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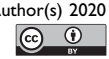

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What Do We Know about the University Contribution to Regional Economic Development? A Conceptual Framework

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Abstract

There are a rapidly growing number of scientific studies analyzing the role of university and higher educational institutions in regional economic development. In this study, the author reviews the rapidly growing body of research streaming out of the geography of innovation and knowledge with particular attention to the period from 1994 to 2019. The author discusses several seminal contributions on the role of universities in regional economic development and then applies a systematic literature review to the extant research of 193 articles. This literature review offers a conceptual framework by identifying four key topics found in the literature: organizational capacity, intermediaries, knowledge dynamics, and policy.

Keywords

university change, regional development, entrepreneurship, literature review, research policy

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What do we know about universities and higher educational institutions (HEIs) in relation to regional economic development? In recent decades, universities and HEIs have been addressed as key actors for industrial renewal and regional economic growth, due to their assumed effect on spatial knowledge production, innovation, and societal changes (Benneworth and Hospers 2007; OECD 2014). Yet, the role of universities in economic and social development is a complex, multilevel, and emergent phenomenon that spans over time and that requires a skillful leadership and policy approach in order to maximize the benefits of localized university–industry interaction (Drucker and Goldstein 2007). Considerable knowledge has been built up over the last few decades of research at four levels of analysis: the organizational impact and functions of universities, intermediary functions, the multilevel approaches focusing on the knowledge dynamic of firm behavior, and policies for regional development and innovation. Despite this breadth of research, knowledge is still fragmented, and the research field lacks integrative multianalysis as Peer and Penker (2016) argue in their review. Inspired by the growing amount of policy documents and regional innovation studies that emphasize the role of universities, a literature search on the term "University/Higher Education and regional economic development" was conducted on Web of Science on November 18, 2016, which identified 158 articles. A new search was conducted on February 28, 2019, based on the same search string, which created 35 new articles. The literature reviewed consists of a total of 193 articles, from which there were three distinct review articles that are relevant to the purposes of this study (Peer and Penker 2016; Drucker and Goldstein 2007; Caniels and van den Bosch 2011). Peer and Penker's (2016) ambitions are to build a sound knowledge basis based on an investigation of policy documents and literature on the role of HEIs in regional economic development. Caniels and van den Bosch (2011) take a narrower regional innovation system (RIS) approach by asking the question, "In what ways can HEIs fuel interorganizational learning within the region?" The third approach, by Drucker and Goldstein (2007), analyzes the evidence of four research studies in the literature by asking the question of whether and to what extent HEIs influence regional economic development outcomes. While all of these review articles focus on the relationship between universities/HEIs and the regional level, they all take different methodological approaches and use different definitions of core concepts. Only one of the reviewed articles is common to all three of the review articles. Based on the literature review, it seems that the research field is characterized by a panoply of different research approaches, methods, and definitions, which makes it hard to draw conclusions for policy and management purposes (Trippl, Sinozic, and Lawton Smith 2015). As an example, the constituency of what characterizes a university has different meanings in different countries, and the roles of universities in regional development have been measured and interpreted differently within the same research area (Trippl, Sinozic, and Lawton Smith 2015). The same is true of the concept of regions, which has been criticized as being a fuzzy analytical concept. Region as an analytical concept has been interpreted differently by researchers and policy makers in terms

of regional characteristics, boundary drawing, change mechanisms, and policies (Asheim, Lawton Smith, and Oughton 2011). These issues will be further addressed in the Discussion and Conclusion sections of this article. The aim of this article is to review the growing number of studies on university and regional development and offer a better understanding of core findings from the large amount of research studies carried out in this research area. Then, this article proposes a conceptual framework for future research studies.

This article is organized as follows. In the next section, the process of the literature review is described. Next, the review process is described, which ends with a presentation of the four main key topics with their thirteen subthemes. Based on the four key topics, a conceptual framework is discussed. At the end of this article there is a discussion on the direction of future research and a conclusion.

Method

In this study, the review methodology began from a disciplinary stance by exploring the emerging phenomenon of university change and regional economic development based on the researcher's prior experience of extensive reading in the literature. In order to avoid the pitfalls of a narrative literature review, which can sometimes be vulnerable to criticism that the choice of articles was biased, arbitrary, or limited in scope, a systematic literature review (SLR) process was used (Pittaway and Cope 2007; Bazeley 2007; Sorensen 2008). The SLRs emphasize basic principles of transparency, clarity, equality, and accessibility, supported by the use of methods for assessing the quality of the empirical evidence via detailed search criteria within citation indexes from Web of Science (Pittaway and Cope 2007). The SLR process, in this study, is based on a five-stage procedure of formal and manual delimitation and expansion of the selected articles (Table 1) supported by the use of the software analytical tool QSR NVivo 11.

In the first stage, a formal search was performed on November 16, 2016, supported by a follow-up search on February 28, 2019, in Web of Science using the following search string ("University" OR "Higher Education") AND ("regional economic development" OR "regional innovation system?"). The terms "university" and "higher education" as the construct of the search string were used because they were traditionally treated as interchangeable in the literature (Boucher, Conway, and Van Der Meer 2003; Chatterton and Goddard 2000; Clark 2004; Drucker 2016; Goddard and Chatterton 2000). "Regional economic development" and "regional innovation system" are selected as constituents of the search process as these terms have become popular research topics in the last few decades, and they also emphasize the localized or regional role of universities/HEIs (Etzkowitz and Leydesdorff 1997; Cooke, Heidenreich, and Braczyk 1998). The selected time span was set from 1994 to 2018 as there were no journal publications identified by Web of Science before 1994. The total number of selected articles was 193. Non-English papers and papers in working progress were eliminated. The second stage included a citation

Table 1. Stages and Procedures of the Systematic Literature Review Process.

Stage	Description
1.	A formal search was conducted with the use of Web of Science using the following search string ("University" OR "Higher Education") AND ("regional economic development" OR "regional innovation system?"). Non-English papers were discarded from the review process, ending up with 193 papers.
2.	Descriptive citation analysis was conducted by using Web of Science citation analytical tools identifying the most popular journals, countries of origin, research areas, citation score, and h-index 2.
3.	Relevant articles and abstracts were downloaded into bibliographic software (EndNote). The bibliographic software was used to abstract and manually identify keywords, discarding papers for which the paper research findings or research questions were not positioned within the literature review framework, ending up with 147 articles.
4.	The EndNote library was download into qualitative analysis software (QSR NVivo 11) where an exploratory content analysis and text search query were conducted by using word frequency analysis aimed at building a coding scheme where articles were classified by assigning attributes.
5.	A manual review process based on the coding scheme identified key themes and subthemes using a rigorous inductive method.

analysis through the use of Web of Science analytical tools, which is further described in the section on descriptive analysis.

Third, an intensive selection process of reading abstracts and keywords was used to reduce the number of papers, ending up with 178 articles. By focusing on the relationship between university/higher education and regional development, only abstracts that directly positioned the selected papers' research findings and research questions in line with the literature review research question were selected for further analysis. Papers that referred in general terms to university or higher education without discussion of the particular relationship between university/higher education and regional economic development or the RIS were discarded from the process.

Fourth, in order to gain an overview of frequently occurring words or concepts, frequent-words analysis was conducted as the starting point of a coding scheme with the use of QSR NVivo 11 analysis software. This technique identified the twenty most frequent words found in the literature (Table 1). The coding scheme identified keywords, themes, and the relationships between keywords and themes, which called for more exploration and a basis for building categories and subthemes.

In the fifth stage, based on the coding scheme, a manual inductive review process (Strauss and Corbin 1990; Gioia, Corley, and Hamilton 2013) identified concepts (first-order concepts), themes (second-order themes), and key categories. The SLR process identified four key dimensions or categories and thirteen subthemes of the

research topics, which became the subject of further manual text search analysis. The organizational principles of the manual text search analysis were study topic, hypotheses or questions, and contributions. The analysis revealed that several papers are boundary-spanning papers. A cluster analysis of coding similarities (QSR NVivo 11) shows that the articles are not coherent in terms of theme structure. In other words, studies that were similar in word usage did not necessarily deal with similar issues and vice versa. The first key category of articles is studies that take the university point of view by focusing on the organizational capacity for regional innovation and growth. The category includes subthemes such as organizational characteristics, university roles and models, and drivers of change. The second category of studies examines intermediary roles, functions, and activities. Issues such as Triple Helix/RIS, knowledge spillover, knowledge production function (KPF), spin-off, start-up, employment, and knowledge infrastructure are found in this subtheme of articles. The third category of articles examines industry knowledge dynamics such as firm research and development (R&D) strategies, absorptive capacity studies, and region as locus for knowledge sources. The fourth and last key category of studies is policy studies that include subthemes of general policy studies, core and peripheral RIS studies, and broader RIS policy studies.

Research Review

In this section, an overall descriptive analysis of selected articles is first presented, focusing on the issue of the relationship between universities and regional economic development. Then, the articles are grouped into four main categories of origin of studies (i.e., organizing principles). The first category includes articles focusing on hypotheses about the organizational capacities of universities, the second group of studies emphasizes hypotheses about the role of intermediary structures and functions for localized knowledge spillover, the third category of studies focuses on hypotheses regarding localized knowledge dynamics, and the fourth and final category of studies focuses on hypotheses concerning policy design and measurements.

Descriptive Analysis of Studies

The initial search revealed 193 articles. In addition, references were used from previous review articles (Drucker and Goldstein 2007; Caniels and van den Bosch 2011; Peer and Penker 2016). The publication years spanned from 1994 to 2018. Non-English papers and papers not relevant to university or regional development were discarded, resulting in 193 articles. The articles came from 78 journals and 377 authors. In total, the articles were cited 4,504 times, with an h-index score of 30 (based on h-index calculation by Web of Science). The average number of citations per item is 23.34. The ten most common research areas are business economics

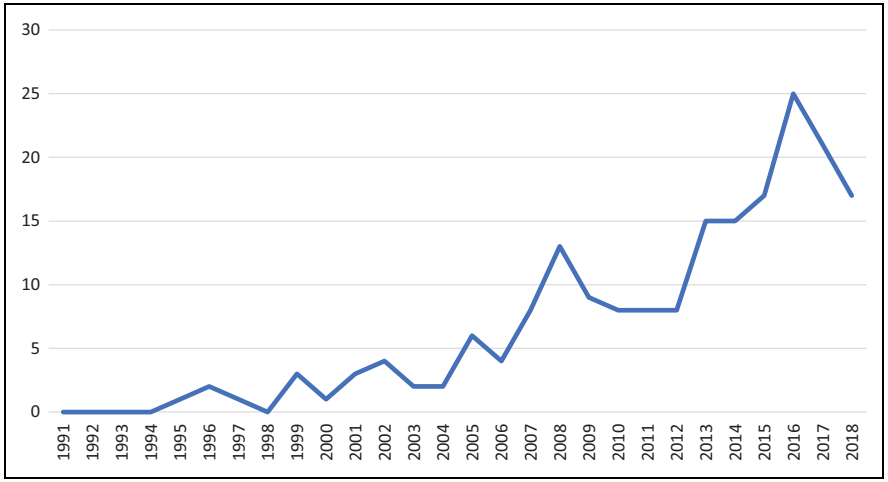

Figure 1. Publications per year from 1994 to 2018 ($N = 193$).

(118), public administration (62), environmental sciences ecology (56), geography (53), urban studies (29), engineering (20), education research (15), operation research management science (13), information science library science (7), and computer science (6). The most popular journals are (by number of articles) *European Planning Studies* (15), *Regional Studies* (15), *Economic Development Quarterly* (8), *Research Policy* (8), *Science and Public Policy* (7) *Journal of Technology Transfer* (6), *Technological Forecasting and Social Change* (5), *Entrepreneurship and Regional Development* (5), and *Technological Forecasting and Social Change* (5). Most of these articles are dominated by authors from Western countries (156 of the 193 articles). Fifty-five articles came from the United States, 29 from England, 18 from Italy, 17 from Sweden, 15 from China, 12 from the Netherlands, and 9 from each of Norway, Canada, and Spain. The average citation score and h-index from articles were as follows: the United States: 33.82/16, the Netherlands: 23.55/7, Sweden: 24.87/9, England: 12.54/10, Italy: 10.5/6, and China: 8.75/6. There has been an increasing growth in the number of articles published on universities or higher education institutions, especially in relation to regional economic contribution (Benneworth and Hospers 2007; Peer and Penker 2016). The growth of the research field shows that between 1994 and 2018, the number of published articles grew gradually from 1995 until 2012, with a significantly increased number of publications from 2013 to 2017 (Figure 1).

The growth of studies discussing/dealing with university contributions to regional development reflects the significant rise in interest among scientific communities in the last decade. In light of the increasing interest in the role universities play for societal and innovation purposes, the growth of new articles will probably continue in the years to come.

Table 2. Most Cited Studies of University Capacity Building and Impact Studies.

Category	Themes	Key Findings of Mechanisms	Authors
University/HEI capacities	Organizational characteristics	Organizational capacities are formed by the relationship between the internal organizational structure of the university and the corresponding profile of the economic structure of the region.	Lee (1996), Goldstein and Drucker (2006), Fischer and Varga (2002), Huggins, Johnston, and Stride (2012), Hayter (2015)
	University roles and models	New university roles and models emerge as a series of transitions whereby multiple stakeholders continually shape the university business model. Different roles or models of universities emphasize different national policy path dependence, spatial activities, and mechanism for engagement.	Gunasekara (2006; see supplemental material), Benneworth et al. (2009), Miller, McAdam, and McAdam (2014), Flores et al. (2009), Guerrero et al. (2016; see supplemental material)
	Drivers of university change	Diminishing public funding, globalization and regionalization of knowledge system, upgrading of academic staff competence, universities are seen as powerhouse for economic development and dissemination of knowledge for economic change.	Boucher, Conway and Van Der Meer (2003), Chatterton and Goddard (2000), Charles, Kitagawa, and Uyarra (2014), Coenen and Moodysson (2009)

Note: HEI = higher educational institution.

Studies on Universities' Organizational Capacities for Regional Innovation and Growth

Studies on universities' internal capacities for innovation and growth (twenty-eight articles) include issues such as the role of the university in a knowledge-based society, and how universities organize themselves in boundary-spanning activities (Gumport and Sporn 1999; Gumport 2000; Harding 2007). Three streams of research are identified in this study category (Table 2). These are the organizational characteristics of universities, universities' roles, and university change forces. Studies focus on the internal characteristics of universities as a mechanism that either

promotes or hampers universities' role in regional economic development. The basic assumptions are that organizational capacities are formed by the relationship between the internal organizational structure of the university and the corresponding profile of the economic structure of the region (Caniels and van den Bosch 2011). These studies emphasize that such a correspondence to the profile of the economic structure opens up the opportunity for the transfer of knowledge, interactive learning, and resource mobility between universities and society. The hypothesis of similarities in competence and experience assumes that corresponding competence and knowledge make interactive learning possible, which is further strengthened when there is a strong academic ethos that is supportive of university–industry interaction (Lee 1996; Hayter 2015; Boucher, Conway, and Van Der Meer 2003). One possible reflection made from these analyses is that the degree of organizational similarities, competence, and knowledge bases seems to impact on regional innovation capability in terms of universities' capacity to interact and disseminate knowledge to the regional business life. However, it is a more open question whether overly close similarities or correspondence of knowledge and competence might hamper a region's capability to diversify into new promising industries or companies' novel ways of searching for (un)related knowledge (Brekke 2015; Cowan and Zinovyeva 2013).

Another research theme is focusing on different types of university roles (Uyarra 2010). In particular, the role played by universities in different RIS approaches, and the regional and national context including policy institutions that underpin them, have become popular studies. The literature has gradually changed focus from seeing the university–industry relationship as ad hoc activities of independent actors toward an integrative and systemic perspective where universities become key actors within a more global, national, and regional knowledge system. Trippl, Sinozic, and Lawton Smith (2015) classify different roles of universities in a narrow and a broad view. These views of roles are based on different types of activities, the policy implication that can be drawn, and the regional and national policy context. Uyarra (2010) identifies five key roles portrayed in the literature in relation to university activity and the way policies tend to explicitly reflect one or a combination of several of these roles. These are the knowledge factory, the relational or collaborative role, the commercial or entrepreneurial university, the node- or boundary-spanning role, and the development role. As Uyarra (2010), Youtie and Shapira (2008), and Trippl, Sinozic, and Lawton Smith (2015) point out, universities often reflect all these roles or different views to a lesser or greater extent, which raises a serious concern over the potentially unrealistic expectation of the university balancing a broad range of stakeholders' needs and new tasks against its traditional core mission without fundamental restructuring and reorientation of the university. One conclusion from these studies reveals that national policies, industrial trajectories, university characteristics, regional culture, and norms may be key explanatory variables for different forms of university engagement and knowledge transfer mechanisms at work.

The last research theme focuses on what the mechanisms and forces that drive university changes. There are two main categories of studies within this research stream. The first group of studies takes a more critical stand to the transformative forces following greater interaction with industry and also includes studies that emphasize the dilemma between academic freedom and the expected, and sometimes unrealistic, contribution of universities to regional development (Boucher, Conway, and Van Der Meer 2003; Etzkowitz 2013). The second group of literature sees universities' contribution to regional development as a way of transforming old and sometimes outdated academic institutions into modern knowledge machines that have the capacity to become powerhouses for economic development by transferring knowledge to society and educating highly skilled students (Chatterton and Goddard 2000). The forces that drive these changes are often explained as exogenous to the university, driven by an increasingly open and global knowledge production system where nation-states seem to be in a less favorable position to handle these forces as it is at the regional level that people live their lives and do their work. Mass education, the decline of state funding, and the emergence of user-driven research policies are forces that have been mentioned in regard to university change. Other studies have emphasized that the changes are also driven by endogenous forces, occurring within the university, through the upgrading of academic staff, and access to funding schemes, which can further increase the research quality and output into new areas of opportunity (Bramwell and Wolfe 2008).

Studies of Intermediary Roles, Functions, and Activities

Ninety-three of the 193 reviewed articles in the literature emphasize the intermediary roles, functions, and activities of universities. These studies address topics such as the Triple Helix governance role and RIS discourse, knowledge transfer or spillover, and the KPF, output analysis, which includes spin-off and knowledge infrastructure solutions such as technology transfer offices (TTOs), and science parks (Table 3).

Studies applying the theoretical concepts of Triple Helix and RIS are often used to inform policy makers about how to construct regional development and innovation. The Triple Helix model and the RIS explain the evolution of institutionalized collaboration among academia, industry, and public government (Etzkowitz and Leydesdorff 1997). The Triple Helix hypothesis assumes that close interaction among a university, industry, and government disintegrates the boundary of actors in such a way that each actor's sphere integrates into a self-sustaining dynamic process that is capable of moving across technological trajectories and renewing itself into new promising areas of opportunity (Etzkowitz and Leydesdorff 1997; Coenen 2007; Arbo and Benneworth 2007). The Triple Helix model is seen as endogenous and dynamic as the actors react to each other's selection. Within an RIS perspective, universities are seen as agents that can play a broader systemic role in regional economic development by plugging gaps in the local RIS or facilitating

Table 3. Most Cited Studies of Intermediary Structure, Role, and Function.

Category	Themes	Key Findings of Mechanisms	Authors
Intermediary roles and boundary-spanning functions	RIS/Triple Helix development	Universities as key actors for knowledge spillover. Knowledge selection mechanisms are found to be related to organizational boundary permeability, market environment, technological trajectories, cultural and communicative competence.	Chen and Kenney (2007), Coenen (2007), Etzkowitz (2012), Leydesdorff and Deakin (2011), Leydesdorff and Fritsch (2006)
	Knowledge spillover and knowledge production function (KPF)	The KPF framework captures a variety of different regional knowledge spillover mechanisms and their effect on regional innovation output in terms of patents or new products. Findings from these studies indicate that universities are generally seen as important factors influencing regional differences in innovation performance.	Acs, Anselin, and Varga (2002; see supplemental material), Buesa, Heijs, and Baumert (2010), Cowan and Zinovyeva (2013), Fukugawa (2016), Li, Kong, and Peng (2007), Hayter (2015)
	Spin-off, start-up, employment, and economic impact	University contribution to regional economy through several knowledge transfer mechanisms such as spin-offs or spin-out, start-ups, and employment. Findings indicate that larger or metropolitan areas benefit mostly from these knowledge transfer mechanisms due to growth being greatest in regions with a high concentration of skills able to apply knowledge created from university.	Bathelt, Kogler, and Munro (2010), Bramwell and Wolfe (2008), Brown and Mason (2014), Huggins (2008), Steffensen, Rogers, and Speakman (2000)
	Knowledge infrastructures such as TTOs, science parks, and KIBS	Knowledge intermediaries affects firms' organizational learning capabilities by impacting on firms' network relationship, and internal learning processes.	Niosi and Banik (2005), Pinto, Fernandez-Esquinas, and Uyarra (2015), Shapiro, So, and Woo Park (2010), Yun and Lee (2013), Lee and Kim (2016)

Note: RIS = regional innovation system; KIBS = knowledge-intensive business services; TTOs = technology transfer offices.

cluster development, particularly in less favored regions (Benneworth 2007; Isaksen and Trippl 2017; Benneworth, Pinheiro, and Karlsen 2017). Network and local knowledge sharing based on geographical and cognitive proximity among actors

is seen as a selection mechanism for enhancing regional economic growth. However, as Benneworth (2007, 504) states, "proximity is subject to a U-curve in its regional value; too much proximity can produce lock-in, path dependence and weaken the overall regional value of the activity." Organizational boundaries are assumed to be a selection mechanism that either strengthens or hampers university–industry interaction by discouraging some knowledge crossovers while encouraging others (Etzkowitz 2012). The constellation or composite of selection mechanisms is found to be highly localized, which is often supported by a bottom-up policy, "use and demand driven," that promotes localized knowledge spillover through regional branching mechanisms such as academic entrepreneurship, mobility, or social networking.

The literature analyzing knowledge transfer and spillover suggests there is a wide range of mechanisms (spin-off, research collaboration, human capital, licenses, and patents) through which universities can potentially contribute directly and indirectly to regional economic development. Economists, in particular, have used the knowledge–production–function framework (KPF) to articulate generalities and particularities of specific regions, policy implication, and new development trends (Goldstein and Renault 2004). The KPF framework, first introduced by Griliches (1979) and later modified by Jaffe, Trajtenberg, and Henderson (1993), has been widely applied in survey studies on different geographical scales and in different industrial sectors (Fukugawa 2016; Ponds, van Oort, and Frenken 2010). The KPF framework captures regional knowledge inputs, such as private and academic R&D expenditures, and the effect on regional innovation output in terms of patents, new products, or firm formation particular to certain technological and scientific fields (Drucker and Goldstein 2007). Recent research studies have modified and extended the Griliches–Jaffe model and by so doing include other variables that give a wide variety of results. Findings from these studies indicate that universities stimulate regional economic development in a wide range of areas, especially where the presence of a university is found to positively impact on regional economic growth and innovativeness (Goldstein and Renault 2004; Buesa, Heijs, and Baumert 2010). Ponds, van Oort, and Frenken (2010) found in their studies that spillover mechanisms from research collaboration occur over longer distances, since geographical distance is less important in the establishment of collaborative research in science-based industries.

Studies focusing on universities' effect on regional economy are divided into three study themes: university spin-offs (USOs) or spin-out effects, TTOs and science park analysis, and human capital and employment studies. The terms "spin-off" and "spin-out" are often used in the literature interchangeably, and sometimes different definitions are applied to the same term. "Spin-out" is often defined as a new entity formed by staff from a parent organization that is based on some form of asset that was developed while staff were employed by the university. A "spin-off," on the other hand, is defined as a part of a business that is separated from the parent organization to operate as an independent organizational entity. USOs are assumed to be important technology transfer mechanisms for generating and sustaining

regional economic growth and competitiveness (Bathelt, Kogler, and Munro 2010). A USO is typically viewed as a new venture that is based on commercializing academic research efforts formed by a faculty, staff, or students (Miner et al. 2012). A USO can impact on economic and employment growth through the formation of new ventures and is recognized as being more innovative than other new technology-based firms. Other research findings indicate that a USO can act in an intermediary role by attracting other high-tech companies to enter the region or by providing ideas and incentives for industrial renewal and reorganization of established firms (Bathelt, Kogler, and Munro 2011). Thus, USOs are often viewed positively by policy makers, yet evidence indicates that very few USOs grow and many remain very small. Some studies emphasize the role of experienced researchers as the founders of new ventures. Other research studies find that USOs are often localized close to their parent organization as they are more dependent on the spatial proximity following from network effects in the first phase of the venture's life; while later in their life cycle, the customer relationship becomes a stronger location coefficient (Huggins 2008). The literature does not provide a clear-cut definition of the actual spin-off phenomenon; instead, the term "university spin-off" remains a vaguely defined concept. This vagueness has created confusion about the different types of spin-off and the impact on local economic development.

TTOs or knowledge technology offices (KTOs) and science parks emerged as an organizational phenomenon in the late 1980s and 1990s as a response to encourage scientists to commercialize their research results. TTOs and science parks as intermediary structures are designed to support the commercialization of academic knowledge through spin-out and intellectual property rights management (Looy, Debackere, and Andries 2003). Most of these institutions are localized in technology-dense areas or larger city areas, which makes them less favorable tools for revitalizing less favorable regions. At the national level, research supports the effect that TTOs/KTOs and science parks have on promoting research collaboration and acting as a knowledge link among technology-dominating regions within and between nations (Yun and Lee 2013). Niosi and Banik (2005) examine the evolution and performance of several biotechnology RISs in Canada, finding that the creation of TTOs in research universities plays a significant role in the growth of new RIS. A study by Parker and Hine (2014) examines intermediary knowledge transfer programs and the effect on organizational learning capabilities; findings indicate that knowledge intermediaries, such as universities, affect firms' organizational learning capabilities by impacting on firms' network relationship, internal and external communication channels, and internal learning process, which in turn affect the ability to interpret and use knowledge within the firm.

The last group of studies in this subtheme examine the positive university effect on employment growth and human capital. Eriksson and Forslund (2014) find that the university effect on employment growth is greatest in regions with a high concentration of skills capable of applying the knowledge created in universities, which means that the regional composition of skills needs to match the knowledge

Table 4. Most Cited Studies of Industrial Knowledge Dynamics and Firm Behavior.

Category	Themes	Key Findings of Mechanisms	Authors
Industry knowledge dynamics	Firms' R&D strategy for knowledge source	Companies, particularly within science and engineering, strongly benefit from close collaboration with a university and the presence of a university impact the regional support environment for innovation.	Agrawal and Cockburn (2003), Freel (2000), Roper et al. (2010), Pinto, Fernandez-Esquinas, and Uyarra (2015), Barra and Zotti (2017)
	Firms' absorptive capacity	Firms' ability to utilize external knowledge sources and spillovers is a function of their own investment in R&D. Knowledge transfer in a spiraling model of knowledge upgrades the actors' collective absorptive capacities.	Agrawal and Cockburn, (2003), Cooke (2005),
	The region or RIS as locus for knowledge sources	The density, structure, and size of the RIS, as well as the characteristics of the industrial sector in the regions, influence the nature and geography of knowledge sourcing and the use of knowledge transfer mechanisms.	Leydesdorff and Fritsch (2006), Tödtling, Lengauer, and Höglinger (2011), Liefner and Zeng (2008), Isaksen and Trippl (2017)

Note: R&D = research and development.

produced by the university for a significant university knowledge spillover effect. Another study, by Fallah, Partridge, and Rickman (2014), finds that universities play their primary role in creating human capital rather than knowledge spillovers for nearby technology firms.

Studies of Regional Knowledge Dynamics

The literature review conducted in this study can be categorized into three types of research themes (Table 4) for regional industrial knowledge dynamics (total of twenty-nine articles in this category). The first group of studies examines firms' strategies for searching for innovation and knowledge resources from a territorial perspective. The second group of studies emphasizes firms' ability to utilize external knowledge sources and spillovers for innovation purposes, and the third group of

articles examines different types of regions and firms' patterns in sourcing knowledge relevant for innovation.

Recent work on innovation suggests that the strategies employed by firms to innovate depend not only on their own internal R&D capacities and competences but also on boundary-spanning activities for searching for innovation and knowledge resources and the quality of the innovation systems, networks, and supply chains with which they are operating. In particular, the availability of external knowledge sources for innovation—such as universities, public, and private research institutes—has been seen as a significant enabler of innovation (Roper et al. 2010; Agrawal and Cockburn 2003). Belussi, Sammarra, and Sedita (2010) examine the life science industry located in the region of Emilia Romagna and its use of public research organizations (PROs), finding that the life science industry used universities and PROs located outside the region more than regional-located universities. Freel (2000) examines strategy in innovative manufacturing small and medium size companies, finding that innovators are found to spend a significantly greater proportion of turnover on research and development and to have more links with universities and support organizations than noninnovators. Some newer studies are expanding our knowledge about the knowledge spillover mechanism by including analyses of human capital development such as education and training. Barra and Zotti (2017) find in their studies that human capital development through university contribution has a positive impact on domestic production and geographical proximity. Pinto, Fernandez-Esquinas, and Uyarra (2015), studying universities and knowledge-intensive business services (KIBS) as sources of knowledge for firms in a peripheral region in Spain, find that the absorptive capacity remains a central dimension in the interaction between universities and the use of KIBS. The interpretation is based on an understanding that universities are used as a form of KIBS in the absence of real KIBS. Taken together, the findings from these in general support the assumption that companies strongly benefit from university interaction through the educational function of universities with the recruitment of a skilled workforce. However, findings indicate that companies do not solely rely on local research capacities, such as universities, as companies become more integrated in the global network of knowledge (Fischer and Varga 2002).

The second group of studies deals with firms' absorptive capacity and modifies the seminal work by Cohen and Levinthal (1990) on notions of firms' ability to utilize external knowledge sources and spillovers as a function of their own investment in R&D. Cooke (2005) expands the absorptive capacity assumptions to include a more dynamic view. His proposition emphasizes that dynamic capabilities stimulate knowledge transfer in a spiraling model of knowledge that is complementary and upgrading, and where it also engages innovation institutions such as universities, it pulls them up the knowledge spiral.

The third group of articles examines different types of regions and firms' patterns in sourcing knowledge relevant for innovation. The hypotheses claims that central or metropolitan regions, which are characterized as organizationally thick and

diversified or specialized, offer better conditions for knowledge transfer and localized learning than organizationally thin regions (Isaksen and Trippl 2017). By analyzing different modes of innovation, RIS typologies, and types of knowledge linkages, Isaksen and Trippl (2017) claim that spatial patterns of learning and knowledge exchange vary substantially across different types of regions and different modes of innovation. Tödtling, Lengauer, and Höglinger (2011) examine a thick and thin RIS within information and computer technology (ICT) companies in Austria, finding strong support for ICT localized in a metropolitan region benefiting more from the dense knowledge networks and university–industry collaboration than companies located in less urbanized areas. Their findings support the hypotheses that the density, structure, and size of the RIS, as well as the characteristics of the industrial sector in the regions, influence the nature and geography of knowledge sourcing and the use of knowledge transfer mechanisms.

Studies of Policy Implication

A central thread running throughout the majority of the investigated articles on policy approaches (forty-one articles), which is more or less based on the normative concept of the Triple Helix and RIS framework, is that universities are assumed to produce a number of core benefits for regions (Table 5). However, recent research studies (Smith and Bagchi-Sen 2012) have questioned these innovation policies by investigating national and regional innovation policy. One finding from these studies indicates that regional differences in terms of governmental support, composition and capabilities of the research and educational sectors, the industry-specific environment, the innovation performance, and paths of regional economic development vary widely between nations. Cai and Liu (2015) examine the roles of universities in fostering knowledge-intensive clusters in the Chinese RIS, finding that the Chinese practice of university engagement differs from Western practice from the perspective of the Triple Helix. The Chinese policy emphasizes a top-down approach by providing financial incentives, the development of science parks, and setting up university towns, while bottom-up initiatives are supported by local or regional government through a trial-and-error approach. Brown (2016) studied entrepreneurial spillovers from universities in peripheral regions in Scotland, finding that university knowledge spillover has been greatly exaggerated due to the disconnection between universities and their surrounding local entrepreneurial and innovation ecosystem. Brown states that within the Scottish context, it seems impossible to achieve the expected third-mission contribution by universities, despite the considerable resources directed at this aim, due to the lack of involvement and poor performance of other actors in the RIS. The policy issue streaming from the Triple Helix and RIS addresses the dichotomy between a top-down and bottom-up innovation policy approach. As mentioned, several findings indicate that a top-down policy approach needs to be combined with local or regional engagement policies, which are more context based and experimental where local knowledge spillovers between

Table 5. Most Cited Studies of Policy Implication.

Category	Themes	Key Findings of Mechanisms	Authors
Policy implication	Policy framework	Regional differences in terms of government support, composition, and capabilities of the research and educational sector, and the industry-specific environment, the innovation performance and paths of regional development vary widely between nations and regions. Trust, culture, proximity, the regional knowledge base, and type of policy approach are found to be of relevance when explaining different path-dependent processes.	Cai and Liu (2015), Chen and Kenney (2007), Lenger (2008), Sohn, Kim, and Lee (2009)
	Regional characteristic	Evidence indicates that universities play different roles in different types of regions and policy instruments.	Brown (2016), Sohn, Kim, and Lee (2009), Tödtling, Lengauer, and Höglinger (2011), Karlsen et al. (2017)
	Top-down and bottom-up, demand-driven or technology-push policy instruments	Development of strong RIS, where the university contributes to regional economic development, is found to be a function of a top-down policy approach combined with or attuned to a technology-push policy that is aligned with specific regional knowledge needs and dynamics.	Brown (2016), Coenen and Moodysson (2009)

Note: RIS = regional innovation system.

academia and industry are at stake. Coenen and Moodysson (2009, 602) conclude in their study on putting constructed regional advantages into Swedish practice that there is no "one-size-fits-all" policy solution to innovation system failure and challenges. Instead, they argue, successful regional innovation policy must be embedded

in, and attuned to, the specific needs and available resources in a particular region, which includes the specific industrial characteristics, knowledge base, human and financial capital, and cultural norms and attitudes among firms and individual subjects to influence regional economic development.

Framework for Analyzing Current and Future Topics on University Contributions to Regional Economic Development

The study was initiated with the goal of reviewing the growing number of articles and to advanced academic discussion on how university contribute to regional economic development. Based on a review and analysis, the literature can be organized into a framework (Figure 2) that clearly shows the linkages between organizational capacities, roles, and functions of intermediary structures, regional knowledge dynamics, and policy tools that impact how university contribute to regional economic development.

The insight gathered from the literature review provides important implication for research. Specifically, the study has identified implication that can help to shape the development of future research agenda on university contribution to regional economic development.

Theoretical Implications of the Term "Region" and "University or Higher Education"

The first implication is related to the two selected core terms of the search string, regions and university or higher education, which turned out not to be simple or unambiguous concepts. *Regions* are today seen as important bases for economic coordination and transfer of knowledge as regions represent spaces where people live and work, where business operates, wealth is produced, and services and products are consumed (Cooke, Heidenreich, and Braczyk 1998; Arbo and Benneworth 2007; Martin 2017). Although the term "regions" is often used to explain uneven spatial economic development and as a unit of target policy design, there exists no unified definition or operational measurement of the concept. Some theorists merely presume the a priori existence of a cohesive geographic and economic entity known as a "region," whereas others base theory on more explicit definitions found in some common approaches such as central place theory and location theory, the nodal or labor market approach, and the functional economic area approach (Dawkins 2003). The most widely used approach among theorists is the functional economic area approach, which is a variation of the central place theory and the labor market approach. The theory is based on the view that the dominance of a central node (place or city) over the surrounding periphery is attributed to the spatial dependence of workers adjacent to employment centers. The approach applies labor as the unit of measurement as labor mirrors how economic agents perceive their environment, the

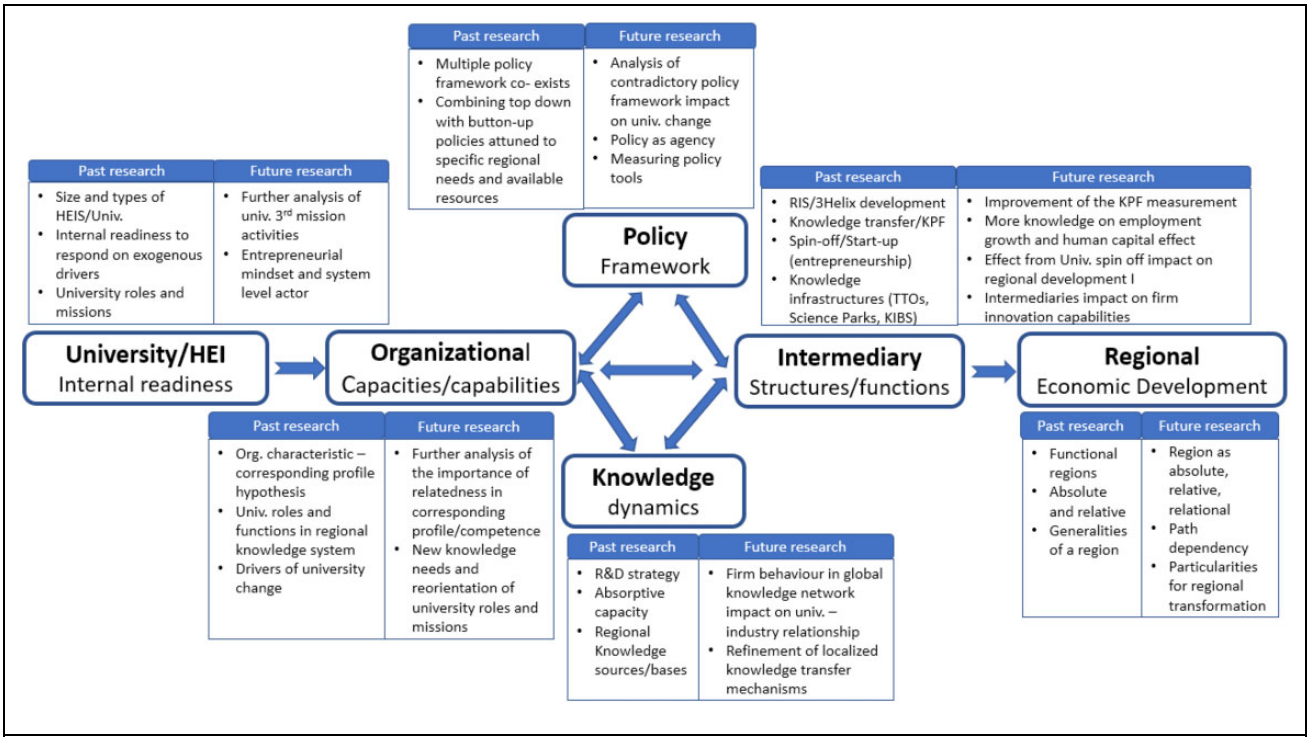

Figure 2. A conceptual framework for future research studies.

commuting distance, and the fact that labor markets also serve as a consumer market. The problem with this definition is that geography (region) is no longer the primary constraint on the boundary of social and economic organizations as advances in communication and transportation technologies have weakened many of the centripetal forces that tie the labor market and economic agents to a place. Secondly, political boundaries rarely correspond to functional economic areas, which reduces the causal relationship between a specific regional problem and the policy instrument design to solve the problem, and estimating the effect of policy tools on regional economic development. In the last few decades, a strain of economic theories has contributed with a new understanding of what drives regional transformation processes. These theories (institutional, neo-Schumpeterian, and evolutionary theory) emphasize the existence of a place-specific institutional, social, and cultural setup that creates unique regional competitive advantages and sees change as endogenous and relational (Sunley 2008; Castells 1996). These theories propose a shift of focus from defining region in terms of absolute and relative (i.e., functional and administrative) to focus on region as absolute, relative, and relational where the term "region" is defined as a system of requiring interaction among a set of actors. The absolute, relative, and relational theories emphasize the local cultural embeddedness of economy and the spatialities of knowledge creation and transfer (Martin 2017). Consequently, regional spaces become more complex to define, and they cannot be treated as a pregiven entity with clear boundaries as actors continuously shape and reshape social interaction. Cooke (2005) claims that a region is "a unit for geographical, functional, social or cultural reasons," which emphasizes different forms of proximities (social, geographical, cultural, etc.), interaction, and institutional mechanisms such as norms, culture, trust, rules, and history. Consequently, the cultural and the relational social dimension of space also includes a shift in searching for general and universal laws toward focusing on particularities and the context-based dimension (Isaksen and Trippl 2017). The shift toward the region as absolute, relative, and relational has two research implications. There are a growing number of comparative surveys and case studies capturing the unique place-dependent regional knowledge spillover dynamism (Tables 2, 3, and 4), and there is a research stream focusing on articulating generalities and particularities of specific regional development dynamics (Tables 3 and 5). The objectives of research on generalities and particularities are to measure R&D investment, innovation output, the degree of university involvement in university–industry collaboration, and a region's knowledge base (Leydesdorff and Fritsch 2006). However, the quality and reliability of national patent data and other sources used in large surveys, such as the European Union Community Innovation Survey and the German Social Insurance Statistics, have been questioned due to a lack of unifying definitions, common sampling procedures, and access to longitudinal data (Pinto, Fernandez-Esquinas, and Uyarra 2015). As an example, Strand and Leydesdorff (2013) conclude in their study of the Norwegian innovation system that a comparison with the Netherlands is of little value or relevance due to the various sizes of geographical units, different

population density, sampling procedures, and historical and geographical factors. Case studies based on qualitative methods with objectives to describe unique place-dependent regional knowledge spillover dynamism are often used as an approach to identify how change mechanisms work under different regional contexts and circumstances. Such case studies are often criticized for lacking significant generalities, so they become storytelling without explanatory power to describe or identify significant mechanisms of regional change. However, case studies can provide a better and richer understanding of localized growth dynamics based on a bottom-up perspective that identifies particularities (Martin 2017).

What has emerged from this discussion is a more pragmatic, relativistic, and open-ended approach where region is seen as the product of multiple separate mechanisms including many processes, such as social life, that are highly localized and particularistic. Regions might be in different forms and shapes (e.g., thick or thin, diversified, metropolitan, or peripheral), and they follow different development paths. The type of definition adopted can heavily influence selection of research approach specific and aspects of a regions, thus often makes it impossible to draw comparisons among them. One way to deal with the blurry concept of region is to differentiate between types of regions and their specific path characteristic (i.e., path extension, industry diversification, or new path creation; Isaksen and Trippl 2017). The shift of focus to absolute, relative, and relational dimension of region, highlights the spatiality of the creation of new knowledge within "territorial places" where systematic localized interaction between private and public interest, and contextualized learning is seen as the main mechanisms to secure competitive advantages for regions. The hypothesis claims that the composition of regional actors produces pervasive and systemic effects that encourage firms within the region to develop specific forms of capital that is derived from social relations, norms, values, and knowledge interaction with the community in order to reinforce regional innovation capability and competitiveness. Universities, as knowledge-producing and knowledge-diffusing institutions, are often seen as key actors in improving regional capabilities for localized interaction and contextualized learning, which in turn might change the regional characteristics and ongoing path processes. Some studies have identified that the characteristics of a region, organizationally thick versus thin regions, do play a role when it comes to the opportunities to disseminate knowledge into society.

As the regional discourse has shifted from a focus on structure and generalization to process and contextualized generalization, the role of the higher educational system and universities at the regional level has become an important topic in the regional development debate. The objectives of regional economic development studies are to better grasp the regional knowledge dynamism and capabilities for innovation in a significantly more open and more global knowledge system, where place-specific capabilities (proximity, spatial concentration, institutions) are seen as competitive advantages and drivers for path-dependent regional development processes (Asheim, Boschma, and Cooke 2011). In particular, the RIS approach

(Table 3) emphasizes cooperation in innovation activity between firms and knowledge-creating and knowledge-diffusing organizations such as universities.

In general, universities are recognized as a key actor for creating and diffusing localized knowledge. However, the variety of university types has not been readily recognized by scholars or policy makers (Huggins, Johnston, and Stride 2012; Smith 2007). There are several types of typologies and indicators used in the literature to differentiate the variety of university types and their relationships with society. A classical approach is to differentiate between established, "prestigious," and research-intensive universities and those with less established track records in terms of knowledge production, measured by patent data, research publication, or license agreements. Some studies indicate that prestigious large universities are more outward-looking and network-oriented than younger institutions. However, other studies claim that old prestigious institutions are more loosely coupled to societal needs and act more or less independently of the surrounding environment. Other studies differentiate between various university roles or models in terms of their regional engagement and third-mission activities (Table 2). New typologies such as the entrepreneurial university, the engaged university, the mode 2 university, and the Triple Helix university have emerged in the last few decades (Table 2). These university typologies are not clearly defined, they have weak theoretical support, and they are often treated as a relatively homogeneous group of actors, which they are not (Uyarra 2010).

Based on the above, it is clear, then, that the terms "regions" and "universities" or "higher education" are not unproblematic entities, and they are far from simple concepts to be used for research and policy purposes without careful interpretation. A similar interpretation can be noted for the term "university," which is treated differently in the literature in terms of universities' roles in society, functions, outreach activities, and their organizational capacities to interact with their surrounding environment. Based on the above elaboration, and for the sake of this literature review study, the term "university" will be used as a broad term that includes all types of HEIs that provide society with education, research, and the broad stream of third-mission activities that involves knowledge transfer, continuing education and lifelong learning, and broader engagement in regional development. As discussed above, there are no unifying or common used definition of what constitute a region or a university, which might explain the high amount of panoply of different research approaches in this research area. However, in order to solve the problem of multiple definitions of a region, this study propose the following definition of a region. A region is as a spatially contiguous population of human beings and economic agents (organizations) that is bounded either by historical necessity or by choice to a particular geographic space. The dependence on location may arise from a shared attraction to local culture, labor force, natural resources, geographical and social proximity, and an institutional setup that is unique and not easy to imitate.

Theoretical Implications Derived from the Four Key Topics

Findings from this literature study have identified some key hypotheses derived from the four mentioned key topics. Studies analyzing the hypothesis of the corresponding profile between universities and the regional industry knowledge bases propose that if there is sufficient correlation between the industry structure and the university, then the university will be in a favorable position for promoting interaction and knowledge flow and enhancing contextualized learning (Table 4). If the situation is the opposite, and the cognitive distance is too large, then we can expect companies to be reluctant to interact with the university, and the knowledge will be rejected by the industry or universities need to search for partners, which might be located outside the region. Two main points can be drawn from studies analyzing the corresponding profile hypothesis. First, the hypothesis links internal reform to the external environment of stakeholders claiming to have a say in internal university affairs (Table 2). Several theories and university models, such as the Triple Helix and the entrepreneurial university approach, propose that external public interest has to be locked into internal reform processes that build university capacities to interact with regional stakeholders (Greenwood 2007; Levin 2007). In particular, the Triple Helix model and RIS approach (external to the university) in addition to concepts such as the entrepreneurial university (internally driven processes) have informed policy makers to initiate reforms aimed at redesigning university work life. Smith and Bagchi-Sen (2012) ask questions about the extent to which universities are capable of handling multiple roles or broad third-mission activities and at the same time respond to user-driven innovation policies. Second, the hypothesis assumes that a corresponding profile will enhance prosperity for regional growth and development. However, as Neffke, Henning, and Boschma (2011) note, too much relatedness or similarity might also be harmful for regional growth dynamics as it might hamper the inflow of unrelated knowledge, which can fuel the region with new growth dynamics, leading to regional path extension, path creation, or diversification (Brekke 2015; Isaksen and Trippl 2017). This topic addresses the hypothesis about university organizational capacities for regional development and path creation.

Studies analyzing industrial knowledge dynamics have highlighted the importance of the quality of the intermediary functions and structure (regional knowledge diffusion infrastructure) and companies' absorptive capacities as enablers for spatial innovation and knowledge diffusion (Tables 3 and 4). The regional knowledge diffusion infrastructure includes resources such as science parks, universities, TTOs, and so on, that stabilize interaction and knowledge flow between regional actors, and institutional factors (such as culture, norms, rules, etc.) that reflect the regional institutional mindset of opportunity recognitions and change behavior. According to Isaksen et al. (2018), universities might act as change actors by both taking care of localized systematic trial-and-error learning processes (entrepreneurial experimentation) and by stabilizing change capacity and diffusing (un)related knowledge into

the regional business life as a system-level actor. However, the research field seems to be more focused on systemic drivers and change mechanisms occurring at the regional level (system) than analyzing how firms search for knowledge in a more open and global knowledge landscape, and the effect these search processes have on universities and regional path development (Varga 2009). Thus, there is a current need to better understand how universities' and companies' absorptive capacities to disseminate, utilize, and share related knowledge can be embedded at the system level of a region. The hypotheses of intermediary functions, roles, and processes are assumed to create capacities for change as well as stabilizing change by diffusing (un)related knowledge from internal and external sources into the wider regional business life.

In recent decades, the study of RIS and Triple Helix models supported by more nuanced KPF measurement has informed policy makers to pay more attention to regional differences, uniqueness, and advantages (Table 5). However, it is reasonable to ask questions about whether these intertwined relationships and policy tools might also conserve critical thinking or hinder the entrance of a new understanding of what is valued as the common interest of a single actor. A similar problem follows the different university roles that universities play in regional development processes that might create dilemmas and contradiction between the university's core mission (education and research) and its broad outreach activities. The growing knowledge and recognition of the fact that regions unfold differently and have different capacities to create changes has led to a shift in national and subnational policies. Today's policies are about embracing these inequalities by developing more nuanced and targeted policies designed to enable each region to identify and develop its own competitive advantages. These new policies assume that a bottom-up process will bring together local authorities, universities, business life, and civil society into a systematic interactive and experimental learning that is aimed at identifying local competitive advantages and future growth potentials. These policies, such as the European Commission Smart Specialisation Platform (S3 Platform), assume that universities can play a key role in the design and implementation of such policies. Universities are "among the few" institutions that act as "boundary spanners" bridging contextualized learning capacities (entrepreneurship experimentation) and diffusion of new knowledge into the region's business life for a new domain of opportunity. By that, S3 Platform hypotheses and following policies assume that universities take an entrepreneurial system-level role that might change the institutional framework or mindset of the region as well as building (university) organizational capacities to serve regional knowledge dynamics.

Conclusion and Direction of Future Research

Regions, like any other spatial scale of the economic system, are formed by complex social, technological, and economic processes that are shaped by an

almost infinite range of forces. These forces create different forms of regional path-dependent processes (path creation, diversification, or extension) and influence the unique composition of the regional knowledge infrastructure, which universities are a part of.

This literature review provides an overview of the most important drivers or mechanisms of the contribution of universities to regional economic development. The motivation for the study is partly based on the curiosity of the growing number (193) of research studies that emphasize the importance of the university contribution to regional economic development and secondly on the extent to which a university creates prosperity for regional economic development and increase firm innovation capacities. The literature study shows that the field is growing rapidly and the new theoretical framework progress toward a better grasp of the complexity of formative forces that continuously transform and change regions as spaces for interactive context-based learning. These theories, models, and concepts have further informed policy makers to develop targeted policy tools and indicators to measure university–industry interaction and promote regional development dynamics. To conclude, the presented literature review of 193 articles provides a rich source of hypotheses regarding universities' contribution to regional economic development organized in four key categories and thirteen subcategories. Each of these categories raises several questions, hypotheses, and research approaches regarding universities and regional economic development, industry innovation performance and knowledge flow, place-specific knowledge and learning conditions, and policy interventions. As the literature review shows, the research field is represented by several different theoretical approaches, such as innovation system thinking, agglomeration economics, evolutionary economic theory, institutional theory, and organizational management theory, all of which have in their own unique way—and they still need to be elaborated further—improved our knowledge of university change and regional economic development. This article shows that the terms "universities" and "regions" have increasingly become the starting point for various policy interventions in the last few decades. The type of definition adopted will influence the researcher's view on specific aspects and thus makes it hard to draw a comparison among them or develop targeted policy tools. As an absolute, relative, and relational entity, the meaning of region is better captured through the concept of systematic interaction and learning among regional actors, which is formed by dynamic and irreversible processes that recombine existing and related knowledge into new business opportunities. In this sense, the institutional and the regional characteristics, as well as the individual strategy and performance, can represent important basic conditions and thus a subject for new policy tools and research studies. Bearing in mind that regions are often used as an analytical starting point or unit of analysis and policy design, there is a current need to further clarify the term "region," what constitutes the boundary of a region, how regions change and grow, and what mechanisms influence regional knowledge dynamics in a long-term perspective (Benneworth and Hospers 2007). In particular, as Cooke (2005,

1129) notes, "... it may serve some purpose in reminding 'regional' scientists to make doubly clear their use of the term 'regional' is relational not containerized." The three bullet points presented below represent some of the shortcomings found in this study, which could act as guidance for future research:

- Organizational capacities and the hypotheses of relatedness or similarity (knowledge dynamics) are identified as a key mechanism for systematic interaction, contextualized learning, and organizational change between university and industry. To a lesser extent, the literature explains how the dynamics of firm innovation behavior influence and impact university–industry interaction and path development. Findings indicate that there is a need for more studies that investigate country differences concerning firm innovation dynamic and university capacities to act on and impact regional path development.
- The intermediary functions, structure, and roles emphasize the bounded interaction as the mechanisms for organizational changes and knowledge diffusion (stabilizations). A future direction of research studies should explore how intermediary functions, structure, and roles might work as a regional system-level entrepreneur that creates changes and stabilizes processes.
- The proposed conceptual framework (Figure 2) needs to be further tested and explored in light of the different types of regions (institutionally thick and thin), university roles (engagement, entrepreneurial, development, etc.), institutional characteristics, and the historical processes of path development as a subject for future studies.

The objective of undertaking this literature review was to present a comprehensive but constructive critical review of the burgeoning literature that now composes our knowledge of university and regional economic development dynamics. The impression of the exponential growth of articles and theories has broadened and deepened and is now richer in scope and relevance than ever before. This literature study provides an analytical approach to summarize some of the knowledge of regional growth dynamics and university contribution that have appeared in the last few years: inevitably, several important areas of theoretical and empirical enquiry have not been included due to the characteristics of the selected search string. Nevertheless, the literature review conveys an analytical approach of organizing different theories, concepts, models, and methods into a conceptual framework of four key variables (organizational capacities, intermediaries, knowledge dynamic, and policies). However, the presented framework needs to be further elaborated to enable a better understanding of the dynamic process of cultural, social, institutional, and political processes that shape the economic landscape.

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