Innovation is a key driver of economic development. The diversity and proximity of economic actors in big cities have long been seen as critical factors enabling and facilitating the innovation and competitiveness of firms, not least in high-tech or knowledge-intensive industries. Indeed, such ideas reflect the theoretical and empirical work that posits the role of dynamic agglomeration economies (Henderson, 2003), clusters (Porter, 1996), density and diversity (Jacobs, 1969; Glaeser, 2011), talent, technology and tolerance (Florida, 2002) – all of which characterise large cities – at the heart of regional innovativeness. However, a small but growing body of work (e.g. Lagendijk & Lorentzen, 2007; Virkkala, 2007; Grillitsch & Nilsson, 2015; Shearmur, 2015; Bonfiglio et al., 2017; Gretzinger et al., 2018; among others) is beginning to point out that, while innovation, of course, occurs in cities, it also takes place outside of cities, in peripheries and borderlands. This understanding poses conceptual and theoretical conundrums in view of the current understanding of the geography of innovation and the role played by interaction, knowledge exchange and collaborations in the innovation process.

The problems are not only theoretical. Many local and regional development policies attempt to promote innovation in local establishments, often drawing upon notions of clusters and local interactions that may be inappropriate for regions with sparser settlement patterns and less institutional thickness than cities. That is, peripheral regions should not aim to copy what is working for the central regions as the conditions in the periphery do not support these methods (Makkonen & Kahila, 2020). Therefore, there is
a need to learn more about how innovation is supported in the periphery and how to build up innovation environments that consider the local conditions of rural regions as a starting point. This is of particular importance for those peripheral areas, which are declining in economic terms. Though innovation is not a sufficient condition for economic development, it is a necessary one, and in-depth understanding of how innovation occurs in these contexts is a preliminary step to ensuring good policy design.

In order to understand how innovation occurs in rural places, and to better inform policy, it is, therefore, necessary to go beyond current understandings and empirical validation of innovation. To date the understanding of how innovation occurs is fundamentally premised on observations from large urbanised areas. Emerging ideas and observations not only point to the fact of innovation in rural areas but to how innovation processes there differ from those in cities. For example, it has been suggested that – while rural firms can still network with the urban ones and supplement regular face-to-face contacts via virtual connections (e.g. Bathelt and Turi, 2011) – innovation processes in more isolated areas rely less on market connections and frequent interactions, and more on technical knowledge, local information and internal capacities (Shearmur, 2015). Conversely, some processes thought to be uniquely urban may also occur in rural regions. For example, confrontation with new ideas and with diversity also occurs in peripheral regions, since they are often multi-cultural places, and remoteness may throw people together who, in urban areas, would have tended to seek out like-minded people (McPherson et al., 2001).

Another related body of work is beginning to articulate the view that firms in peripheral regions do not merely overcome their peripherality: peripherality can be a positive advantage to certain types of innovation that require slowness, radical departure from prevailing (urban) norms or resources (such as space, specific fauna, testing grounds, local culture) unavailable in cities (Grabher, 2018; Meyer, 2020).

This special issue presents a collection of papers that articulate and explore these questions. The contributions are delving into the innovation patterns, knowledge networks, information sources, capabilities and support systems relied upon by firms located outside of big cities, in peripheral and border regions presenting empirical evidence relating to innovation in such areas. The papers describe and analyse innovation processes in these types of areas re-assessing current understandings of the geography of innovation processes in the light of the growing empirical evidence that cities and agglomeration are not the sole contexts within which firms can bring new products, processes and organisational forms to the market.

First, the paper by García-Cortijo et al. (2019) discusses the drivers of innovation in the rural areas of Spain. In terms of the innovation propensity of firms situated in rural areas, the paper highlights the importance of firms' internal capacities. At the regional level, training and knowledge exchange with research centres are also shown to assist
innovation. Further, the results underline the significance of firms’ location within the periphery: firms situated in peri-urban areas or closer to urban areas (intermediate rural areas) are more innovative. Thus, the paper concludes by highlighting that to be effective, innovation policies in rural regions need to go beyond the classical core-periphery models and acknowledge the difference between peripheries; i.e. between peri-urban and intermediate rural areas and the “periphery of the periphery”.

Second, the paper by Kratzer and Ammering (2019) discusses the role of Biosphere Reserves – the World Network of Biosphere Reserves (WNBR) covers internationally designated protected areas that demonstrate a balanced relationship between people and nature (UNESCO, 2020) – in fostering social innovation in rural areas with case study examples from Austria and Switzerland. Biosphere Reserves are shown to have a strong institutional presence in rural regions where they are situated. For rural regions, commonly “suffering” from institutional thinness, belonging to WNBR is, thus, a significant advantage in terms of regional development. Therefore, Biosphere Reserves foster social innovations in rural areas as they raise awareness, provide platforms for exchanging ideas, encourage product and service development and connect the region into international knowledge networks. However, the paper also pinpoints that local actors are still not fully integrated in these networks thus suggesting a definite direction for further development.

Third, the paper by Galliano et al. (2019) discusses the dynamics of local and extra-local resource utilisation in French agro-food projects to describe what is in the paper termed “peripheral systems of eco-innovation”. The results highlight the importance of local context in eco-innovation: the analysed projects rely on local resources and personal networks. Therefore, they are strongly embedded in the local (peripheral) environment. However, the significance of extra-local connections increases as projects develop. This result underlines the importance of the capacity to utilise extra-local resources and knowledge networks (absorptive capacity). Regional public institutions are key players in this process: they support actors from the periphery in connecting to these extra-local networks. The paper thus concludes that peripheral systems of eco-innovation are characterised by strong reliance on local resources, personal networks and regional institutions.

Fourth, the paper by Gaddefors et al. (2020) discusses the role of entrepreneurial exaptation – that is, the adoption of a resource for a different purpose than it was originally intended or designed for (Dew et al., 2004) – in fostering regional development in institutionally thin rural regions, with a case study example from Sweden. Entrepreneurial exaptation is shown to be an important source for innovation in rural regions: exaptation can initiate new ventures and resource combinations. This result contradicts the deterministic connotations concerning lock-in effects and path dependency vis-à-vis the rural resource base. That is, rural regions’ development paths are not locked-in or
determined solely by their existing resource base as they can evolve beyond it through exaptation. Entrepreneurs play a key role in this process. As such, rural policies should not focus just on resources but, also, focus on attractivity and liveability of rural areas to influence entrepreneurs to stay in or move to the periphery.

Fifth, the paper by Hjaltadóttir et al. (2020) discusses inter-regional innovation cooperation in urban vs rural and non-border vs border regions with data from 15 European countries (EU-15). The results of the paper show that, overall, urban and non-border regions are more successful at inter-regional innovation cooperation than rural and border regions. This is in line with the commonly stated positive impacts of agglomeration economies and the negative impacts of international borders (border effect). However, it is also shown that rural border regions engage actively in inter-regional cooperation with their immediate neighbours across the border (a process that is expected to be supported by cross-border social contacts and organisational ties and in some cases by a common culture and a shared language). This compensates for the negative border effect. The latter result gives tentative evidence of the usefulness of EU’s programmes (such as INTERREG) in intensifying cross-border cooperation.

Finally, the paper by Guerrero (2020) discusses the role of graduate employees in firms' external knowledge acquisition strategies in the rural and metropolitan regions of Denmark. The results of the paper show that graduate employees' cognitive proximity to universities (measures as the percentage of employees in the firm that held a university degree) is positively associated to firms' propensity to cooperate with universities. This connection is stronger for firms situated in rural regions that for those in metropolitan areas, even though their geographical distance to universities is greater than for metropolitan firms. Thus, for firms situated in rural regions, the graduate employees' cognitive proximity to universities can compensate for the lack of geographical proximity in industry-university collaboration.

Overall, these papers highlight the complexity of the connection between innovation and geography. Whilst certain innovation processes seem to be facilitated by cities and by urban proximity, others occur in peripheral and border regions. The ‘slowness’ of peripheral innovation – in particular its heightened reliance on internal capacities, local resources and technical information – is confirmed, as is the importance of external connections with actors in other peripheral and border regions as well as with actors in cities. Certain types of innovation, for example exaptation, seem to be more prevalent in peripheral regions where adaptation is not only a necessity but can also be an opportunity. This collection of papers cannot offer any definitive answer to the question of how innovation occurs in peripheries and borderlands: however, not only does it confirm that innovation processes develop in these regions, often in ways that differ from urban regions, it provides a framework for further exploring the question as well as empirical
pointers about what to look for. Further studies could build on the papers presented here and elaborate in greater detail:

- Longer time-series data and larger sets of control variables to establish and confirm causes and effects of innovation in peripheries and borderlands
- Mixed-methods research to move forward the dichotomy of the results based on qualitative case studies (providing snapshots) and quantitative samples (providing a general picture)
- Formally evaluate the impacts of (regional) policies in facilitating innovation in rural regions
- Go beyond the focus on developed countries and explore the patterns of innovation in rural regions of the Global South

To conclude, we hope that this special issue has raised interest in the topic and will pave way for further research on innovation in peripheries and borderlands.

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