Introduction

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We come from different nations, from different cultural backgrounds. Our politics differ, our professions are various. But we believe that the problem of human settlements is a general and fundamental problem in our new dynamic world and that it must be viewed and studied in such a way that it will, in common with all great scientific disciplines, transcend our local differences. We agree that the practical implementations of policy – in such vital fields as land use, the location of investment or the planning of cities over time – will be determined by domestic politics and needs, and as citizens we pledge ourselves to attempt to bring these issues into the active political dialogue of our local societies. But we are not divided in what we wish most strongly to affirm – that we are citizens of a worldwide city, threatened by its own torrential expansion and that at this level our concern and commitment is for man himself.

This statement on urban dynamics was formulated half a century ago at the Delos Symposium (Doxiadis 1963, pp. 22–23) in Greece. This symposium found its origin in the intellectual views and organizational capacities of the great Greek urbanist Doxiadis, the founding father of the Ekistics association. The results and recommendations of the Delos Symposium can be found in the Newsletter published by Doxiadis Associates, Athens, 1963.

The surprising feature of reading at present the Delos Declaration (Doxiadis 1963) is that over the past 50 years the concern about the future of human settlements has not declined; on the contrary, it has become even more manifest. The message of the Delos Symposium was that cities are bound to adapt themselves to the dynamics of modern times, as otherwise the city being the cradle of civilization and progress would turn into a source of socio-economic and ecological catastrophe. Today, the emerging megacities, especially in the developing world, tend to become high-risk agglomerations for millions of citizens, as a result of environmental decay, social stress, ecological damage, or natural disasters. The dramatically needed change towards survival, called for by Doxiadis and his supporters, has, however, not materialized.

Admittedly, urban agglomerations show – in addition to shadowy sides – also many sunny sides. Agglomeration advantages are in many

cases abundantly present and are a driving force for structurally continuing urbanization processes and ongoing increases in urbanization rates (see Kourtit 2014a,b). One might argue that a modern city may find itself as an epicenter of antagonistic forces with many diverse and sometimes contrasting movements which are difficult to control.

The concern about urban dynamics and its urgently needed strategic policy on urban agglomerations has prompted a new interest in future research challenges in the urban domain. In a “Scoping Report on Research Priorities” by the UK Economic and Social Research Council (ESRC) (2014), various thematic research priorities were formulated. The following three themes were identified as key areas for social science research in this field, viz.:

- Social innovation and digital technology.
- Environment, resilience and urban vulnerability.
- Urban economics.

In addition, two cross-cutting themes were proposed, viz:

- Inequalities, diversities and difference.
- Politics, contestation and governance.

In a study of the Commission of the European Communities (CEC) on *Cities of Tomorrow* (2011), various pathways for innovative and challenging research endeavors on cities were identified, in particular:

- The balance between competitiveness in the global economy and the need for sustainable local economies.
- The creation of a resilient and inclusive economy.
- The potential of socio-economic, cultural, generational and ethnic diversity.
- Combating spatial exclusion and energy poverty with better housing.
- Design of a holistic approach to green and healthy cities.
- Recognition of the importance of thriving and dynamic small and medium-sized cities.
- Design of attractive open public spaces to promote sustainable, inclusive and healthy mobility.

Finally, in a study by Bouton et al. on “How to Make a City Great” (2013), various challenging messages – with far-reaching research implications – were formulated, from the perspective of the achievement of smart urban growth. Four routes were proposed:

- Adapt a strategic approach (in particular, identification of competitive clusters, investments to support growth, think client service).
- Plan for change (e.g., make planning an inclusive process, keep urban plans flexible).
- Integrate environmental thinking (in particular, plan and build green infrastructure, safeguard resources).
- Insist on opportunity for all (e.g., connect the city outskirts, promote social integration, build affordable housing).

Clearly, the research agenda on the future and strategic challenges emerging in our “urban century” is vast. But from reading various research policy documents and many social science research contributions on the architecture and working mechanisms of the “new urban world” (Kourtiti 2014a,b), it becomes clear that the city is a source of great inspiration for advanced and policy-relevant research on urban affairs, in both the developed world and in emerging economies.

The present volume on *The Rise of the City: Spatial Dynamics in the Urban Century* aims to offer a systematic collection of original and advanced contributions to enable a better understanding of urban dynamics in an open space-economy. These contributions cover various geographical areas in our world and serve to highlight the use of new methodological tools so as to enhance our insights into the complex constellation of the “urban century.”

This volume is divided into three parts. These building blocks of this book center on the following main themes:

- Part 1: Urban creativity and growth.
This part highlights the role of creativity and knowledge in relation to spatial clustering in agglomerations and the dynamics of urban areas (including smart cities).
- Part 2: Cities, innovation and productivity.
In this part of the book the competitive performance of cities is examined, in relation to entrepreneurship and innovation of firms in the context of favorable seedbed conditions.
- Part 3: Urban systems, infrastructure and sustainable development.
This section addresses the long-range external conditions of successful cities, such as accessibility, transportation investments, quality of life (health) and energy savings initiatives.

We now briefly summarize the individual contributions in each of the parts 1–3 of the volume. Part 1, on urban creativity and growth, commences

with a study by Åke Andersson, David Emanuel Andersson, Björn Hårsman and Zara Daghbashyan on complexity, creativity and urban cluster formation. Industrial investments in research and new product development have been the key factors behind economic growth in recent decades. They have also been the most important causes of the changing comparative advantages of regions and countries. This chapter aims to generate theoretical insights into the mechanisms behind the spatial clustering of research-dependent production and the impact of the increasing complexity of products and production technologies. The authors claim that increases in product complexity in information and communications technology (ICT), biomedicine and other high-tech industries necessitate closer co-operation with basic science and interdisciplinary research in universities. At the same time, statistics on the allocation of research and development (R&D) investments between industry and universities show that in most countries the share going to university-based research is quite low. This is especially marked in the cases of South Korea and Japan. The Andersson et al. study offers three key policy conclusions. First, governments should increase their funding of scientific research, which would provide a stronger knowledge infrastructure in support of industrial R&D investments. Second, increasing scientific complexity implies a need for more support of projects with scientific *diversity*. Such projects will tend to have leadership that can integrate different disciplinary perspectives. Third, from a European perspective, there is a particular need for greatly expanded increases in science and R&D investments in many countries in southern and eastern Europe. Otherwise there is a real possibility that scientifically peripheral regions will lag even further behind northwestern Europe in the future than they do at present.

Next, Ana Barufi and Karima Kourtit present an overview of concepts and theories on agglomeration advantages of cities and metropolitan areas, in relation to Smart City concepts. The authors argue that agglomeration advantages are a key force in shaping cities and metropolitan areas. Next to system-wide benefits of such urban externalities generating intra-urban and extra-urban advantages, such agglomeration forces have also had a thorough impact on the local labor and housing markets, in terms of wage formation, spatial disparity and quality of life. The United Nations (UN) objective of making urban areas inclusive, resilient, safe and sustainable calls for effective initiatives. A contemporaneous response to this global challenge is given by the “Smart Cities” movement, which aims to turn urban agglomerations into knowledge-based, innovative, environmental and equitable concentrations of human and business activity. Based on the notion of urban system capital, this chapter critically reviews and synthesizes the current literature in this field.

The concept of Smart Cities also plays a key role in the subsequent contribution by Andrea Caragliu and Chiara Del Bo. They start from recent EU policies, prompted by the European Commission, which revolve around the word “smart” and are aimed at stimulating the best from each region and city. At the urban level, several policy initiatives are focused on the concept of Smart City, which initially developed around the relevance of ICT infrastructure as a means of connecting cities and, thus, empowering their growth capabilities. More recently, the “smart” label has also been applied to regional policies. “Smart Specialization Strategies” were originally conceived in terms of industrial specialization and are a currently a highly debated topic in regional science, both in terms of steering policy making and eliciting academic studies. Despite the popularity of these concepts in the policy domain, only a few attempts have been made to properly ground the concept of “Smart Specialization Strategy” in a comprehensive theoretical framework, and none has been made to explain the difference between the concepts of a Smart City and a Smart Specialization Strategy. This chapter attempts to fill this gap by framing both concepts in a single fused framework. A previous definition of Smart City is the basis for the construction of an urban indicator of smartness, while a new empirical methodology to identify Smart Specialization Strategies among regions is proposed. By combining the two levels of analysis, empirical results suggest that EU regions appear to be on a Smart Specialization path and that Smart Cities are more likely to emerge in regions where Smart Specialization is taking place ((semi-) mature stage) or being implemented (introduction stage).

The final study in Part 1 is contributed by Roberto Camagni, Roberta Capello and Andrea Caragliu. The main hypothesis investigated in this chapter concerns the fact that decreasing returns related to urban size can affect not only large but also small cities; for the latter, decreasing returns are occurring at smaller-sized cities. The existence of one single optimal city size for all cities is questioned: as empirical analysis shows, agglomeration diseconomies can take place in small cities as well as in large cities. In addition, in each city agglomeration diseconomies can be turned into agglomeration economies by reorganizing urban activities towards higher value-added functions and networking with other cities as suggested by urban economic theory. These propositions are empirically tested on a sample of 136 European small and large cities, showing similar patterns of structural dynamics. These patterns, however, show specific properties for each urban class.

Part 2, on cities, innovation and productivity, starts with a multi-level modeling experiment on metropolitan performance analysis carried out by Karima Kourtit, Miruna Mazurencu and Peter Nijkamp. This study

examines the relative competitive performance of a set of metropolitan areas in our world by means of multi-actor explanatory models. These models are a specific class of a much broader technique known as multi-level modeling. In this study, extensive databases on 35 world cities are derived from the Global Power City Index (GPCI) database created by the Institute of Urban Research of the Japanese Mori Memorial Foundation. These data served as input for comparative models addressing the multi-annual performance growth of these areas. A fixed effects modeling approach is then used to identify and assess the determinants of urban performance from the perspective of different classes of stakeholders. An empirical application using R software is carried out. The study highlights the importance of different stakeholders in assessing the performance of metropolitan areas.

In the next chapter in this part of the book, written by Amy Rader Olsson, Hans Westlund and Johan Larsson, the issue of entrepreneurial governance for local growth is assessed. Taking as their starting point the general literature on entrepreneurship and the growing body of literature on entrepreneurship among public sector actors and institutions, the authors offer a conceptualization of entrepreneurship and metrics that can capture municipal propensity to launch local development initiatives. Results of an initial survey of Swedish municipalities indicate that there may be important differences in the way larger and smaller communities of various types introduce new initiatives and leverage local resources. They conclude that not only do local governments contribute to the creation of communities that support entrepreneurial firms, but also act in entrepreneurial ways. In particular, they create new institutions as a response to the risk and uncertainty associated with new development ventures and due to local resource constraints.

Next, Marina van Geenhuizen and Qing Ye analyze the role of cities as seedbeds of innovation. They argue that in transitions towards higher sustainability in our society, the quality of space (place) has rarely received attention or has received no attention at all. Rather, the focus has been on the national innovation system, thereby overlooking local/regional specificities that enhance or block developments towards higher sustainability. This chapter deals with a specific category of young, high-technology firms involved in responsible (sustainable) innovation, namely, spin-offs from universities, and it explores whether the city is a locational attractor for these firms and whether the networking by these firms makes a difference to their growth and potential contribution to higher levels of sustainability. The authors' work starts with a conceptual reflection on responsible innovation and what the role of cities as seedbeds could be according to various spatial-theoretical perspectives. Then the chapter proceeds with an exploratory analysis of growth among university spin-off firms active in

responsible innovation in two contrasting cities, a core metropolitan location and a peripheral city in Europe. Regression modeling and retrospective descriptive analysis of six case studies are used. The study concludes with a discussion of the implications and research needs and a more comprehensive measurement of responsible innovation.

The final chapter in Part 2 is written by Stephan Brunow and Valentina Nafts. Their study starts with the observation that innovation is a key driver of technological progress and growth in a knowledge-based economy. There are various motives for individual firms to innovate: improving quality, introducing new products and adopting new technologies. Much empirical work using binary logit or probit models has been conducted to identify variables that affect the likelihood of being active in one of these fields. Firms, however, can perform innovation activities in one or more of these areas or in none of them. The question then is what variables are associated with innovative processes in these areas? This is answered by constructing a measure that counts the number of actually performed innovation types. The measure of active research fields serves as a proxy for the establishment of specific innovative capacity. For this purpose the authors employ plant-level survey data and combine it with administrative data from Germany's social security system. An ordered logit model is estimated using a variety of characteristics which describe the workforce diversity and other establishment-related variables, the regional, intra-industrial environment of establishment's location, as well as industry and region fixed effects. The empirical evidence from this study suggests that workforce diversity is relevant for innovative processes. The location itself does not lead to higher propensities to innovate; however, being located in an intra-industrial cluster provides a positive spillover effect, highlighting the importance of regional innovation systems.

The third and last part of this volume, Part 3, addresses issues of urban systems, infrastructure and sustainable development in relation to urban dynamics. The first chapter in this part, contributed by Zhenhua Chen and Kingsley Haynes, explores the public surface transportation investment impact on economic output, using a Granger approach. The chapter investigates causal linkages between surface transportation infrastructure and economic performance in the northeast corridor in the United States. To improve the validity of estimation, financial data for highways, public rail and transit are measured in real monetary value. The panel Granger causality test shows that the endogeneity between surface transportation input and the regional economic output does not exist with statistical significance in this analysis. Surface transportation infrastructure is found to "Granger cause" the change of employment and personal income per capita whereas the reverse effects are not found.

In a subsequent study, Renato Vieira and Eduardo Haddad present an accessibility index for the Metropolitan Region of São Paulo. The objective of this chapter is to elaborate on an index for measuring accessibility to jobs. The index follows a gravity-based formulation, weighting the opportunities according to the impedance to achieve them. The authors define “opportunities” as the number of jobs in each zone, and “impedance” as an inverse exponential function of travel time between each pair of zones. Two indices were calculated, one for trips by private vehicles and a second one for public transportation. The study concludes that: (a) accessibility is usually higher for zones nearer to the city center; (b) the spatial distribution of accessibility is different between the two modes concerned, because accessibility by public transportation is strongly related to the subway and railway network; (c) there is a significant spatial correlation between income and accessibility.

Urban systems may also exert differential effects on human health. In a chapter on urbanization and quality of life, Noriko Ishikawa, Karima Kourtit and Peter Nijkamp offer an overview of health effects on urban and rural residential patterns. It is well known that there exist considerable inequities in health within and between countries. A number of studies have shown that health outcomes are affected not only by individual socio-economic status, but also by the physical environment, and socio-economic and political circumstances. Most of the effects on health outcomes of socio-economic circumstances, commonly referred to as contextual factors determined by spatial and environmental characteristics of the area itself, seem to be intuitively plausible, except for the effect of urbanization. This chapter offers an inventory of many studies that have addressed the relationship between urban conditions and human health, to examine why the estimated effects of urbanization vary among countries and studies. The finding is that it is difficult to draw accurate conclusions as to whether contextual factors might precisely and steadily affect health outcomes, mainly due to a variety of health outcomes and a lack of appropriate criteria classifying the arena into urban and rural areas. The authors also argue that area-based differences are masked when using the urban–rural dichotomy because of the existence of intra-regional heterogeneities. Therefore, it may be important to find a more accurate classification scheme or a proper analytical method that minimizes the heterogeneity within regions rather than evaluating the usefulness of dichotomous and continuum classifications. The authors argue that health studies should reveal which and to what extent regional components affect health outcomes. Consequently one should decompose regional characteristics into relevant components in order to identify more precisely which components have a critical influence on health

outcomes. Finally, the authors propose six critical contextual factors which may affect health outcomes in relation to urbanization.

Cities are also large energy consumers. In his chapter Yuyuan Wen offers an interesting dynamic analysis of energy rebound effects in the megacities of Beijing and Shanghai. This chapter, employing both nested CES and Cobb-Douglas production functions, estimates the energy rebound effects for Beijing and Shanghai in the period 1990–2011, as well as for the country as a whole. The findings are as follows: (a) short-term rebound effects in both Beijing and Shanghai are higher than in the country as a whole. Their values are under 100 percent and experience only a small increase between 1990 and 2011, which indicates, at least theoretically in the short term, that improvement in energy efficiency can reduce total energy consumption; (b) long-term rebound effects in Beijing, Shanghai and the country as a whole predominantly show a decreasing trend between 1990 and 2011, which suggests that China's energy saving policy has yielded positive results since the mid-1990s. However, how to overcome energy "backfire effects" in the long-term rebound effects is a difficult issue for the megacities and the country as a whole to address in the future; (c) due to the rebound effects, technology progress, economic structure adjustment and institutional transformation should be taken into consideration when developing an energy-saving policy.

The final contribution in this volume is produced by Marlon Boarnet and Richard Green. They raise the question of how cities should manage economic development in the future. They argue that economic development policy and real estate development are closely linked, often conflated, and exist in a politicized environment where the need to "do something" too often trumps insight from theory. The authors suggest that the economic rationale for public sector efforts to promote economic activity can and should be based on theories of market failures. They further note that government regulation of the land market can either help or hinder economic development efforts. In turn they propose real estate regulatory principles that are consistent with effective economic development policies. These insights from theory are combined with summaries of experiences from four U.S. cities – Austin, New York, San Diego and Washington, D.C. – to develop policy recommendations for economic and real estate development.

After this panoramic overview of the rise of cities, their underlying mechanisms and the possible effects on the urbanized space-economy, the question emerges: which lessons and trends have been uncovered.

The opening chapter by Andersson, Andersson, Hårsman and Daghbashyan argues that industrial investments and new product development have been key factors behind economic growth in recent decades.

This is an important observation and implies that economic growth in cities has come primarily from R&D investments, that is, research and technology development. This is one of the basic ways that economic growth occurs; the others are through physical resource extraction and education. Resource extraction plays a minor role in general urban economic growth today. Education that produces improved human capital has long been a source of economic development in modern times and also has likely contributed to urban economic growth, but this driver of growth has been evolving for a long time; at least since the rise of industrialization. What is new is that recent urban economic growth appears to have come primarily from the development and adoption of new technology that has been concentrated in urban places. But why has this occurred and will it continue?

Sifting the substance of the contributions of this book and recognizing both the stated and hidden assumptions upon which its contributions rest one concludes that the recent evolution and adoption of ICT combined with telecommunication developments are the primary drivers of the continuing growth of cities (urban places). These developments have resulted not only in the creation of huge new amounts of information and knowledge but, perhaps even more important, the reality that this corpus of knowledge can be accessed more broadly and deeply than at any time in history. This fact has had profound impacts on nearly all processes in urban (as well as rural) existence. Consequently, most processes that undergird sustained societies have become more open than in the past. Thus we see openness, broadening participation and increasing transparency occurring in such urban and social maintenance processes as governance, big project/infrastructure finance, management, planning, transportation, government service provision, education as well as in R&D. While such processes have historically been more closed, they are becoming increasingly more open and this openness is occurring most in urban places. So why is this so?

Thomas Friedman (2005) recently wrote a book in which he argued that the “world is flat.” His argument is that the merging of ICT and telecommunications technology evens the knowledge playing field so that all places (all people) have similar access to information and knowledge. Yet, if that is the case, then why are cities and urban places growing? It is because in most cases not all locations have the same ability to convert that knowledge into new economic growth. The counterargument to Friedman’s influential book put forth by Richard Florida (2005) and others is that “the world is spiky” and continues to become more agglomerated in the knowledge age. Urban places are expanding and evolving because proximity of people, knowhow and resources remains an important factor in economic growth

even in the knowledge age. As people congregate in urban places, demand for products not only grows in quantity but it also diversifies and together these factors create increased demand for a broader array of goods and services. This creates a fertile bed for innovation and entrepreneurship and the development of new goods and services. As this demand is met, new jobs are created which in turn attracts more people to fill those jobs. Further, proximity is important for the innovation process. Proximity makes it easier to recognize the new and diverse opportunities because there are always fine grained local factors (e.g., tacit knowledge) that are required as inputs for the successful innovation and entrepreneurship that create the new goods/services. These factors have a higher probability of being known and used in urban places because of the proximity of people and knowledge. In short, a self-reinforcing or positive feedback system arises in urban environments that attracts people, creates new demands and responses to meet those demands, which in turn produces new jobs and which in turn creates new and diverse job opportunities, and thus more people are attracted to fill the jobs and growth occurs. This line of reasoning is that offered by the new economic geography and new international trade theory (Krugman 1991).

In the knowledge age the growth of cities begins, for the most part, where cities are already located and where proximal advantages already exist, and consequently this is where the forces of the knowledge age are themselves amplified and focused. The result is growth due to increased knowledge fueled by continuing advances in ICT and telecommunications technology. Because of the concentration of new opportunities in cities and their potential for exploitation it is not surprising that scholars and observers note that creative people are increasingly attracted to cities or as Florida (2005) observes – “Spiky Places.” What is important not only about the overall continuing growth of cities and their attraction for entrepreneurs, innovators, inventors and creative people is that the positive reinforcing and positive feedback nature of cities in the knowledge age is likely to continue for some time. This growth and the forces producing it are driving increasing openness in the processes that serve to govern, manage and undergird the urban reality. This evolving openness and how to use and manage it is a huge dynamic that underlies “cities in transition.” The contributions of this book all in one way or another are important because they provide a window into the adjustments that are, or are not, taking place in urban and city spheres.

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