Editorial

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Biographical notes: Peter Teirlinck obtained his PhD from the University of Antwerp and is a Professor in Innovation Management at the KU Leuven, Faculty of Economics and Business. He is an experienced researcher in the field of R&D and innovation and has published widely on innovation policy, industry-science relationships, the spatial organisation of R&D and innovation, and innovation management. In terms of contract research, his focus is on policy-oriented evaluation and impact assessment studies at regional (Flanders, Wallonia, Brussels Capital Region), national and international level (such as the OECD and European Commission). He is a policy advisor in the field of research and innovation for the Belgian Science Policy Office.

The literature on the spatial organisation of innovation has been exemplified by concepts such as 'innovative environments' (Aydalot, 1985), 'innovative milieux' (Camagni, 1991), and 'regional innovation systems' (Cooke, 1992). Over the past two decades, the concept of regional innovation systems has evolved into an accepted way of understanding the uneven spatial development of the knowledge-based economy. Innovation systems emphasise both the importance and uniqueness of context, path-dependency and lock-ins, and complementary action by a broad range of stakeholders in affecting change. The focus on a broad set of actors (private, public, and more recently society in a broader sense) and formal and informal interactions for knowledge dissemination, adaptation, and production to explain regionally produced competitive advantage made regional innovation system thinking a popular tool for policy makers to support the creation of new pathways for exchange by means of implementing a vast array of newly developed innovation instruments (Guy, 2014; Teirlinck et al., 2013), not in the least in the field of technology intermediaries. Our understanding of regional innovation systems is not static and has evolved in line with major trends in innovation (such as open innovation – Chesbrough, 2003) but also in terms of our understanding of how to account for the specific regional context (Asheim et al., 2013). System components, linkages, and boundaries, along with path-dependency (Boschma and Frenken, 2006) and endogenous potential [following the views provided by Friedmann (1972) and Aydalot (1985)] reflected in critical mass, absorptive capacity, smart specialisation, network capabilities, and the institutional framework within the region, are increasingly being considered keystones in regional innovation system thinking (Guy, 2014). This innovation system way of thinking is opposed to a neoclassical economic approach assuming that economic agents can easily change production technology or its underlying broader knowledge base (Guy, 2014).

Building on some of the core themes presented and debated at the 8th European Conference on Innovation and Entrepreneurship (ECIE 2013, Brussels, Belgium), this

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special issue of the *International Journal of Innovation and Regional Development* is devoted to actual trends in innovation systems and policy making. The issue offers a balanced geographical mixture of regions in emerging and more developed economies (Mexico, Poland, Canada, Belgium, and Indonesia) as well as a triangulation of qualitative and quantitative approaches. The issue starts with two papers providing original overall system level insights in further strengthening our understanding of the regional innovation system approach. They capture the permanent changes – territorial, sectoral, technological – innovation system thinking is undergoing. Starting points are that each system has its own features and characteristics, and the necessity to give a dynamic description of the configuration of each system in order to forecast its possible future evolution.

In the first paper, 'A system dynamics model of science, technology and innovation policy to sustain regional innovation systems in emerging economies', José Carlos Rodríguez and César L. Navarro-Chávez provide a model for innovation policy thinking with particular attention to the use of indicators. A simulation model is developed for the case of the province of Michoacán in Mexico. Attention is paid to stocks (levels) and flows in order to better understand the dynamics of an innovation system. Differences in both components give guidance for strategic direction and underlying mechanisms driving individual actions and governing interactions with other agents (Stamboulis, 2007), which is essential when constructing a system dynamics model of science, technology and innovation policy to sustain regional innovation systems in emerging economies. An emerging economy is characterised by a catching-up processes (instead of being first mover) in indigenous firms and high path-dependence and cumulativeness (Padilla-Pérez et al., 2009). Within this context the authors use four basic elements – feedback loops, flows and stocks, time delays, and nonlinearities – to reveal the nature of innovation systems as a complex multi-loop system interconnected within a structure that reinforces multiple feedback processes. Simulation results reveal the importance of actors and institutions to advance the development of the province's regional innovation system. The paper supports the view that regional innovation systems are composed of multiple dimensions, each of which is associated with its own rate and direction of change causally connected to produce patterns of change.

In the second paper, Natalia Irena Gust-Bardon presents a study of the structural and functional analysis of innovation systems based on the Polish economy ('The structural and functional analysis of innovation systems: outline of the Polish case'). The paper tackles the identification of problems occurring within an innovation system in transition. The case exemplifies the situation of a low-cost labour competitive economy which is challenged by upcoming cheaper economies. This context forces the Polish economy to enhance its competitiveness based on the development of science, technology, and knowledge. Empirical research on the Polish innovation system leads to the identification and evaluation of main actors, institutions, cooperation networks, and infrastructure supporting innovative activities. The structural analysis focuses on static components (actors, institutions, cooperation networks, and infrastructure), whereas the functional analysis takes a systemtic view (what happens within) an innovation system (Hekkert et al., 2007). Main outcomes of the structural and functional analyses of the Polish innovation system are the identification of factors that inhibit the progress of economic transformation towards an innovation-based economy. The barriers identified by the author include the relatively slow adjustment processes of the academic sector to new challenges with regard to the networking economy; low priority given to innovativeness

and R&D in the public sector; a lack of focus on radical innovation and investment in R&D in the business enterprise sector; limited financial resources for innovative activities; and institutional constraints in terms of bureaucracy, a complicated tax system, instability of the judicial system, and high non-wage labour costs. Within a context of large dependency on EU funding, the author formulates recommendations in terms of more rationalised rules of allocation of national funding as well as a more appropriate return to government in case of successful innovation.

After the overall system level perspective applied to a developing and an emerging region, the issue takes a closer look at the role of technology transfer offices and science parks as enablers of knowledge production and diffusion within regional innovation systems. The focus is on regions in the more developed economies of Canada and Belgium. The interest in these topics is related to the theory of endogenous development (Friedmann, 1972; Aydalot, 1985), which was one of the first to emphasise the dormant potential present within the territory itself. This theory reflects the shift in policy from a purely top-down approach to bottom-up initiatives and emphasises the need to mobilise local resources through local partnerships and ensuring that local firms become equipped to take advantage of technological opportunities and develop competitive advantage in innovation.

Tarek Sadek, Rafael Kleiman and Rafik Loutfy address 'The role of technology transfer offices in growing new entrepreneurial ecosystems around mid-sized universities'. The premise for the paper is the evolved role of universities from their traditional focus on education and research to active participation in regional economic development. More particularly, the authors consider the role technology transfer offices can play to help regulate and monetise the transfer of knowledge created by the university researchers to the marketplace, and the role that these offices could play in developing a new entrepreneurial ecosystem around universities. The focus of the paper is on university spin-offs as a commercialisation channel. In Canada, research-oriented universities have technology transfer or industrial liaison offices that act as coordinators of commercialisation activity. Moreover, Canadian universities have a diversity of approaches to IP ownership, IP strategies, and the organisation of their technology transfer activities. The case of Ontario (Canada) is used to illustrate this. The study reveals that technology transfer offices can play a critical role in coordinating different bottom-up initiatives to promote entrepreneurship, and in attracting and integrating new external resources to the university. However, the ability to effectively support the commercialisation of university research results is conditional upon the existence of an entrepreneurial culture in the university. The authors measure the entrepreneurial ecosystem around universities in terms of a conductive culture; facilitating policies and leadership; availability of dedicated finance; relevant human capital; venture friendly markets for products; and a wide set of institutional and infrastructural support mechanisms. The outcomes of semi-structured, in-person interviews with academic inventors and researchers, intermediary agents, and technology transfer officers, confirm earlier findings by Wigren-Kristoferson et al. (2011) and Gill et al. (2007) that central technology transfer offices are more effective when the purpose is to formalise a deal (licensing technology or formalising a research contract). The results also agree with Phan and Siegel (2006), suggesting that technology transfer offices should adopt the value-chain model, in which they assign the different technology transfer functions to specialists, leveraging the capabilities and resources of the outside organisations and other partners in the process.

The next paper, 'Technology transfer as a driver for location of R&D active firms on science parks', by André Spithoven, deals with the role of science parks as intermediary infrastructure to facilitate knowledge transfer in regional innovation systems, a topic that is particularly relevant for young technology-based firms, which typically reside in science parks. From a resource dependency theory perspective that views the firm as an open system, depending on external organisations for the supply of key resources science parks are believed to reinforce and regenerate regional expertise (Löfsten and Lindelöf, 2001; Siegel et al., 2003). Science parks have been a popular instrument for policy makers to facilitate technology transfer and hosting R&D active firms (Ferguson and Olofsson, 2004), and as such play an important role in the innovation system. The paper starts from the premise that science parks must be anchored in modern innovation theory in order to explain technology transfer activities. The paper investigates the drivers for R&D active firms to locate on science parks in times of more open innovation business models (Chesbrough, 2003). Based on a quantitative study comparing on- and off-site science park companies in the urban field of the small open Belgian economy, technology transfer drivers in favour of location on science parks mainly can be found in terms of proximity to a university or research centre together with a cluster effect (in terms of specialisation or diversification) and the possibilities for networking. These practices also figure prominent in the literature on open innovation and confirm the need for collaboration for resource constrained young R&D active firms. The findings highlight that, in policy making, science parks are instrumental in stimulating or facilitating R&D activities, and are an environment where firms are actively relying on academic research. The author confirms earlier findings by Cooke and Leydesdorff (2006) that local rules and regulations are conceived as a constructed advantage offered on park. Interestingly, the author highlights that physical infrastructure such as terrains and transport facilities, and the financial attractive location are less determining conditions related to the presence on science parks.

Within an innovation system, broad framework conditions limit or facilitate the scientific production and application performance of public and private organisations that are involved in research and innovation (Heijs et al., 2011). In the last paper, 'Service innovation in the complex environment of tax administration: the Indonesian public sector perspective', Agung Darono and Dessy Irawati highlight the importance of institutionalisation of service innovation. The use of institutional analysis, with inclusion of the position of international financial institutions, enforced the process of Indonesia's tax reform and enforced, on the one hand, the set-up of innovative services in support of the taxpayer and, on the other hand, the provision of adequate tools for the tax officers to examine the validity of the submitted information. Based on a descriptive study, the authors present the establishment of service innovation by the tax administrator in Indonesia since 2001 as a case study. They pay attention to the strategic measures used to initiate innovation in ICT-based services and take into account the specific context of the innovation system to unfold hidden matters in accordance to public sectors innovation initiative, and how these initiatives can ultimately be developed and put into practice. The authors provide an in-depth understanding about the institutionalisation of e-service implementation as a form of public service innovation, and answer the 'why' and 'how' of the institutionalisation e-services-based service innovation. Main findings of the paper include that, besides technical matters, the successful implementation of innovative ICT-based public services largely depends on the institutional aspects surrounding an organisation. The case of an early adopter public organisation in implementing e-services

in Indonesia reveals the need for (external- and context-related) normative pressure in order to discover and implement service innovation. This normative pressure needs to be maintained to force innovations beyond obligations of government procedural.

This special issue demonstrates that regional innovation systems are a typical case of the practice of multilevel governance. They are about the changing linkages between innovation actors at different levels, with a particular emphasis on territory-specific framework conditions. From the evolutionary, path-dependent perspective of innovation systems the theoretical and empirical insights provided in this special issue can be seen as stepping stones towards a more closed policy cycle in innovation thinking.

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