



Radical innovation and its regional impact—a roadmap for future research

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Abstract The aim of this paper is to introduce the special issue of *Small Business Economics* on “Radical Innovation, Entrepreneurship, and (Regional) Growth” and present a roadmap for future research in the area. This article argues that the link between the literature on radical innovation, entrepreneurship, and (regional) growth is still an underresearched topic. This paper also reviews the special issue’s contributions that allow for a more nuanced understanding of this important link.

JEL Classifications O31 · O32 · O38 · L26

Keywords Radical innovation · Entrepreneurship · Regional growth

1 Introduction

The purpose of this special issue is to broaden our understanding of the linkages between radical innovation, entre-

preneurship, and (regional) growth. At a first glance, there is now a large and still growing literature that links entrepreneurship and regional growth (among others, see Acs and Audretsch (2003), Acs and Armington (2006), Glaeser et al. (2010, 2015)). Although we have an empirically validated understanding which factors might foster the relationship between entrepreneurship and (regional) growth, in turn, this literature is very silent to the question which specific role radical innovations might play there. Can radical innovations be exploited by entrepreneurial activities in the same way as non-radical ones? Do radical innovations lead to higher or maybe qualitatively different (regional) growth? Thus, the aim of this special issue is to shed light on these very important questions, both from a systematic empirical and from a theoretical point of view. The second part of this paper provides an overview of the relevant dimensions that might help to explain how radical innovations are related to entrepreneurship and regional growth, both from a microeconomic and from a macroeconomic perspective, whereas the third part of this paper shows how each contribution to the special issues adds to these dimensions. The last section summarizes some policy implications and concludes.

2 Radical innovation, entrepreneurship, and (regional) growth: a missing link

The link between knowledge (spillovers), innovation, entrepreneurship, and regional as well as urban growth has been subject of extensive research in the last years. Inter alia, Rosenthal and Strange (2003), Glaeser et al. (2010, 2015) or Audretsch and Keilbach (2004) found

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that entrepreneurs as a potential source of innovation are an important ingredient for regional growth. Frenken and Boschma (2007) argue that gains from relatedness at the firm and regional level (e.g., knowledge, human capital, or industrial relatedness) provide the basis for interactive learning and for important feedback mechanisms which lead to increased urban and regional growth. The same holds for a higher number of innovations resulting from related regional knowledge (Fornahl et al. 2011).

However, the academic discussion often does not specify the degree of innovativeness at all—but focusses on counting innovations alike—or is often associated with incremental rather than with radical innovation. Thus, despite the notable progress in this line of research indicated above, our understanding of radical innovations as the source for urban and regional economic growth, the conditions under which such radical innovations emerge, and the explicit role of clusters is still very limited (Audretsch and Aldridge 2008). In particular, we only have a partial understanding which regional socioeconomic or cultural factors support the emergence of radical innovations, whether or not clusters provide a supporting environment for radical innovations and whether they are the result of or the source for regional growth and under which conditions radical innovations lead to regional growth. Rare empirical research has shown that a cognitive proximity to other actors in an economic system spurs innovativeness (Boschma and Frenken 2010; Fornahl et al. 2011). However, the role of how the cognitive proximity between firms and the regional knowledge base influences agents to generate radical innovations is still an open empirical question.

Moreover, we only have limited insights which role entrepreneurship plays in the transmission from radical innovation to regional growth. Innovation and entrepreneurship can be linked via the knowledge spillover theory of entrepreneurship (Audretsch 1995; Audretsch and Link 2019; Audretsch et al. 2006; Link 2017) stating that entrepreneurial firms identify and exploit opportunities stemming from knowledge spillovers as a result from innovative activities. In this context, earlier empirical and theoretical studies pointing to the fact that internal knowledge flows and its organization seems to be important to explain the emergence of radical innovations (among others, see Audretsch 1995; Antony and Klarl 2020; Fleming 2001). However, we do not know whether the link between innovation and entrepreneurship is particularly enforced (or not) by radical innovations.

We also have a limited understanding regarding the importance of possibly bi-directional dependency between the microeconomic and the macroeconomic level that might also influence radical innovations and growth (Kerr (2010) might be considered as a rare exemption).

Furthermore, also from a policy maker's perspective, the role of radical innovations for economic growth has recently gained (but still limited) attention. For instance, smart specialization policy in Europe aims to target the development of new specializations building on existing regional capabilities. There is debate whether Smart Spec policy is targeting and should be targeting the development of radical breakthroughs and, if so, how such policy should be designed and implemented.

3 Contributions of this special issue

The papers that are included in this special issue tackle different perspectives explaining the link between radical innovation, entrepreneurship, and (regional) growth.

Employing an ego network approach and based on a longitudinal dataset, Shkolnykova and Kudic analyze the channels of radical innovations induced by small- and medium-sized firms (SMEs) in the time period 1996–2006 for the German biotech industry. In particular, they found that firms which are directly cooperating with radical innovators show a significant higher innovative performance than the control group. In turn, this implies that a cluster policy that is targeted towards direct cooperation with radical innovators inside the region and to selected partners across regions might be a fruitful way to foster innovation performance in the future.

Whereas the former contribution has a focus on the private sector, Graf and Menter by focusing on public research institutions shed light on determinants of patent quality, particularly in terms of radicalness. Link (2017) point out that entrepreneurial firms rely on public research institutes. In particular, an entrepreneurial university might play an active key role in innovation networks, and, thus might contribute to radical inventions. By focusing on public research infrastructure in Germany, Graf and Menter find that the type of institution and the respective scientific orientation (basic versus applied) are decisive drivers for the quality of inventions and, hence, might help to stimulate radical innovations. The centrality of the respective institutions within innovation networks reinforces the radicalness of

inventions. However, the authors also point to the fact that the entrepreneurial orientation of the public sector per se does not significantly influence the quality of inventions. This implies that innovations require a suited environment to be radical.

One conclusion of the Graf and Menter paper is that policy makers should be aware of the individual strengths of public institutions in fostering (radical) innovation activities. The question which innovation policies are able to facilitate a radical transformation is taken up by Zabala-Iturriagoitia. By focusing on public procurement initiatives in Galicia (Spain), using a mixed-method approach, the author finds that public procurement has some potential to develop strategies for a radical, territorial transformation that, in turn, might spur regional growth.

4 Ongoing research challenges

In a nutshell, the papers in this special issue highlight some salient ways how radical innovations, entrepreneurship, and (regional) economic growth are related to each other and reinforce each other. The papers of this special issue have shown that there are several fruitful avenues of further theoretical as well as empirical research regarding the link of radical innovations, entrepreneurship, and economic growth.

Until now, there is no consensus whether to label an innovation as radical, disruptive, discontinuous, or breakthrough (Kovacs et al. 2019). These labels are frequently used as synonyms, even by the same authors. This partly leads to confusion especially if researchers from different scientific backgrounds interact. Only by taking a deeper look into the requirements of the emergence of such innovations, their specific characteristics, and their effects on markets or technological development, there is the potential to differentiate between them and to select the most appropriate empirical approach to measure them.

All contributions in this special issue points to the importance of taking a closer look on the interactions of organizations and regions. In particular, the authors point to the specific role of the structure of knowledge repositories in a region and knowledge exchange that is central to understand the emergence and diffusion of radical innovations. Future research must shed additional light on the organization of regional and extra-regional knowledge networks as well as on the role

played by single key organizations in the region (such as research institutes or firms at the technological frontier). Focusing on the average relatedness of knowledge in a region masks the importance of single dominant entrepreneurial organizations. In general, our knowledge is still limited with regard to the factors on different levels of analysis leading to radical innovations. The same holds true for the effect of radical newness. In which cases and under which circumstances can something radically new affect the market and regional growth? We know that not all new ideas and inventions and probably especially the radical ones really diffuse and have an impact. But what makes the difference? Are entrepreneurial clusters for example a breeding ground for the emergence, diffusion, and market impact of radical newness leading to high regional growth rates? Are local externalities (Guiso and Schivardi 2011) the reason why we find some regions that produce relatively more radical innovations than others? These questions provide direct avenues for further research.

Several policy implications are directly derived from the papers of this special issue helping to design more appropriate policy measures. First, Shkolnykova and Kudic point out that R&D supporting policy endeavors should be tailored in a way to meet the regional knowledge portfolio; i.e., the policy maker should take into account the specific network characteristics of collaborative R&D projects. Hence, R&D policy designs that neglect the specific characteristics of (regional) knowledge networks in which firms are embedded might turn out to be suboptimal from a social point of view. This is particularly true for radical innovations. Second, as suggested by Menter and Graf and Zabala-Iturriagoitia, public R&D spendings should be allocated to specific institutions or initiatives that are suited to produce radical innovations. Although these institutions should have a more central position in a research network, it is the interplay of these institutions with other members of the network that ultimately triggers the diffusion of these radical innovations. The possible catalyzing role of radical innovations for the economy has started to gain more attention by policy makers in recent years and led to the establishment of specific innovation agencies such as the JEDI (Joint European Disruptive Initiative) on the European level (JEDI 2018), or the SprinD (Agentur für Sprunginnovationen) in Germany (BMBF 2018). Their purpose is to create an environment that fosters the production of radical innovations, but until now we have limited insights into how such agencies

should be designed to reach these goals (for an overview, see Breznitz et al. 2018). Hence, the newly established agencies should be thoroughly followed and evaluated.

These and other issues need to be taken up in future research, in order to increase our understanding of the emergence and diffusion of radical innovations and the link between radical innovation, entrepreneurship, and regional growth.

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