

Chapter 18

Higher Education Institutions and Regional Development

Bernd Ebersberger, Sverre J. Herstad and Andreas Altmann

18.1 Introduction

Growth theories generally acknowledge that innovation and knowledge generating activities play a crucial role in determining the growth dynamics and their trajectories in national and regional economies (Solow 1956; Temple 1999; Romer 1990). Innovation—the development of new processes, products, and organizational structures, which are both technologically feasible and commercially successful—is 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 while enabling innovation embeds the actors in a dense network of interactions 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 et al. 2006; Malmberg and Power 2005; Maurseth and 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.

B. Ebersberger (✉) · A. Altmann
MCI Management Center Innsbruck—The Entrepreneurial School,
Universitätsstrasse 15, 6020 Innsbruck, Austria
e-mail: bernd.ebersberger@mci.edu

A. Altmann
e-mail: andreas.altmann@mci.edu

S. J. Herstad
Norwegian Institute for Studies in Innovation, Research and
Education, Wergelandsveien 7, 0167 Oslo, Norway
e-mail: sverre.herstad@nifu.no

Consequently, the region is increasingly seen as the locus of innovation. Against this background it is remarkable that the discussion and analysis of innovation policy still predominantly focus on national measures (Fritsch and Stephan 2005). This entails the risk of neglecting the need for contextualization of policies according to those specific institutional, technological, and industrial preconditions in a region that are already in place. These conditions often simultaneously represent the main barriers to and opportunities for entrepreneurship, diversification, and growth (Asheim et al. 2007; Karlsen et al. 2011).

The overall target of this contribution is to tie together three rather independent strands of the literature linking regional development, entrepreneurship and higher education. The discussions on 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.

18.2 Three Points of Departure: Setting the Stage

The discussion here builds on an evolutionary economic tradition, where learning, knowledge, competencies, and their cumulative development are accepted concepts on the micro and firm level as well as on the regional and national level to analyze the interactive innovation activities. 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 exposure of regions toward cyclical fluctuations and structural disruptions, but also in shaping the 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.

18.2.1 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 and Stankiewicz 1995; Callon 1992), and regional systems of innovation (Cooke et al. 1997).

Perhaps somewhat paradoxically, the shift toward distributed knowledge networks increases the role of the region as the locus of innovation (Doloreux et al. 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 and Hussler 2005; Asheim and Isaksen 1997; Maskell and Malmberg 1999).

Also, Porter argues that competitive advantage is generated by localized capabilities, competencies, and interaction structures at the regional level (Porter 1998), and by resources, which are not easy to imitate by distant competitors. 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 and Malmberg 1999) and the active constructing of knowledge development and diffusion mechanisms which contribute novelty and speed 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.

18.2.2 Technological Specialization and Variety

Direct collaborative linkages and indirect linkages of geographically bounded contexts create localized spillovers, which in turn may reinforce technological development paths and 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, which eventually may turn out to be useful for

creating value (Malmberg and Maskell 2002). This includes entrepreneurial opportunities, which can be identified and harnessed at the intersection of existing firms' competencies (Acs et al. 2009). On the other hand, the interdependencies between infrastructure, historical investment, and the cumulativeness of knowledge generation might lead 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 it is the economic growth dynamics associated with the knowledge-based competitiveness of a region, which drives policy interest in regional systems and increases attention toward their characteristics (Fritsch and 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 have been discussed (Pyka et al. 2000; Cantner et al. 2008; Frenken et al. 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 rejuvenate the interest in place-specific agglomeration economies (Beaudry and Schiffrauerova 2009; Frenken et al. 2007; Jacobs 1969).

The composition of the regional economy can be characterized on the basis of 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. It also offers a broader and less exhaustible search space for the application of given technologies and knowledge. Frenken et al. (2007) found that related variety indeed exerts a positive effect on employment in a region. Ebersberger and Becke (2010) illustrate how related variety can be conceptualized differently when using publicly available patent data.

On the contrary, unrelated variety is a 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 reuse of knowledge. Unrelated variety exerts negative effects on unemployment (Frenken et al. 2007). Last, the similarity of actors associated with Marshallian (Marshall 1920) industrial districts combines the risk of external shocks with the disadvantages of lock-into 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 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 enables this relatedness to be explored on a more broad basis.

18.2.3 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 and Herstad 2011; Laursen and 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 favors 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 specialized 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 2005, 2007; 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 (Lichtenthaler and Ernst 2007), the process also has external effects (Lazaric et al. 2008; Morrison 2008; Owen-Smith and 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 commercialization efforts or as externalities. It is a key factor in determining the regional absorptive capacity (Carlsson and Eliasson 2002).

18.3 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 labor market mobility, by personal networks, and not least by knowledge development and diffusion institutions. Everything else being equal, higher survival rates of heterogeneous actors increases the diversity in an economy. As argued theoretically and found empirically, increased diversity is linked to an increase in innovativeness (Frenken et al. 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 and Herstad 2011; Laursen and 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 et al. 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 its future social value. Competitive processes inevitably lead to the exit of firms, which is generally regarded as a variety destroying and heterogeneity reducing selection process (Boschma and 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 and Marsili 2005; Buddelmeyer et al. 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.

18.4 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 is 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. Third, 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 labor 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. Third, higher education institutions serve as a source of inspirations and ideas for companies in their open innovation processes.

The two findings that regional growth 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 and 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 and Storey 2002; Girma et al. 2007; Ebersberger 2011).

When it comes to strategically opening the regional economy for regionally beneficial actors attached to a multinational network (Dachs et al. 2008; Ebersberger et al. 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 labor 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 aligning the organization with the planned long-range targets of the region. Where these strategic long-range targets do not exist or they have 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 stay 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 when ever 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 and 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 opportunity but it will also see thriving entrepreneurship with lots of failures but with some successes which eventually support the region in its strive 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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