The science of space: new endeavours in regional science

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Regional science is the social-science oriented study of the development of regions, cities, land use, environment and territorial resources from the perspective of a multi-disciplinary and spatial-analytical approach to location, allocation and interaction of people, industry and socio-economic activity, as well as of policy mechanisms for designing and governing a sustainable space-economy at appropriate geographical and time scales. One of the founding fathers of regional science, Walter Isard (1956), argued in the Preface to his seminal book ‘Location and Space-Economy’: “Such a record of man’s adaptation to, and interaction with, his physical environment suggests that a comprehensive theory of society or economy should embrace both time and space dimensions. It should be able to unravel the dynamic interplay of forces not only currently but also over the long past. Its propositions should be testable against the background of historic development in the several regions of the world and concomitantly should offer explanation of this development. Its hypotheses should encompass the influence of past events and intermingling of forces upon existing economic and social structure and conditions. Ideally, its conceptual framework should enable one to anticipate the course of future development, given certain premises and judgments”.

It is noteworthy that Isard in this writings talks about a comprehensive theory. His above mentioned influential opus has even a pretentious subtitle: “A General Theory Relating to Industrial Location, Market Areas, Land Use, Trade, and Urban Structure”. More than 65 years after the expressed ambition of a generally valid theory on regions—or, in general, on socio-economic geographic space—it is fair to say that this ‘grand objective’ has not been achieved. This is already clearly reflected in Isard’s (1960) follow-up study on ‘Methods of Regional Analysis’, which unfolded the toolbox of regional science rather than its theoretical framing. A uniform and generally accepted multi-disciplinary theory on regions is apparently beyond the capability and horizon of regional science. Regional science—as a

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multi-disciplinary scholarly activity—derives its conceptualisations and theoretical frameworks mainly from—or in cooperation with—other disciplines in the social sciences.

However, what has been achieved in regional science over the past decades is the development of an impressive collection of advanced—often quantitative-analytical—methodologies for studying regions, cities, land use, environment and territorial resources (including economic and social interactions). Geo-information science, spatial econometrics and statistics, morphometrics and urban design, complexity and resilience models, and spatial ‘big’ data metrics—to mention only a few—all demonstrate the great vitality of regional science approaches. Regional science has largely turned into an evidence-based multi-disciplinary analysis framework for understanding complex socio-economic phenomena in their spatial context. The emphasis on applied methodology has facilitated its recognized position in the broad spectrum of social science.

Since the early days of regional science—as a truly interdisciplinary approach to social-science issues related to geographical space and locations (ranging from nations or territories to regions or settlements)—there has been an ongoing debate on the very nature of a region or city. Are regions or cities administratively defined, are they based on spatial-functional homogeneities, are they characterized by historical or cultural determinants, or are they platforms of economic action or policy? And how are borders between regions or cities defined? This problem is clearly witnessed in the seminal writings of Walter Isard (1956) and August Lösch (1954). A prominent and relevant question has often been: what is precisely a region or a city, and what is the nature of distance frictions between geographic entities? After more than half of a century, several pressing problems still remain, such as:

- Is space a passive geographic substratum that acts as a barrier or as a geographic platform or arena for human activities? (see e.g., Kourtit et al. 2017). Is there a ‘science of space’? Is the science of a *region* different from the science of a *city*? Are borders externally imposed or are they endogenously determined?
- Is space related to the socio-economic use possibilities by mankind and does it create permanent and new opportunities as an enabling source for the ‘homo sapiens’? (see e.g., Harari 2011). Is there a science of human behaviour in relation to geographical space and distance? Is the behaviour of humans in a broader regional context different from that in a microcosmic intra-urban context?
- Is space a limitation for human behaviour or does it open up new modes of living, e.g., through mobility and migration (the ‘homo mobilis’) (see e.g., Ozgen et al. 2013). Does regional science offer a satisfactory foundation for understanding spatial interaction and dynamics, both conceptually and empirically? Is spatial mobility (e.g., migration) determined by the quality of the built environment (‘body’) or by the quality of the human and economic environment (‘soul’)?
- If space is a general ‘container’ of nations, regions, cities, settlements, rural areas and nature, is there a unifying conceptualisation of spatial structures of our world (e.g., central place theory, topodynamic corridors)? (see e.g., Teller 2009). What are the building blocks of such a scientific architecture and which disciplines are involved? And how can social sciences, humanities, and

physical sciences be combined in one coherent framework? And what is the impact of connectivity networks on the functioning of space?

- Humans are in principle able to live everywhere in our urbanized world, but de facto they tend to live in local neighbourhoods, in which direct social interaction and street-level type of communication is more important than the global functioning or position of a locality. Is there a comprehensive analysis framework that would be able to map out human behaviour in space from a microcosmic perspective? (see e.g., Bettencourt 2013; Bettencourt et al. 2007). What is the nature of a theory on localized human micro-behaviour, mental maps and spatial appreciation? What is the role of the new geography of happiness? And how does that relate to cities and human settlements?
- Space is not only subjected to human activities and group interventions and to external shocks, but is also influenced by policy choices and institutional forces. Is it possible to identify the contours of a theory on spatial policy that is distinctively different from general policy? (see e.g., Banaszak et al. 2015). Or would this imply a merger of regional science and political science? And in particular, what is the role of public space in spatial policy, e.g., in cities?
- In urban geography and planning, the ‘new science of the city’ is becoming en vogue (Batty 2013; Fusco et al. 2017). This is mainly based on advanced data analytics and urban metrics (the city as a ‘data machine’). Is this also a new opportunity for regional science?

For all these questions, it would be great to get more insight into the nature of the underlying scientific challenges which might prompt the formulation of foundation stones for a novel research agenda on the very nature of (mega) cities, settlements or rural areas, and related policies. Especially the way we define, collect and analyse (multilevel and 3D) data on urbanity and rurality deserves critical attention in mapping out and understanding the ‘*New Urban World*’. This calls for new data-analytical roadmaps, e.g., in spatial data mining, spatial big data analysis, multi-level modelling, multifunctional multivariate statistics etc. And finally, there is much scope for new types of policy support systems, e.g., for i-city governance.

The above formulated questions are not a sign of shyness or confusion, but demonstrate that regional science is alive and kicking, and is not afraid of being confronted with challenging questions that touch even its roots. This open attitude has always been a characteristic of any vital science. Regional science has, since its inception, been in search of new scholarly endeavours, with a critical view to the past and an open eye for the future. Examples of refreshing—often critical—contributions to the methodology, empirical basis or policy scope of regional science can be found inter alia in: Bailly and Coffey (1994), Bailly and Gibson (2020), Barnes (2003), Batey and Plane (2019), Boyce (2004), Button (2020), Capello and Nijkamp (2019), Chatterji (1998), Hägerstrand (1970), Hansen (1975), Nijkamp et al. (2016), Stimson (2016), and Wang (2017). This—undoubtedly biased and incomplete—set of contributions on the prolegomena of regional science reveal real science spirit, namely a permanent attempt to improve scientific performance for the sake of better understanding our complex world.

The real challenge of regional science will be to develop a spatial research methodology that is forward-looking so as to anticipate and investigate future sources of the space economy.

This scholarly mind is also present in this special feature of the Asia Pacific Journal of Regional Science. It critically reviews analytical thinking in regional science (Gordon Mulligan, Makoto Tawada/Akihiko Yanase), it explores new ways of thinking (Karima Kourtiti, Peter Nijkamp), it applies new concepts in the real world (André Torre/ Muazzam Sabir/ Hai-Vu Pham, Soushi Suzuki/Peter Nijkamp), or it sheds new light on existing spatial-economic issues (Daidai Shen/ Jean Claude Thill/ Jiuwen Sun, Budy Resosudarma/ Abdurrohman/ Arief Yusuf/ Djoni Hartono). All in all, this special feature of the Asia–Pacific Journal of Regional Science reflects and stimulates the drive for academic innovativeness in regional science. Regional science is indeed work in progress.

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