

# Entrepreneurship, higher education institutions and regional development

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## Abstract

This paper discusses entrepreneurship and regional development from three different viewpoints: regional innovation systems, related variety, and open innovation. It distils two major insights for regional development. Heterogeneity of actors, technology and problem solving approaches as well as entrepreneurship are to be fostered to support innovation led regional development. Finally the discussion arrives at one conclusion: regional development strongly hinges on the understanding of regional innovation systems, the heterogeneity of their actors and their entrepreneurial activities. Finally it depends on how these actors interact in generating and exploiting knowledge.

Key words : Higher education, entrepreneurship, regional development, innovation systems

## Introduction

Growth theories generally acknowledge that in national and regional economies innovation and knowledge generation plays a crucial role for the growth dynamics and their trajectories (Solow, 1956; Temple, 1999; Romer, 1990). Innovation—the development of new processes, products and organizational structures, which are both technologically feasible and commercially successful—are created through the continuous interaction between firms, research institutes, government agencies, financing organizations and, what is particularly important here, higher education organizations. The exchange of knowledge, human and financial capital and other resources enables innovation and simultaneously embeds the actors in a dense network at the national, local and, most of all, at the regional level. This is because regions serve to accumulate and diffuse information and knowledge more intensively through social network formation and labor market mobility, than what is the case at national and international levels (Agrawal, Cockburn, & McHale, 2006; Malmberg & Power, 2005; Maurseth & Verspagen, 2002). It has been shown that the variety of actors within a region is a strong determinant of innovativeness. This variety is fostered by entrepreneurship and the entrepreneurial attitude of the actors.

Against this background the development and the evaluation of economic policy, innovation policy in particular requires contextualisation according to those specific institutional, technological and industrial preconditions in a region that are already in place (Fritsch & Stephan, 2005). These conditions often simultaneously represent the main barriers to and opportunities for entrepreneurship, diversification and growth (Asheim, Coenen, Moodyson, & Vang, 2007; Karlsen, Isaksen, & Spilling, 2011).

The overall target of this contribution is to tie together three rather independent strands of literature and to link regional development, entrepreneurship and higher education. The discussions of regional innovation systems, variety and specialization, and open innovation will be connected to form a theoretical—and empirically tested—basis, upon which policies for regional entrepreneurship and development can be built. In particular the discussion highlights the preconditions for entrepreneurship, the role of the

entrepreneur and the role of regional higher education institutions in supporting entrepreneurship.

## Three points of departure.

The discussion here builds on an evolutionary economic tradition, encompassing learning, knowledge, competencies and their cumulative development on the micro and firm level as well as on the regional and national level. Regional innovation systems refer to the interplay between regional industrial structure and a set of knowledge development institutions and mechanisms, which include regional labor markets and higher education institutions. Specialization and variety within this industrial structure plays a crucial role not only in determining the region's exposure to cyclical fluctuations and structural disruptions, but also in shaping the region's opportunity space for future development. If one focuses exclusively on the meta-level argumentation about regions and their characteristics such as specialization and variety, one might overlook that it is individual, micro actors—driven by their individual objectives and strategies—who jointly and interactively determine the emergent properties of a region. Hence, the third point of departure relates to open innovation as a strategic option for interactive knowledge development and exploitation at the firm level.

## Regional innovation systems

Part and parcel of the contemporary economic landscape is the shift, which has occurred from innovation relying primarily on the internal knowledge bases of firms to innovation becoming embedded in distributed knowledge networks. The concept of innovation systems builds on the idea that linkages, collaboration and networks composed of a wide variety of actors are crucial for understanding the creation and diffusion of innovations (Edquist, 1997). Based on the demarcation between elements that constitute the system and elements that do not, the literature distinguishes between national systems (Lundvall, 1992; Nelson, 1993; Freeman, 1987), sectoral systems (Malerba, 2002), technological systems (Carlsson, 1995; Carlsson & Stankiewicz, 1995; Callon, 1992), and regional systems of innovation (Cooke, Gomez Uranga, & Etxebarria, 1997).

Perhaps somewhat paradoxically, the shift towards distributed knowledge networks increases the role of the region as the locus of innovation (Doloreux & Parto, 2004). This is because regions are characterized by cultural and institutional proximity conducive to trustful—and more flexible forms of—interaction and collaboration. Therefore regions may serve as a venue for strong intentional and unintentional diffusion of information and knowledge, which does not travel well on far distances. In essence, the region may serve as a containing social structure around the knowledge development processes of individual firms. Regional actors thus accumulate and distribute information and knowledge externalities from these firms. From this follows the formation of territorially embedded knowledge bases, upon which creativity and knowledge creation activities may draw (Rondé & Hussler, 2005, Asheim & Isaksen, 1997; Maskell & Malmberg, 1999).

Also Porter argues that competitive advantage is generated by localized capabilities, competencies and interaction structures at the regional level that resist imitation (Porter, 1998). The concept of regional innovation systems has been developed to understand how these processes may be better influenced and channeled by means of public policy (Maskell & Malmberg, 1999) and how the active construction of knowledge development and diffusion mechanisms contribute to novelty by speeding up the process of reconfiguration and exploration.

The concept of regional innovation systems derives its theoretical, empirical and policy importance from the fact that it stresses the mutual interplay of heterogeneous actors in the innovation process such as funding agencies, policy makers, regulations and

standards, financial intermediaries and last but not least educational institutions (Ebersberger, Herstad & Koller, 2013).

## **Technological specialization & variety**

Direct collaborative linkages and indirect linkages of geographically bound contexts create localized spillovers, which in turn may reinforce technological development paths and may further strengthen collaborative linkages. Combined, this leads to regionally distinct profiles of capabilities and competencies (Storper, 1997). Localized externalities and the 'local information ecology' (Gertler, 2003) nurtured by proximity create a milieu where the odds are better for individual actors to pick up information that eventually turns out to be useful (Malmberg & Maskell, 2002). This includes entrepreneurial opportunities, which can be identified and harnessed at the intersection of existing firms' competencies (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009). On the other hand, one often observes that the interdependencies between infrastructure, historical investment, and the cumulateness of knowledge generation leads to local lock-ins, resulting in a strong persistence of specialization patterns. .

Eventually, the creation of innovation is not a target in itself (Howells, 2005). Rather is it the economic growth dynamics associated with the knowledge-based competitiveness of a region that drives policy interest in regional systems and increases attention towards their characteristics (Fritsch & Stephan, 2005). Yet, knowledge has either been interpreted as exogenous to development and economic growth (Solow, 1956), or it has been conceptualized as a one dimensional quantity (Temple, 1999; Romer, 1990). Only in the Schumpeterian or evolutionary perspective of economic growth variety and heterogeneity of actors, technologies and knowledge has been discussed (Pyka, Cantner, & Hanusch, 2000; Cantner, Gaffard, & Nesta, 2008; Frenken, van Oort, & Verburg, 2007). Recently, the traditional emphasis on R&D spillovers as sources of growth has merged with approaches focusing on how the composition rather than R&D intensity of regional industries determine growth trajectories, and rejuvenated the interest in place-specific agglomeration economies (Beaudry & Schiffauerova, 2009; Frenken, Oort, & Verburg, 2007; Jacobs, 1969)

The composition of the regional economy can be characterized whether the industries in the regional economy are related or not. Related variety refers to the variety of knowledge bases, competencies or technologies, which in combination form the basis for the innovation processes of regions. Related variety is based on the concept of Jacob's externalities (Jacobs, 1969). It has to be recognized that variety only provides the basis for novelty to the extent that cognitive distances between competence bases are not excessively large (Nooteboom, 2000). Related variety influences the growth trajectories of regions by supplying complementary knowledge bases, which can be combined and re-combined by existing firms, and through new firm formation. It offers a broader search space for solutions to given problems (Ebersberger, Herstad & Koller, 2013). It also offers a broader and less exhaustible search space for the application of given technologies and knowledge. Frenken et al. (2007) find that related variety indeed exerts a positive effect on employment in a region. Ebersberger & Becke (2010) illustrate how related variety can be conceptualized differently when using publicly available patent data.

On the contrary, unrelated variety is variety generated by different industrial sectors in a region, which are not related through a common knowledge base. Unrelated variety generates portfolio effects and immunizes the regional economy vis-a-vis exogenous shocks, but comes with the cost that cognitive distance creates friction on the diffusion and re-use of knowledge. Unrelated variety exerts negative effects on unemployment (Frenken, van Oort, & Verburg, 2007). Last, the similarity of actors associated with Marshallian (Marshall, 1920) industrial districts combines the risk of external shocks with the disadvantages of lock-in to narrow specialization paths and opportunity spaces.

Specialization and variety within a region are both the cause and effects of certain paths of development, where rejuvenating developments rather originate from related

variety than they do from unrelated variety. Yet, the latter ensures more stability in times of fluctuations and instability. The former however requires a certain degree of heterogeneity within the economy, where—as a condition—the knowledge bases are not too distinct to allow for certain overlap, linkage and cross-fertilization. However, it is not given in advance which sectors and knowledge bases that are potentially related in the sense that they can develop novelty at their intersections eventually do so. The regional innovation system enters this equation as an additional, constructed bridging mechanism, which enable this relatedness to be explored on a more broad basis.

## **Open Innovation**

Turning to the strategic approach of corporate actors it has recently been claimed that corporate innovation is approaching a new era of openness (Chesbrough 2003, 2005). An era of purposeful corporate strategies through which the closed investments in intramural R&D and the hermetically capsulated in-house development are augmented or even substituted (Lazonick, 2006, 2007) by extensive use of external knowledge and information sourcing and external pathways to commercialization. Openness of the innovation process increases innovation performance (Herstad et al. 2008) by opening up external interfaces and linking to a universe of new partners and tapping into diverse knowledge and information sources (Ebersberger & Herstad 2011, Laursen & Salter 2006). Corporate entrepreneurship is one of the crucial features characterizing open innovation approaches. Although some claim that these trends are leading to a 'flattened' distribution of productive competencies across actors and space (Friedman 2005, Chesbrough 2003), systematic empirical evidence clearly reveals that they are associated with a process of divergence in growth rates and technological development path. This favours those regions with the most well-functioning accumulation and diffusion mechanisms (Florida, 2005; Simmie, 2003, 2004) Yet, this in turn means that numerous regional environments are 'out there', outside ones own context of location, full of specialised ideas and knowledge ready to be utilized by those who master the trade of open innovation processes which extend across space as a result of globalization (UNCTAD 2005, Cooke 2007, 2005, Asheim 2005, Bathelt et al 2004).

Open innovation strategies teach us three lessons. First, open innovation emphasizes the value of heterogeneous information outside the company boundaries. Second, this knowledge should be sought out on an international scale rather than only locally or within national economies. Third, development and the following up of ideas are not necessarily bound to fall into given walls of established organizations. Taking ideas beyond the organizational boundaries is part and parcel of successfully exploring new ideas and insights. This holds both for the corporate world as well as for the science sector. In addition to these structured processes of external commercialization, the process also has external effects (Lazaric, Longhi, & Thomas, 2008; Morrison, 2008; Owen-Smith & Powell, 2004). Entrepreneurship is the key activity within the realm of open innovation to create new ventures based on ideas developed in established organizations, and made available through commercialisation efforts or as externalities. It is a key factor in determining the regional absorptive capacity (Carlsson & Eliasson, 2002).

## **Two insights—as the analysis**

The three different views on regions, regional systems of innovation and actors' strategies arrive at two insights, which stress the importance of heterogeneity and entrepreneurship.

First, the concept of regional systems of innovation puts a strong focus on the contribution of different sets of actors, which—in the light of related variety—ideally should develop different but complementary knowledge assets linked at the regional level by means of collaboration, by labour market mobility, by personal networks and not least by knowledge development and diffusion institutions. Everything else being equal, higher

survival rates of heterogeneous actors increase the diversity in an economy. As argued theoretically and found empirically, increased diversity is linked to an increase in innovativeness (Frenken, Van Oort, & Verburg, 2007; van Den Bergh, 2008; Woerter, 2009). Also from an individual actor's point of view tapping into the diversity of an external pool of knowledge is beneficial for the innovation process (Ebersberger & Herstad 2011; Laursen & Salter 2006). Yet, the region may offer too small a pool and—through historical development—too restricted a set of resources to supply the diversity of knowledge and ideas sought. International sources will have to be utilized in this case (Bathelt, Malmberg, & Maskell, 2004). When individual firms engage in such external information or knowledge sourcing, by means of spillover effects they may contribute to enriching the regional competence base further (Graf, 2010). As the potential in a regions' competence base is rarely fully explored and exploited by existing firms, entrepreneurship is a key component to the process of identifying and harnessing its social value.

Second, entrepreneurship is also crucial for determining the future social value of the regions knowledge base. Competitive processes inevitably lead to the exit of firms, which is generally regarded as a variety destroying and heterogeneity reducing selection process (Boschma & Sotarauta, 2005). Creating new variety or reducing exit is required for maintaining a sufficient level of heterogeneity. Entrepreneurship is one of the pathways to increase heterogeneity or to – at least – maintain its current level. If entrepreneurship is thought of being the activity of starting up a new venture, then entrepreneurship clearly counterbalances the reduction of heterogeneity caused by exit. If entrepreneurship is conceptualized as good and successful leadership and management practice in established organizations contributing to innovation and to the revitalization of the organization, then it reduces exit (Cefis & Marsili, 2005; Buddelmeyer, Jensen, & Webster, 2010). Thereby it keeps the current level of heterogeneity within the economy.

Maintaining heterogeneity and fostering entrepreneurship is therefore a key ingredient for regional development.

## **One bottom line—as a lesson for higher education institutions**

We have argued so far that the composition of regional innovation systems with their actors are crucial for the innovation led development of regions. We have further argued that the composition of the knowledge base plays a central role in providing opportunities or challenges for the innovation system. Thirdly we have also argued that the interactive notion of the innovation process induces firms to tap into knowledge sources within and outside of their corporate walls. These three lines of argument put higher education institutions in a central position. First as active actors in the innovation system connected with literally all types of other actors in the regional innovation system through networks of mutual interaction, through networks of labour mobility flows and through the educated talent they supply. Second higher education institutions play a central role in the generation of new knowledge for other actors in the innovation system. Thirdly higher education institutions serve as a source of inspirations and ideas for companies in their open innovation processes (Ebersberger, Herstad & Altmann, 2012a,b).

The two findings that regional grow and prosperity require heterogeneity and entrepreneurship can provide a structure for strategic development and operational practices for managing higher education institutions in the given context of the region's historical heritage, its specialization, its competences and its overall strategic aspirations (Asheim & Coenen, 2006).

Generally there are various ways to foster heterogeneity of actors and knowledge, ranging from initiatives securing entrepreneurial opportunity (Acs et al., 2009) to initiatives

targeting the exercise of the entrepreneurial function, such as financial incentives to start up a company (Wren & Storey, 2002; Girma, Görg, & Strobl, 2007; Ebersberger, 2011).

When it comes to strategically opening the regional economy for regionally beneficial actors attached to a multinational network (Dachs, Ebersberger, Lööf, 2008; Ebersberger, Herstad & Lehtoranta, 2010) higher education organizations can play a leading role in making regions attractive to outside investors by offering an appealing portfolio of study programs at all levels to supply the required labor force. Assuming that these actors remain linked to regional knowledge diffusion infrastructures such as labour markets or higher education institutions, entrepreneurial opportunity is increased.

Breeding new and heterogeneous knowledge in higher education institutions can form part of the basis upon which technological or innovative new ventures can be built (Cooke, 2001). This is particularly the case if it occurs in interaction with knowledge intensive industrial actors, which further increase entrepreneurial opportunity. For managing a higher education institute this requires to strategically align the organization with the planned long-range targets of the region. Where these strategic long-range targets do not exist or they are not shared the management of the higher education institution might be found in a position shaping the development. In particular this may happen in regions with only a few such organizations. In this case it is crucial to support the region's interactively emerging development path by a heterogeneous set of competencies. Proactive and coordinated development of study programs and of research orientation is crucial in this respect.

It seems particularly important for the higher education institutions to behave entrepreneurially with distinct challenges to HEI management (Altmann & Ebersberger, 2012). This involves their staying abreast the social, technological and scientific development to be able serve current and future needs of other actors in the innovation system. Generally, the innovation system is as good as its weakest part. But whenever these organizations, that are responsible for the knowledge and competence supply in the region, fall behind, the whole innovation system and the innovation led development will suffer regardless of the excellence of other parts of the system.

We have argued that higher education organizations maintain a central position in the innovation systems especially when it comes to lay the foundation for the creation of social, economic or technological opportunities. Once opportunity is created by creation of heterogeneous knowledge bases, the entrepreneurial function must be developed and employed. Without entrepreneurial activity opportunities will just remain being unrealized potential.

The mentioned policy measures such as public funding significantly reduce the risks of and hence improve the incentives for starting up a new company. Successful entrepreneurship requires a whole plethora of skills and capabilities for instance technical, scientific and management expertise. It requires carrying out a complex set of activities (Lichtenstein et al., 2007) and a considerable amount of entrepreneurial self-efficacy. It has been argued that management education in general and supplementary management education after graduation in particular influence the willingness to start a new venture by supplying required management expertise (Wilson et al., 2007), where target group specific approaches are required as, for instance, gender plays a significant role the perception of such programs (Ebersberger & Pirhofer, 2011).

For the strategic development of higher research organizations this means that the region requires at least one actor to supply education, which facilitates entrepreneurship through providing post-graduate management education for engineering and science graduates. Only then will the region not only generate opportunities but it will also see thriving entrepreneurship with lots of failures but with some successes which eventually support the region in its endeavor for sustained growth.

At the core of the innovation system in such a region lies the entrepreneurial university that supports growth and entrepreneurship through supplying technological

progress and diffusion through intermediaries such as technology transfer offices, incubators, or science parks (Rothaermel et al., 2007)

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