



UNIVERSITAT  
ROVIRA I VIRGILI

DEPARTAMENT D'ECONOMIA



## WORKING PAPERS

Col·lecció “DOCUMENTS DE TREBALL DEL  
DEPARTAMENT D'ECONOMIA - CREIP”

Innovation and Geographical Spillovers:  
New Approaches and Empirical Evidence

Agustí Segarra-Blasco  
Josep Maria Arauzo-Carod  
Mercedes Teruel

Document de treball n.15 - 2018

DEPARTAMENT D'ECONOMIA – CREIP  
Facultat d'Economia i Empresa



UNIVERSITAT  
ROVIRA I VIRGILI

DEPARTAMENT D'ECONOMIA



*Edita:*

Departament d'Economia

[www.fcee.urv.es/departaments/economia/public\\_html/index.html](http://www.fcee.urv.es/departaments/economia/public_html/index.html)

Universitat Rovira i Virgili

Facultat d'Economia i Empresa

Av. de la Universitat, 1

43204 Reus

Tel.: +34 977 759 811

Fax: +34 977 758 907

Email: [sde@urv.cat](mailto:sde@urv.cat)

CREIP

[www.urv.cat/creip](http://www.urv.cat/creip)

Universitat Rovira i Virgili

Departament d'Economia

Av. de la Universitat, 1

43204 Reus

Tel.: +34 977 758 936

Email: [creip@urv.cat](mailto:creip@urv.cat)

*Adreçar comentaris al Departament d'Economia / CREIP*

ISSN edició en paper: 1576 - 3382

ISSN edició electrònica: 1988 - 0820

**DEPARTAMENT D'ECONOMIA – CREIP**  
**Facultat d'Economia i Empresa**

# **Innovation and Geographical Spillovers: New Approaches and Empirical Evidence**

Agustí Segarra-Blasco (\*) agusti.segarra@urv.cat

Josep-Maria Arauzo-Carod (\*) josepmaria.arauzo@urv.cat

Mercedes Teruel (\*) mercedes.teruel@urv.cat

## **Abstract**

This special issue concerns the generation of knowledge and geographical spillovers, and it includes a selection of papers that cover existent research gaps with respect to the role of space in the promotion of knowledge spillovers and innovation. These papers analyse different typologies of innovation processes carried out in several geographical areas and highlight heterogeneities of these processes, after focusing on several determinants in innovation. Empirical results indicate the positive role of geographical spillovers and the importance of accurate matching among firms, in industry and with regard to regional characteristics, in order to ensure the generation of knowledge and innovation.

Keywords: innovation, geography, spillovers

JRL Codes: O30, R10

(\*) CREIP, Department of Economics, Universitat Rovira i Virgili, Av. Universitat, 1;

43204 – Reus (Spain) Phone: +34977759854, Fax: +34977300661

## **Introduction**

There is a wide consensus about innovation as a crucial factor in order to generate productivity gains and to promote long-term economic prosperity. However, understanding the genesis of innovation and its effects is not an easy task. Innovation requires physical capital, skilled workers, creative people, R&D infrastructures and cooperation between local firms and the public sector. Furthermore, as innovation is a complex, dynamic, and a risky activity subject to great uncertainty, research and innovative activities require institutions that are able to guarantee property rights and appropriate - and stable - social, economic and legal conditions. Despite these already existent obstacles, the speed of innovation generation is increasing constantly, and today, innovation is a major driving force for economic growth. Those mechanisms that foster the economic impact of innovations involve both knowledge spillovers and the absorptive capacity of the agents involved. This special issue contains eight contributions that explore the importance of regional dimension with respect to these mechanisms.

The role of innovations as a player in the field of economic growth was first noted by Joseph Schumpeter, when he identified the central role of entrepreneurship and technological innovations as forces of change. His initial affirmations remarked on the role of innovative entrepreneurs and the disruptive nature of innovations (Schumpeter, 1934), and in later years he highlighted the relevance of R&D activities undertaken within large corporations (Schumpeter, 1942).

During the 1970s and 1980s, new growth theories focused on the different patterns of economic growth that may arise as a result of increasing returns of knowledge (Grossman and Helpman, 1991; Lucas, 1988; Romer, 1986). Those models however, were unable to explain the complex nature of knowledge transmission from inventors to innovators, the role of knowledge spillovers and the impact of public policies on R&D private investments. Empirical evidence in fact reveals that entrepreneurs, inventors, R&D managers, universities, research centres and many other agents interact in innovative territories (Feldman and Florida, 1994). In other words, these agents are not spatially distributed in a homogenous manner – and the fact that they are concentrated in specific regions and metropolitan areas reveals the role of space in the generation of knowledge, the diffusion of spillovers and the innovation process. This spatial concentration enhances the generation of innovations that later boost growth rates (Krugman, 1991). In short, adopting a geographical approach to phenomenon of innovation helps in the understanding of knowledge spillovers (Feldman, 1999).

Economists and geographers interested in analysing drivers and the effects of knowledge spillovers are therefore forced to focus their analyses on specific geographical contexts. Within this framework, Krugman (1991, p.5) states: “What is the most striking feature of the geography of economic activity? The short answer is surely concentration (...) production is remarkably concentrated in space”. Although he was right, it is also true that the concentration of economic activity only appears when innovation generation is already concentrated. Furthermore, Feldman (1994a) provided compelling evidence to show that what Krugman observed to be true for production was even truer for innovative activities. Both authors raised relevant questions about links between the spatial concentration of production and innovation activities, and they

opened the door to a long list of theoretical and empirical contributions (Audretsch and Feldman, 1996).

Given the role that space has on the innovation process, this special issue includes eight papers grouped into two lines of research: the first is related to the drivers and the characteristics of spatial knowledge spillovers, and the second refers to the absorptive capacity of firms. Both topics have been covered on previous occasions by *Regional Studies* in single papers, as well as by special issues such as “Proximity and Innovation” (49 (6), 2015); “From Learning Region to Learning in a Socio-spatial Context” (46 (8), 2012) or “Regional Innovation Systems: Theory, Empirics and Policy” (45 (7), 2011), among others.

The first research line is based on a well-known taxonomy of externalities that analyses the generation of local knowledge spillovers and their effects on economic growth. Following this line, Glaeser, Kallal, Scheinkman, and Shleifer (1992) identified three types of knowledge externalities from which the positive effect of agglomeration occurs: Marshall–Arrow–Romer externalities (which emerge from the concentration of firms within a specific industry), Jacobs’ externalities (which are generated by the diversity of industries located in a specific area) and, finally, Porter’s externalities (which are caused by local competition among clustered firms in the same industry). From a spatial approach, Feldman (1994b) suggested that the complementarity between institutions and resources generates positive externalities and spillovers that are beneficial to innovative activities. According to this perspective, the innovative capacity of firms located in a territory is related to their proximity with other innovative firms, local infrastructures that promote R&D activities, and the supply of scientific and

business services (Feldman and Florida, 1994). In fact, this approach focuses on the analysis of territorially-embedded institutional networks that favour or deter the generation of innovations (Rodríguez-Pose and Crescenzi, 2008).

The second research line suggests that a firm's absorptive capacity plays a crucial role in the innovative capacity that takes place in a specific territory; an idea first introduced by Cohen and Levinthal (1989). This contribution opened a fruitful research line concerning the role played by geography with regard to learning processes and the generation of innovative ideas. In this line, it is important to stress that a firm's innovation effort not only generates new knowledge, but also enhances a firm's ability to capture, assimilate and exploit existing knowledge. The concept of absorptive capacity is related to the complementarity between different elements in a specific territory and the limitations of knowledge appropriability faced by innovative firms. Finally, the spatial proximity of complementary resources, institutions and activities promotes knowledge flows that diminish costs and reduce risks associated with knowledge appropriability (Wang, Ling, Ni and Prevezer, 2016; Guastella and Oort, 2015).

### **An overview of the contributions to the special issue**

The heterogeneity of previous research topics justify using diverse methodological and conceptual approaches, as in the case of the authors of this special issue. However, some important points shared by most of the authors do exist. Among them, it may be mentioned that it is necessary to properly account for the heterogeneity, not only of

those firms involved in this process, but also the geographical areas where these firms interact with both themselves and with other agents. Furthermore, it is important to maintain a broad approach to innovation processes as they may have an influence at national, regional or local levels. Similarly, institutions matter when discussing how innovations are designed, created and disseminated, at both shorter and longer distances. Consequently, the geographical scope of knowledge spillovers is far from being homogeneous, partially due to the specificities of innovation generation across different industries.

The eight papers included in this special issue contribute to the literature by analysing the processes of innovation generation through geographical spillovers and the way in which absorptive capacity impacts innovation performance. The most relevant topics that these papers address are the following: *i)* the role played by firm heterogeneity, *ii)* the role of spatial asymmetries in terms of knowledge generation, *iii)* the effect of regional factors on a firm's absorptive capacity, *iv)* the role of public infrastructures on knowledge generation and the firms' innovative performance, *v)* innovation dissemination across space and industries, *vi)* the effects of local vs. global knowledge spillovers, *vii)* the spatial range of knowledge spillovers, *viii)* innovation diffusion through migration, and *ix)* R&D activities and knowledge generation.

#### Knowledge spillovers and innovation

Regarding the first line of research, Stuetzer, Audretsch, Obschonka, Gosling, Rentfrow and Poter (2018, in this issue) start this special issue by offering a novel approach to the measurement of entrepreneurship based on established psychological constructs. These authors report a positive impact of the entrepreneurship culture on employment growth



for US metropolitan areas. Those authors suggest taking regional cultural dimensions into consideration when designing public policies.

Adopting a longitudinal perspective, Sanso-Navarro and Vera-Cabello (2018, in this issue) believe that knowledge generation depends on an existing stock of ideas. For a group of regions in France, Germany, Italy and Spain, these authors show that knowledge spillovers and the resources devoted to R&D are essential for innovative performance at a regional level.

Triguero and Fernández (2018, in this issue) disentangle the simultaneous innovation spillovers for Spanish firms. These authors take into account the spillovers from firms in the same industry and those from different industries that are still located in the same region. They find that involuntary knowledge spillovers have positive effects on product innovation and R&D among neighbours in the same industry; and a negative effect on the R&D of neighbours in other industries.

Finally, Arauzo-Carod, Segarra-Blasco and Teruel (2018, in this issue), using the case of Catalonia, analyse whether locating to a Science and Technology Park matters for firm growth. These authors apply a matching methodology to generate homogeneous comparable groups of in and out-park firms. Their results show that these infrastructures exert a positive effect for high-growth firms and a negative effect for low-growth firms and that Science Parks have a stronger effect than Technology Parks in this sense.

Absorptive capacity and the innovation performance

Regarding the second line of research, Prenzel, Ortega-Argilés, Cozza and Piva (2018, in this issue) analyse the impact of firms' innovation efforts on productivity growth in terms of European regions. They contribute to the empirical literature by disentangling interlinkages between the effect that R&D has on productivity growth at firm level and the regional context of these interlinkages. These authors find that more innovative regions facilitate the transformation of R&D investments into productivity for European high-tech industries.

López-Bazo and Motellón (2018, in this issue) analyse the regional determinants of innovation at firm level, and show that most variability in terms of innovation performance is explained more by individual firms' characteristics, than by regional factors. Using data for Spanish regions, they show that the absorptive capacity of a company plays an important role in its innovative activities.

By considering the heterogeneity of knowledge, Miguelez and Moreno (2018, in this issue) assess whether regions are more easily able to absorb similar or dissimilar knowledge. These authors prove that only locally-related knowledge has a positive impact on regional innovation. They find that the greater the similarity between external knowledge flows and the extant local knowledge base, the higher the impact.

Finally, Lissoni (2018, in this issue) highlights the importance of the international migration of highly skilled individuals to disseminate innovations. In this extensive literature survey, the author reviews both theoretical and empirical contributions, and analyses both destination-to-origin and origin-to-destination approaches, as well as return migrants, among other issues, and suggests new and promising lines of research.

Although papers included in this special issue focus on different geographical areas, there are noticeable similarities in their results. In this respect, the paper of Stuetzer, Audretsch, Obschonka, Gosling, Rentfrow and Poter (2018, in this issue) illustrates the interrelationships between the entrepreneurship culture and employment growth; Sanso-Navarro and Vera-Cabello (2018, in this issue) find that the resources devoted to R&D facilitate the generation of knowledge spillovers and are key for innovative performance; similarly, Triguero and Fernández (2018, in this issue) show the positive impact of spillovers on product innovation and R&D for neighbours in the same industry but, surprisingly, negative effects on the R&D of neighbours in other industries. Additionally, Arauzo-Carod, Segarra-Blasco and Teruel (2018, in this issue) show that location in a Science and Technology Park has a positive effect on firm growth for dynamic firms but a negative effect for lagged firms. Previous papers highlight the positive influence of regional factors, such as entrepreneurship culture and those public infrastructures that are used for innovation generation, and knowledge transfer to generate knowledge spillovers, to foster growth rates and to boost skilled jobs. In this sense, given the positive role of spatial characteristics on economic performance, public institutions are expected to play a key role in guaranteeing these knowledge spillovers.

Nevertheless, previous spatial factors are not a sufficient condition, as firms need to be able to capture these positive externalities and let them interact with their internal characteristics. Therefore, firms need absorptive capacity in order to take advantage of external knowledge. In this sense, Prenzel, Ortega-Argilés, Cozza and Piva (2018, in this issue) identify combinations of firms' characteristics and regional specificities that

allow firms to benefit from external environment and, in a similar way, López-Bazo and Motellón (2018, in this issue) focus on role played by firm characteristics when capturing external factors, whilst Miguelez and Moreno (2018, in this issue) underline the importance of connection between knowledge flows and the existent local knowledge base, and Lissoni (2018, in this issue) show the way in which migration helps to disseminate knowledge, as innovation inputs move with migrants and also move back to where they came from, being that origin and destination areas may have important institutional differences. These papers demonstrate that what is relevant is not knowledge generation per se, but a matching with firm, regional and industrial characteristics.

In short, these empirical contributions show several regularities at regional level that may allow practitioners to understand innovation processes and, consequently, to implement policies to help the innovative performance of firms. Different regional policy recommendations arise from previous papers. First, the deployment of a regional policy promoting public investment in knowledge infrastructures (i.e., technological centres and science parks) and firms' incubators in order to facilitate geographical spillovers among private firms. Second, the importance of helping to improve absorptive capacity by local firms in order to promote the spatial mobility of skilled and non-skilled workers and sectoral regional specialization. The role of public institutions is certainly essential in promoting the generation of new ideas, the diffusion of knowledge and the reduction of obstacles limiting innovations on local firms.

Despite the diversity of data sources and methodological procedures, the papers included in this special issue will help to reduce existing gaps in current knowledge

about innovation processes and geographical spillovers although there are obviously several potential research directions still arising from those papers presented in this issue. Among them, we highlight *i)* those related to the spatial aggregation level of the analyses, as it is not clear at all whether results for NUTS-2, metropolitan areas or municipalities would hold for alternative spatial areas, and *ii)* those related to the specificities of regional innovation systems in order to identify common patterns, and to obtain comparable measures across different regions and countries.

### **Acknowledgements**

We would like to thank funding from Ministry of Economics and Competitiveness of the Spanish Government (ECO2017-88888-P and ECO2015-68061-R).

### **ORCID**

Agustí Segarra-Blasco <http://orcid.org/0000-0001-6316-3171>

Josep-Maria Arauzo-Carod <http://orcid.org/0000-0002-3801-223X>

Mercedes Teruel <http://orcid.org/0000-0002-4104-7679>

## References

Arauzo-Carod, J.M.; Segarra-Blasco, A. & Teruel, M. (2018). The Role of Science and Technology Parks as Firm Growth Boosters: an Empirical Analysis in Catalonia. *Regional Studies*.

Audretsch, D.B. & Feldman, M.P. (1996). R&D Spillovers and the Geography of Innovation and Production. *The American Economic Review*, 86 (33), 630-640.

Cohen, W.M. & Levinthal, D.A. (1989). A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35 (1), 128-152.

Feldman, M.P. (1999). The New Economics of Innovation, Spillovers and Agglomeration: A Review of Empirical Studies. *Economics of Innovation and New Technology*, 8(1-2), 5-25.

Feldman, M.P. (1994b). Knowledge Complementarity and Innovation. *Small Business Economics*, 6, 363-372.

Feldman, M.P. (1994a). *The Geography of Innovation*, Boston: Kluwer Academic Publishers.

Feldman, M.P. and Florida, R. (1994). The Geographic Sources of Innovation: Technological Infrastructure and Product Innovation in the United States, *Annals of the Association of American Geographers*, 84(2), 210-229.

Glaeser, E.L.; Kallal, H.D.; Scheinkman J.A. & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(6), 1126-1152.

Grossman, G.M. & Helpman, E. (1991). Endogenous Growth Trade, Knowledge Spillovers and Growth. *European Economic Review*, 35(2–3), 517-526.

Guastella, G. & Van Oort, F.G. (2015). Regional Heterogeneity and Interregional Research Spillovers in European Innovation: Modelling and Policy Implications. *Regional Studies*, 49 (11), 1772-1787.

Krugman, P. (1991). *Geography and Trade*, Cambridge, MA: MIT Press.

Lissoni, F. (2018). International Migration and Innovation Diffusion: An Eclectic Survey. *Regional Studies*.

López-Bazo, E. & Motellón, E. (2018). Innovation, Heterogeneous Firms and the Region: Evidence from Spain. *Regional Studies*.

Lucas, R.E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, 3-42.

Miguelez, E. & Moreno, R. (2018). Relatedness, External Linkages and Regional Innovation in Europe. *Regional Studies*.

Prenzel, P.; Ortega-Argilés, R.; Cozza, C. & Piva, M. (2018). Interplay between Regional and Industrial Aspects in the R&D–productivity Link: Evidence from Europe. *Regional Studies*.

Rodríguez-Pose, A. & Crescenzi, R. (2008). Research and Development, Spillovers, Innovation Systems, and the Genesis of Regional Growth in Europe. *Regional Studies*, 42 (1), 51-67.

Romer, E.M. (1986). Increasing Returns and Long-Run Growth, *Journal of Political Economy*, 94 (5), 1002-1037.

Sanso-Navarro, M. & Vera-Cabello, M. (2018). The Long-run Relationship between R&D and Regional Knowledge: the Case of France, Germany, Italy and Spain. *Regional Studies*.

Schumpeter, J.A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*, translated from the German by Redvers Opie, New Brunswick (U.S.A) and London (U.K.): Transaction Publishers.

Schumpeter, J.A. (1942). *Capitalism, Socialism and Democracy*, Floyd, Virginia: Impact Books.

Stuetzer, M.; Audretsch, D.B.; Obschonka, M.; Gosling, S.D.; Rentfrow, P.J. & Potter, J. (2018). Entrepreneurship Culture, Knowledge Spillovers and the Growth of Regions. *Regional Studies*.



Triguero, A. & Fernández, S. (2018). Determining the Effects of Open Innovation: the Role of Knowledge and Geographical Spillovers. *Regional Studies*.

Wang, Y.; Ning, L.; Li, J. & Prevezer, M. (2016). Foreign Direct Investment Spillovers and the Geography of Innovation in Chinese Regions: The Role of Regional Industrial Specialization and Diversity. *Regional Studies*, 50 (5), 805-822.