, and cultures within the same firm» (Tushman and O'Reilly, 1996, p. 24). Empirical research has offered robust support to the link between ambidexterity and performance, under conditions of market and technological uncertainty (O'Reilly and Tushman, 2013). Organizational ambidexterity can be achieved in three modes. First mode is sequential: organizations that need to re-align their structures with strategy can shift structures over time. Second mode is simultaneous: organizations must set autonomous units with separate people, structures and processes to exploit and explore. Third mode is contextual: members of an organisation should be free to allocate their time and energy to accommodate conflicting demands.

Most of the research on academic spinoffs has focussed on antecedents and consequences of spinoffs, but has left HEIs organizational evolution in the dark. One possible reason is that HEIs are subject to different regulatory systems, allowing distinctive degrees of freedom as far as organizational evolution is concerned. By now, two main distinctive organizational trajectories have emerged. First trajectory relies on organizations like technology transfer offices (TTOs), incubators and scientific parks whose aim is to increase the commercialization of university research and support formal spinoffs based on university owned intellectual property. Recent research supports the view that several organizational levels are crucial in the academic spinoff process. For example, departments might control important resources and offer incentives to professors and researchers. For the same token, specific courses may encourage students to become more proactive in starting new companies. However, most scholars have pointed out that TTOs, incubators and scientific parks can play a key role, as they assignment is specific and their resources specifically devoted to support TM. Having a broad scope they can diffuse and promote an entrepreneurial culture; develop industry and users' connections; assist in searching for different possible applications of a new technology; support academic spinoffs in getting access to initial funding and early stage investments, and so on. The extent to which TTOs, incubators and scientific parks support academic spinoffs creation and help them growing is controversial (Mosey and Wright 2007). TTOs, incubators and scientific parks can also suffer from capability deficiencies (Clarysse *et al.*, 2005).

Studying the populations of university spinoffs in three European countries, Fini *et al.* (2016) concluded that in order to develop high quality spinoffs technology transfer infrastructures were not enough. However, as argued by Cesaroni and Piccaluga (2016), a wide heterogeneity exists in the types of models adopted and in the outcomes arising from TTOs' activities. They suggest that the three models they identified (the first being oriented to research; the third more balanced between research and knowledge transfer and the second in between the two) might represent different steps of an evolutionary path towards «a greater valorisation of research and a stronger involvement with the external economic environment» (pag.771). Similarly, Phan *et al.* (2005) emphasise how TTOs, incubators and scientific parks can be extremely helpful in addressing problems faced by startups in early phases, above all the «liability of newness» issue.

The second trajectory is more consistent with the simultaneous mode of the ambidextrous organisation. Here the main assumption is that in order to valorise research and promote academic spinoffs HEIs must set independent, autonomous units. Quite often, these units are legal entities with their own governance structures, managers and employees. For example, Oxford University Innovation (OUI) –a subsidiary wholly owned by Oxford University– is responsible for managing technology transfer, consulting activities and spinoffs. In 2015, OUI had a revenue of £24.6; managed around 2,500 patents, signed more than 500 deals and returned to Oxford University and its researchers £13.6. OUI has spun off a new company based on academic research every two months on average. OUI spinoffs raised over £266 million in external investment since 2000, and five are currently listed on London's AIM market (Isis Innovation Annual Report, 2015).

Both trajectories signal that the organizational structure of HEIs is subject to evolve over time. The evolution is context and probably time-dependent: HEIs with a favourable institutional setting will be the first to move towards a new overall configuration. A new overall configuration will presumably parallel the increased weight and importance of TM. HEIs will more and more look like hybrid organizations; hybrid organizations try to achieve external effectiveness and adaptation as well as internal efficiency at some functional level (Daft, 1983). Hybrid organizations have separate groupings that allow for effective coordination within each grouping, as well as central functions providing horizontal coordination. If this is a possible scenario, it is unclear how HEIs will solve the typical puzzles of hybrid organizations: high administrative overhead and possible conflicts among the groupings.

4. CONCLUDING REMARKS AND FUTURE RESEARCH

The study of HEIs third mission has been of undoubted interest to policy makers and university managers for the past two decades. Both governments and HEIs worldwide have made concerted efforts to improve engagement with the pri-

vate sector under the expectation that the exploitation of knowledge created at HEIs would influence the development of new sectors and eventually economic growth (OECD 2003).

Although the existing literature in the economics and management of innovation has largely covered the relationship between HEIs and industry, comparatively less attention has been paid to HEIs' role for regional development. This is even more apparent when one looks at a specific (but largely discussed) mechanism of technology transfer: academic spinoffs.

In this paper we have explored the link between academic spinoffs and regional development. Building upon the available evidence, we have speculated on how academic spinoffs can contribute to regional economic growth. More importantly, we have highlighted two major research lines which can contribute to this area of study: (i) management practices and (ii) hybrid organisations. We contend that a better understanding of these two lines of research can prove useful in guiding future research on the contribution of higher education institutions to regional development and in guiding the decisions by policy makers and (public and private) managers. There are a number of lessons for future research which can be drawn from this review.

First, the study of management practices in HEIs is just in its infancy. Very few works have analysed the role of management practices in HEIs. Specifically, our analysis suggests a lack of works focusing on the analysis of management practices for the engagement of HEIs with the external environment. Not only future research should address this gap, but these studies should also try to attach a causal impact to the effect estimated. At the moment, most of the available evidence points to a strong positive correlation between the implementation of management practices and performance. Therefore, in order to provide robust policy and managerial prescriptions, more studies are needed to confirm whether the effect is in the assumed direction.

Second, existing studies have only looked at one side of the relationship, namely the adoption of management practices in HEIs, thus disregarding whether specific management practices adopted in academic spinoffs complement or substitute the positive/negative effect of those implemented in HEIs through their TTOs.

Third, although there is ample worldwide evidence on the role of management practices for the performance of private companies, works on the adoption of management practices in HEIs just refer to two countries: the UK and Italy (McCormack *et al.*, 2014; Benassi *et al.*, 2017). Ideally, future works should expand the available evidence to other countries to provide a more substantiated claim about the role of management practices for HEIs in different institutional contexts.

Further research is also needed on the drivers in the adoption of management practices, particularly within HEIs. The extant literature has found a strong role of competition and type of ownership in explaining the adoption of effective manage-

ment practices. However, this evidence entirely refers to for-profit organisations. As most of HEIs are not-for-profit organisations, other factors can play a more important role in spurring the adoption of management practices. For instance, a better grasp of factors such as the level of internationalisation, academic labour market regulations as well as human capital attraction and retention can prove to be central for a better understanding of the phenomenon.

Finally, contrary to most of the studies analysing management practices in the private sector, existing works focusing on the public sector find a mix of positive and negative effects of management practices on performance (Rasul and Rogger, 2016; Benassi *et al.*, 2017). As civil servants operate in an environment different from the private sector, they are likely to be affected differently by incentive systems originally designed for the private sector. An important objective for future research is, therefore, to critically evaluate the effect of management practices on performance, and shed light on which of them can contribute to explain the positive role of academic spinoffs on regional economic growth.

As for «hybrid organisations», HEIs do represent an interesting area of application. The vast majority of empirical research on hybrid organizations is based on private organisations, notably firms. The ability to cope with environmental changes is a well-known issue in the management literature (Pfeffer and Salancik, 1978). Common sense and empirical evidence support the view that in order to survive and possibly prosper organizations must evolve and adapt to the new. Management literature offers several cases of companies that fumbled their future. Organizations that have been successful in the past often stick to their products and their technology. Not surprisingly, they get selected out. To avoid or minimize the risk of being selected out, organizations should explore new domains, and at the same time exploit their usual ones.

HEIs are organizations facing to a large extent a similar challenge. For institutional and competitive reasons HEIs are going to explore domains far away from their usual ones, as in the case of the so called third mission. Academic spinoffs are part of the third mission. To succeed in promoting robust spinoffs, HEIs will have to support differentiation (to maximize environmental fit) and at the same time maintain coordination and control. To deal with these changes, we argued that HEIs could either define new roles and positions (as in the case of TTOs) or set independent legal entities.

From a more general perspective, HEIs are going to become hybrid organizations. Hybrids have emerged as a type of organisation that earns part or all of its revenue to support a social mission. Hybrid organizations «exist at the interface between non-profit and for-profit business models» (Holt and Littlewood, 2015), leveraging a mission-driven business ethos in achieving a societal goal. This is exactly the case of HEIs as they must earn part of their revenue to support their mission. Capturing value from the market to produce social value blurs the usual distinction between for profit vs not for profit. Managerial and business literatures highlighted

that ambidexterity could be the right solution, but for HEIs this is not an easy recipe. First, rules and principles used can conflict and even collide: HEIs' main activities are regulated by a clear institutional framework that cannot be used in doing business in the open market. Second, HEIs might find it difficult to turn antagonistic assets into complementarities as they often employ people with skills that are incompatible for productive processes and are equipped with physical resources conflicting with market and technological requirements (Hockerts, 2015).

Despite these possible limitations and the challenges they are facing, HEIs are a new breed worth exploring. The new breed stems from two different organizational species. It aims at combining attributes that have been seen incompatible. Combination can occur in different forms. Besides, not all hybrids were born alike. Future research will discover invariants and reveal under which conditions hybrids can fulfil their (only apparently competing) goals.

In conclusion, we believe that the external ecosystem is a crucial element in order to recombine the two contrasting logics in the link between academic spinoffs and HEIs. The role of the external environment is also central in the implementation of sound management practices. The integration of these two dimensions (hybrid logics and management practices) can eventually contribute to regional development. Evidently, a central role in this process is played by the selection mechanisms in place, such as the selection of employees and screening procedures for the emergence of capable entrepreneurs. By addressing some of the key questions emerging from our work, scholars can help to move the topic of the role of HEIs for regional development forward, thus building impact for this important field of research.

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