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**INNOVATION, ENTREPRENEURSHIP,
GEOGRAPHY AND GROWTH**

Philip McCann and Les Oxley

This special edition of the *Journal of Economic Surveys* provides a timely audit of the state of art regarding our understanding of the complex links between innovation, entrepreneurship, geography and growth. Until the 1980s these issues were all generally treated as being part of the Solow residual, and as such, were largely outside the domain of mainstream economic research work. Before this period, the assumed primary role of factor allocation mechanisms in driving growth relegated such issues to being topics of minor interest, and the situation only really started to change in the 1980s when a series of important theoretical and empirical publications first began to shift ideas and priorities after many decades of inertia. From the late 1980s onwards, the rate at which publications on these topics appeared accelerated rapidly. An early series of theoretical breakthroughs was followed shortly by a surge of empirical chapters, which increasingly opened up the debates to wider sets of issues. The debates first shifted from a focus almost solely on manufacturing and industrial arenas to services and other areas of the economy, and then secondly by emphasizing the role played by small as well as large firms in growth, followed by an increasing awareness of the non-technological and institutional aspects of innovation, and finally incorporating the role of geography. Over time, more commentators have taken on board something of a systems-type understanding of these phenomena, but econometrically such an approach poses great difficulties. Therefore, orthodox empirical approaches still dominate, but now the much improved availability of survey-based microeconomic data, as well as aggregate national and regional data, has provided for both more, and also for more nuanced, analyses. Overall, it is probably fair to say that our current understanding of innovation, and its relationships with entrepreneurship, geography and economic growth, is currently more advanced empirically than it is theoretically, although this is in marked contrast the situation pertaining three decades ago. However, what becomes clear from the chapters presented in this special issue is that there are still many aspects of these relationships that need both further theoretical as well as empirical analysis. A widespread acceptance of the centrality of technology, innovation, entrepreneurship and geography in driving economic growth means that these issues will no longer be treated as elements in

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an economic residual, but rather as the key issues on which public policy will seek to have a positive influence.

The chapters in this special issue all deal with different aspects of the relationships between technology, innovation, entrepreneurship and geography, which drive economic growth. They do so from a variety of theoretical, empirical and institutional angles, and importantly, each of them operate at the interface between at least two of these key aspects. Moreover, the ordering of the chapters also reflects the shifts in our understanding of these relationships, which initially operated at the interface between micro and macroeconomic theoretical models, were then developed econometrically using aggregate sectoral data, and since have rapidly been extended via the use of microeconomic and survey data to examine more disaggregated geographical and institutional aspects. As such, the aim of the special issue is to provide the reader with a comprehensive roadmap of the types of issues that research at the interface between these different aspects addresses, to reflect the developments in our understanding of these relationships, and to open up debates as to the most fruitful ways forward for enhancing our understanding of these issues.

The first chapter by *Simon Parker*, discusses the theoretical relationship between entrepreneurship, innovation and economic growth. It is clear that firm destruction, new firm formation and the ongoing inter-firm competition that this churning ensures, is an essential element of innovation and economic growth. Yet, the exact mechanisms by which these interrelationships operate are far from clear, and various theoretical arguments have been proposed. Parker distinguished three broad classes of theoretical approaches to understanding these relationships: models of creative destruction; models of innovation and implementation cycles; and models of production under asymmetric information. Despite their differences, these three models all share the property that entrepreneurship is potentially pro-cyclical, and one or two of them also admit the possibility that entrepreneurship trends may also exhibit acyclicity, whereas the major differences between the theories concern whether entrepreneurship is predicted to vary contemporaneously with the business cycle, or whether it lags or leads it. Taken together, these theories generate at least three major insights: first, personal assets are important for the occurrence and persistence of business cycles; second, expectations play an important role in the timing of innovations; and third, entrepreneurship continues even in recessions.

The second chapter by *Raquel Ortega-Argilés* discusses the huge econometric literature seeking to uncover the reasons for the transatlantic productivity gap, a productivity gap which rapidly began to emerge during mid-1990s. The emergence of this productivity gap was in marked contrast to the previous long-term trends. By the late 1980s the productivity performance of the two major macro-regions of Europe and North America had largely converged, after almost half a century of European economic restructuring and integration. However, this Transatlantic inter-regional convergence process was rapidly reversed some two decades ago, leading to a period of marked inter-regional divergence. The reasons for this divergence appear to be related to ways in which the United States reaped the benefits of the widespread adoption, and adaptation, of the new generation of general purpose technologies emerging, based on modern information and communications technologies (ICTs). The econometric evidence suggests that the productivity shock in favor of North America was related firstly, to production of ICTs, and then secondly to dissemination and use of ICTs in non-ICT producing sectors. Europe was much slower to realize either of these types of benefits, and the positive impacts of technological change have been lower than in the United States. However, from the empirical evidence it also becomes clear that

within Europe there are large differences in these technology-productivity effects across sectors, firms and regions, and that a more nuanced understanding is called for.

The third chapter by *Shangqin Hong, Philip McCann and Les Oxley* considers the role played by the increasing availability of empirical surveys in shaping our understanding of innovation. An examination of the theoretical and conceptual arguments surrounding innovation, and the relationship between these arguments and empirical research, demonstrates that the evolution of our understanding of the nature of innovation, and also the role of innovation in economic growth and development, has in part been related to the evidence available. Early survey-based research tended to focus on manufacturing and science, reflecting a rather narrow understanding of innovation, and such surveys still dominate in some technology-science lead societies. However, over time in many countries there has been an increasing awareness of the role played by non-technical and institutional factors in driving innovation in service industries as well as manufacturing and engineering, and this shift in emphasis has also been reflected an increasing emphasis on the 'softer' influences on innovation. Most recently, the role of economic geography, and in particular the role played by the interactions between economic geography and institutions, in shaping, fostering and even inhibiting innovation, have come to the fore. These shifts both reflect, and have been reflected in, the contemporary nature of modern innovation surveys.

The fourth chapter by *Tommaso Ciarli, Valentina Meliciani and Maria Savona* discusses the literature and empirical evidence regarding the dynamics of the relationships between knowledge, structural change and the spatial concentration of economic activities in the case of business services. To do so, they explore how the role of knowledge has evolved in relation to the dimensions of: science, technology and structural change; the long-term processes of tertiarization of economies and in particular the growth of business services; and the spatial concentration of business services. This increasing spatial concentration is explained as an outcome of the increasing size and complexity of knowledge and the increasing need for managing this through spatial proximity. The argument is supported by empirical evidence on the spatial concentration of business services in the European regions.

The fifth chapter by *Frank van Oort, Martijn Burger, Joris Knoen and Otto Raspe* moves the discussion explicitly to a geographical level, and analyses very detailed Dutch data to examine the ambiguities evident in much of the empirical research regarding the role of agglomeration economies in fostering growth. Much of this ambiguity is related to measurement issues and heterogeneity in terms of the scale, time period, levels of aggregation, growth definitions and the functional form of the models applied. The authors argue that a powerful way forward for resolving many of these ambiguities lies in the application of hierarchical or multi-level modeling to firm-level datasets. Hierarchical or multi-level modeling, which allows micro levels and macro levels to be modeled simultaneously, is becoming an increasingly common practice in the social sciences. In economics, however, these techniques are still relatively under-used, but firm-level data, which is also geographically coded provides an ideal context for using such approaches to uncover the firm-specific roles in economic growth.

The sixth chapter by *Ernest Miguélez and Rosina Moreno* aims to devise a method for computing a composite indicator that measures the regional degree of exposure to external knowledge sources. Such methods are critical to allow comparisons between regions and to benchmark different places on the basis of their knowledge spillover characteristics. On the basis of this indicator the authors then propose a typology of regions according to their potential capacity to access non-local items of knowledge. It is this ability to access external

knowledge sources, which helps them to overcome locally specific limits and to build on and recombine local and non-local complementary knowledge elements so as to produce a higher number of new ideas. Building on various research streams that have been relatively independent to date, they review recent key studies which motivates their approach and the construction of their composite indicator, which can then be used to appraise the extent to which each region is in an optimal position to access external innovative resources.

The seventh chapter by *Riccardo Crescenzi and Andrés Rodríguez-Pose* follows a similar approach to the previous chapter, although here the approach is primarily from a conceptual rather than an empirical angle. The authors discuss recent developments in the literature on local and regional innovative performance, with the aim of demonstrating how an integrated ad conceptual framework based on a combination and linking of different theories can serve as a foundation for comparing the relationships between innovation, geography and institutions in both developed and developing countries. Such relationships are often discussed in terms of 'regional innovation systems', and drawing on elements of endogenous growth theory, new economic geography and the innovation systems literatures, the chapter outlines an analytical framework for explaining the differences between innovation systems and their geography. This framework then forms the basis of an analysis of the differences in innovative capacity between the 'mature' technological leading regions of the European Union and the United States, and the 'emerging' technological catching-up regions of China and India. The systematic analysis of a large body of empirical literature shows that there are important differences between the spatial patterning of the regional innovation systems in the mature and emerging economies.

The eighth chapter by *Wenyang Fu, Javier Revilla Diez and Daniel Schiller* adopts an evolutionary economic geography approach to examine the regional innovation system in two regions of China currently undergoing rapid transformation, namely Shenzhen and Dongguan. A comparison of the two regions demonstrates that the technological upgrading processes in the two regions are quite different, and in part depending on the different governance systems of the region. Indeed, the institutional development of the regions is seen to be a critical part of the evolutionary story of each region. In the case of Shenzhen, the production system of 1980s has gradually evolved to a higher level globalized system characterized by something of an interactive regional innovation system, in contrast to the grassroots-type globalized production system in Dongguan, where innovation activities are low and are still passively managed by global players. The review on the evolutionary path of electronics industry in Shenzhen and Dongguan reveals that the locational first-mover advantage in Shenzhen is further strengthened by the institutional first-mover advantage.

Taken together, these eight chapters succinctly capture the evolution of our understanding of the relationships between entrepreneurship, innovation, geography and economic growth. Although it is clear that research on these issues has made enormous strides over the last three decades, it is also clear that much remains to be explored. Reading these eight chapters sequentially suggests that a great deal of progress might be made from a theoretical perspective by finding ways to increasingly incorporate into growth models the types of insights discussed in these chapters regarding the interactions between technology, geography and institutions. Such theoretical approaches ought to be motivated by, and based on, the empirical evidence underlying most of the advances in our understanding of these issues, as it has been empirical research which has largely dominated the field over the last two decades.