

Financing Innovation, Neo-Schumpeterian Theory and the Reduction of Regional Disparities in the European Union

Petr Jiříček, Zdeňka Dostálová

College of Polytechnics Jihlava

Abstract

The paper analyses at the European Union's support policy for research, development and innovation and the financial instruments used to implement this policy. The impact of the policy is analysed within the context of economical, territorial and social cohesion and the reduction of regional disparities. The aim of the paper is to highlight the influence of neo-Schumpeterian innovation theory on the formation of EU innovation policy and regional innovation strategies after the year 2000. The analysis revealed that pursuant to the conclusions of this theory, new financial instruments to support the competitiveness of and innovation in small and medium-sized enterprises can contribute to solving regional disparities. The paper also highlights the new intermediary institutions and agencies that were established in the European Union after the year 2000 and the role they play in the transfer of research results to the business sector in order to support innovation.

Keywords: financing innovation, European Union, neo-Schumpeterian innovation theory, regional disparities

Introduction

The origins of EU support policies for research, development and innovation, and cohesion, go all the way back to the signing of the Treaty of Rome in 1957. In the initial stage of its implementation, cohesion policy only focused on individual structural problems in the member states of the European Community. Regional disparities were not considered an important problem for the further political and economic integration of the member states participating in the European project. The support policy for research, development and innovation was also mostly only a part of the policies of the

individual member states. Its links to other EU policies, in particular with regards to the reduction of regional disparities, cannot be found until after 1973. The economic crisis of 1973 resulted in a change of view and the realisation of the need for a coordinated response. There was a need for innovation in regionally affected industries, especially within heavy industries and the energy sector, even in those member states that did not feel the full impact of the crisis at that time (Baldwin and Wyplosz 2012). The first signs of a coordinated common regional policy and the emergence of common support policies for research, development and innovation came in 1974 in the form of the European Regional Development Fund, the focus of which was to solve regional disparities and structural problems in crisis affected regions (Dostálová and Jiříček 2012). During the period 1983-2000, financial instruments were developed to support the research, development and innovation policy. Just like the financial instruments of the structural and regional policies of that time, they tended to be multi-annual programmes linked to the financial framework of the European Union. Archibugi and Filippetti (2011) describe the impact of innovation performance in Europe on the convergence of regions after the crisis and the influence of creating national innovation systems. Audretsch and Link (2012) define the amount of utility for public policy through commercial innovations. The theoretical concept that economic growth is driven by the creative role of small and medium-sized enterprises was applied within the European Union's strategies for solving regional disparities (Granieri and Renda 2012). It is only after 2000, and within the context of the Lisbon Treaty and the Europe 2020 strategy, that it is possible to speak of a higher degree of linking between the support policy for research, development and innovation and the EU's cohesion policy (Wamser, Nam and Schoenberg 2013). The issue of innovation policy and its relation to the divergence or the convergence of EU regions after the economic and financial crisis of 2008-2009 is described by Izsak and Radošević (2017).

Materials and Methods

The aim of the paper is to determine how, beyond the endogenous growth theories focused on internal sources of regional development, Aghion and Howitt's neo-Schumpeterian growth theory, based on innovation as a growth factor, influenced a change in the approach to solving regional disparities. The analysis includes a comparison of fundamental theoretical concepts from the field of economics and Schumpeterian innovation theory and specifies their contribution to the EU's long-term innovation policy. With regards to individual EU financial frameworks, reference is made to financial programmes that were/are instrumental for the support of research, development and innovation in the entrepreneurial sphere. For the analysis, aggregate data were used according to:

a) individual EU financial framework periods:

- 1973-1999 - annual or multi-annual programmes based on exogenous growth theories,

- 2000–2006; 2007–2013; and 2014–2020 – shift from endogenous growth theories to neo-Schumpeterian growth theory based on innovation for solving regional disparities.

b) the area/field the financial instruments targeted:

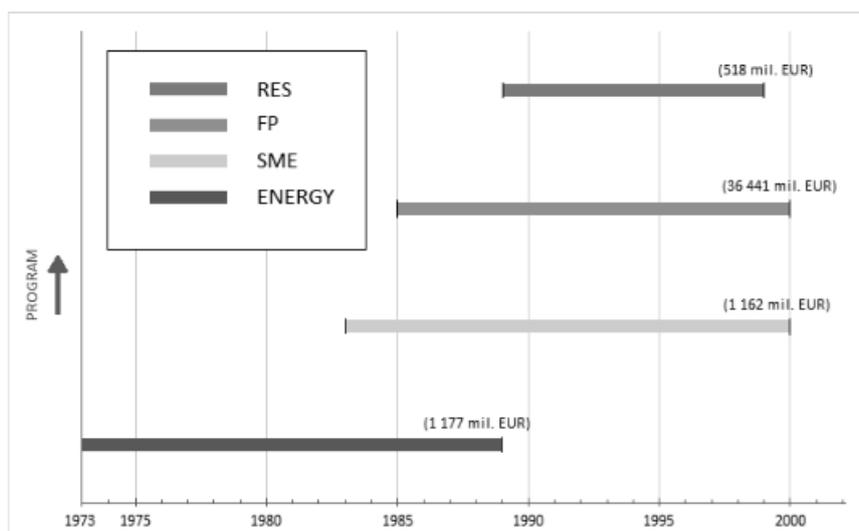
- technological innovation in the commercial sphere,
- innovation in energy production,
- research programmes.

Results

Financing of EU innovation policy and reduction of regional disparities in the period 1973-2000

The concept and financing of the policy for research, development and innovation and the creation of the financial tools to support it were a reflection and a reaction to the situation after the world economic crisis. The crisis led to the emergence of regional disparities in the, up to then, relatively homogenous regions of the six founding member states of the European Economic Community. From the perspective of postulates of the exogenous economic growth theories that prevailed at that time, namely Keynesian theory, investment in innovation in heavy industries and traditional energy production was considered crucial to eliminate regional disparities. As a result, the financial instruments that emerged were oriented towards supporting research, development and innovation in these sectors. These included, for example, *HYDROCARB*, *ENSALT*, *LIGASF* and *ENDEMO*. The predecessor of the research programmes was the COST programme, which focused on supporting the formal cooperation between research institutions within the EEC (Babjaková et al. 2014). The onset of the technological revolution in the area of new materials and computing led, in 1984, to the emergence of new joint multi-annual programmes called *Framework Programmes*. The objective of these programmes was to support research institutions. The impact of new economic theories based on the influence of technological capital (Romer's endogenous growth model) (Romer 1990) was reflected in an essentially different view of dealing with regional disparities. As a result of focusing on these very factors of economic growth, EU innovation policy began to take shape. Figure 1 shows the time sequence with regards to the implementation of the individual financial instruments of the policy, including the sums of money spent until 2000, whereby ENERGY indicates the support for traditional energy production, FP the support for research institutions, SME the support for small and medium-sized enterprises, and RES the support for renewable sources of energy.

Figure 1: EU financial instruments for support of research, development and innovation (1973-2000)



Source: Adapted from Babjaková et al. 2014

Neo-Schumpeterian growth theory and its influence on dealing with regional disparities for the period 2000-2020

Aghion and Howitt's theory of innovation as a growth factor, which was first published in 1994 and revised in 2005, is based on Schumpeter's theory of creative destruction (*Theorie der wirtschaftlichen Entwicklung*) published in 1912. It assumes that individual innovations are significant enough to affect the entire economy. Their theory has its roots in the likes of Lucas' neo-institutional growth theory published in 1988 and Romer's endogenous growth theory published in 1990. Aghion and Howitt build on Romer's concept of three economic sectors (Romer 1990), namely the research, intermediate and manufacturing sectors, which participate in the investment process that leads to economic growth. Aghion and Howitt's innovation theory had a theoretical influence on research into the role of the innovation process on the convergence of the European region. Cooke (2001) states that the future will require the widespread evolution of public innovation support systems along with stronger institutional and organisational support from the private sector. Fagerberg (2003) similarly deals with Schumpeter's influence on new innovation theory. The empirical findings presented by Fritsch and Slavtchev (2008) suggest that the transfer of knowledge from the private sector, as well as from universities and other public research institutions, has a positive effect on the efficiency of private sector research and development, which in turn supports regional development. The synthesis between Schumpeterian and neo-Keynesian approaches to innovation is presented by Dosi, Fagiolo and Roventini (2010). The neo-Schumpeterian model presented by Aghion and Howitt defines a period

between two successive innovations, whereby the duration of each period is stochastic. The model distinguishes between two effects. The first effect is that of creative destruction, whereby the payoff for the research conducted in the period is the prospect of monopoly rents during the next period, and whereby the rents only last until the next innovation occurs. The second effect is the general equilibrium effect that works through the wages of skilled labour, which can either be engaged for research or manufacturing activities. The functional relationship between two successive periods of research has a unique fixed point, which defines a stationary equilibrium. The stationary equilibrium is reflected in balanced growth, i.e. the allocation of skilled labour between research and manufacturing activities remains unchanged with every innovation.

The expected utility (U) from innovations (as an expression of social welfare) is defined as:

$$U = \int_0^{\infty} e^{-r\tau} \sum_{t=0}^{\infty} \Pi(t, \tau) A_t F(N - n) d\tau$$

(1)

Where:

r = constant rate of preference of time, e.g. interest rate;

τ = continuous time in innovation process;

t = denotes the interval starting with the tth innovation (with $\tau = 0$ in the case of t = 0) and ending just before the t+1 innovation;

A = parameter indicating the productivity of the intermediate (innovation) output;

N = fixed flow of skilled labour between the manufacturing and research sectors;

n = flow of skilled labour used in research;

$\Pi(t, \tau)$ = probability that there will be exactly t innovations until time τ .

Equation (1) suggests that the socially optimal level of research maximises utility (Aghion and Howitt, 1994). This conclusion can also be applied to utility created in a particular region. The aforementioned relationship indicates that utility newly generated in this way depends on several factors:

1. The length of the period between two technological innovations.
2. The probability that innovations will occur in the given region: the authors consider Poisson probability distribution that shows the number of occurrences of innovation phenomena in a certain interval, and which occur independently of one another.

3. The number of research institutions carrying out research focused on entrepreneurial innovation and residing in the region or contributing to the region, as well as the value of the achieved output in the form of cashflow.
4. The number of intermediary organisations in the region or contributing to the region (on the basis of application research, specialised agencies, or development centres owned by entrepreneurs-innovators), which transfer the results of research in applicable form to enterprises, as well as the value of the achieved output in the form of cashflow.
5. The parameter that characterises the level of technological development in the region.
6. The interest rate as time preference of the utility (a lower interest rate increases the utility of innovation because it reduces the costs of borrowing the capital required to fund innovation).

When analysing the EU's innovation policy (see for example Granieri and Renda, 2012), it can be said that Aghion and Howitt's neo-Schumpeterian model is reflected in it in the following ways:

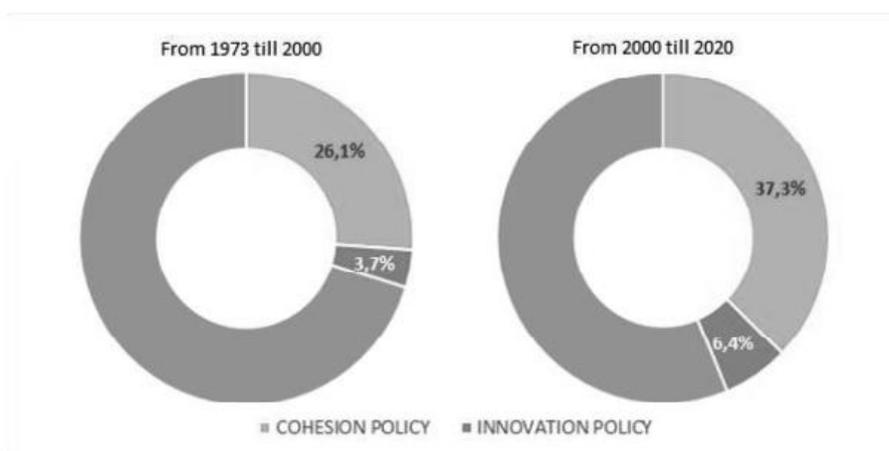
- a) through the incorporation of the foundations of the new support policy for research, development and innovation in primary European law – in the Treaty of Amsterdam of 1996, Article XVIII;
- b) through the elaboration of long-term innovation strategies as part of the Lisbon Strategy of 2000 and the Europe 2020 strategy of 2010;
- c) through the emergence of medium-term plans focused on research, development and innovation – the first were the *Action Plan for Innovation in Europe*, which was established as early as 1996, and *ETAP (Environmental Technologies Action Plan)* in 2006;
- d) through the financing of multi-annual programmes through the EU budget in support of research, development and innovation - *Framework Programmes, MAP, CIP, COSME*, etc.;
- e) through the establishment of and extension of subsidies to special institutions that support EU policies in the field of research and innovation for SMEs - *EACI (Executive Agency for Competitiveness and Innovation)* in 2007, and *EASME (Executive Agency for Small and Medium-sized Enterprises)* since 2014;
- f) through the linking of regional objectives in terms of concepts, cohesion and innovation policies - *Regional Innovation Strategies (RIS)*, which came into effect in 2000 (Henderson, 2000), and most recently *RIS3 (Regional Strategy for Smart*

Specialisation) for the period 2014–2020, and the creation of the conceptual triple-helix model;

- g) through the inclusion in operational programmes, as part of EU cohesion policy, of the objectives and activities that support innovation in the SME segment in supported convergence regions, with the aim of reducing regional disparities.

Aghion and Howitt's concept of innovation-based growth has since been incorporated into theories related to regional science, and applied to practical measures for the endogenous development of regions with the aim of reducing regional disparities. This can be seen, for example, in the work of Lundvall (2010) on the role of innovation in learning regions.

Figure 2: Share of financing for support of research, development and innovation in the EU financial frameworks for the periods before and after 2000.



Source: Adapted from European Commission 2014b

Figure 2 shows the development of the share of finances from the financial frameworks of the EU distributed towards the support of research, development and innovation in the periods before and after 2000. This watershed marks a crucial change in EU innovation policy, which was triggered on the grounds of the Lisbon Strategy. For comparative purposes, the share of EU cohesion (prior to 2007 - structural and regional) policy costs is also stated. Based on the neo-Schumpeterian theory's fundamental postulate that the innovation holder is a private entrepreneur and on the neo-institutional economic findings on the fundamental influence of institutions on economic growth, several significant contact points appeared for the linking of the EU's cohesion and innovation policies.

Discussion

From the perspective of the application of endogenous growth theories, the use of financial instruments to support innovation in small and medium-sized enterprises is highly important for reducing regional disparities. According to Aghion and Howitt's theory, which deals with the role of innovation in economic growth, such instruments do so by supporting the competitiveness of small and medium-sized enterprises. For the period 1998-2002, as part of the 5th Framework Programme, research and innovation in SMEs was financially supported to the tune of ECU 359 million under the *Innovation/SME* programme. After 2000, the financial support for research and development in SMEs was gradually separated from technological innovation support. In the 6th Framework Programme (2002–2006) the financing for research support was increased, whereby *specific activities covering a wider field of research in SMEs and cooperation* had a budget of ECU 1.3 billion. In addition, for the period 2001–2005, a specialised community programme *MAP (Multi-annual Programme for SMEs)* was newly established. This programme included modern financial instruments for the support of SMEs, such as start-up support (*ETP Start-up Scheme*), guarantee facilities (*SME Guarantee Facility*), and a special innovation fund (*Seed Capital Action*). For the financial framework period 2007–2013, the *Competitiveness and Innovation Programme (CIP)* was established. Its sub-programme, the *EIP (Entrepreneurship Innovation Programme)*, focused on supporting technological innovation in SMEs and had a budget of EUR 2.2 billion (Babjaková et al. 2014). In 2007–2013, the cohesion policy was already directly linked to private sources with the aim to finance innovation in SMEs through multiple sources. In addition to community programmes supporting innovation, the modern financial engineering instruments *JEREMIE* (European Commission 2014d) and *JASMINE* (European Commission 2014c) were established; they were financed under EU cohesion policy. The European Commission coordinated the *JEREMIE* initiative with the EIB and the European Investment Fund (European Commission 2014d). For the current financial framework period, the EU established *COSME (Competitiveness of Enterprises and Small and Medium-sized Enterprises)* to support innovation in SMEs. For the period 2014–2020, a budget of EUR 2.3 billion has been allocated for the programme's implementation (European Commission 2014a). The research activities in SMEs are financed separately through the *HORIZON 2020* community programme, which is a financial instrument under the EU policy. For this purpose, an *Industrial Leadership* pillar was set up with a budget of EUR 17 billion (Babjaková et al. 2014).

Conclusion

The neo-Schumpeterian approach to dealing with regional disparities means using the innovation potential of entrepreneurs to stimulate utility growth in a region. In a narrower sense, it is the use of economic growth factors from the implementation of innovations, or in a broader sense, the use of social capital as a contributor to the growth of utility through interactions between entrepreneurs, the general public and scientific research sectors within the so-called triple-helix model. The aim of European Union

policy after 2000 has been to achieve synergy in its cohesion policy and its support policy for research, development and innovation. The priority is to transfer the results of research, development and innovation to small and medium-sized enterprises because of their essential role in regional development. When comparing the period before 2000, when the influence of economic theories focused on exogenously conceived growth prevailed in EU strategies, it is evident that there has been a substantial increase in the concentration of European Union funds spent on financing this priority. This is reflected in the establishment of new institutions and agencies to support and mediate the transfer of scientific research results to stimulate innovation as assumed under Aghion and Howitt's neo-Schumpeterian growth theory. Although the neo-Schumpeterian innovation theory does not deal with the form of financial support for innovation at the entrepreneurial level, the analysis of the EU's regional and innovation policies in this paper clearly shows the importance of a system of public support, especially for SMEs. Due to the conservativeness of the banking system, this segment could not fully fund its innovation activities and contribute to regional development without financial support from EU funds.

References

- AGHION, P. and P. HOWITT, 1992. A Model of Growth through Creative Destruction. *Econometrica*. **60**(2), 323-351. ISSN 1468-0262.
- ARCHIBUGI, D. and A. FILIPPETTI, 2011. Innovation in times of crisis: National systems of innovation, structure, and demand. *Research Policy*. **40**(2), 179-192. ISSN 0048-7333.
- AUDRETSCH, D. and A. LINK, 2012. Entrepreneurship and innovation: public policy frameworks. *The Journal of Technology Transfer*. **37**(1), 1-17. ISSN 0893-12.
- BABJAKOVÁ, B. et al., 2014. *Financování a management inovačních programů Evropské unie*. Brno: Akademické nakladatelství CERM. ISBN 978-80-7204-905-9.
- BALDWIN, R. and CH. WYPLOSZ, 2012. *The Economics of European Integration*. Maidenhead: McGraw Hill Education. ISBN 978-0077131722.
- COOK, P. Regional Innovation Systems, Clusters, and the Knowledge Economy. *Industrial and Corporate Change*. **10**(4), 945-974. ISSN 0960-6491
- DOSI, G., G. FAGIOLO and A. ROVENTINI, 2010. Schumpeter meeting Keynes: a policy-friendly model of endogenous growth and business cycles. *Journal of Economic Dynamics and Control*. **34**(9). 1748-1767. ISSN 0165-1889.
- DOSTÁLOVÁ, Z. and P. JIŘÍČEK, 2012. 55 Years of Financing Structural and Regional Policy in the context of the Economic Development of the European Union. In: KLÍMOVÁ, V. and V. ŽÍTEK [online]. *15th International Colloquium on Regional Sciences. Conference Proceedings*. Brno: Masarykova univerzita, 2012-06-20, 128-139 [accessed 2018-04-25]. ISBN 978-80-210-5875-0. Available at: <https://munispace.muni.cz/index.php/munispace/catalog/book/65>.

EUROPEAN COMMISSION, 2014a. *COSME*. [online]. Luxembourg: Office for Official Publications of the European Communities [accessed 2018-05-02]. Available at: http://ec.europa.eu/enterprise/initiatives/cosme/index_en.htm

EUROPEAN COMMISSION, 2014b. *European Union Public Finance*. Luxembourg: Office for Official Publications of the European Communities. ISBN 978-92-79-35004-7.

EUROPEAN COMMISSION, 2014c. *JASMINE: Joint Action to Support Micro-finance Institutions in Europe* [online]. Luxembourg: Office for Official Publications of the European Communities [accessed 2018-05-02]. Available at: http://ec.europa.eu/regional_policy/en/funding/special-support-instruments/jessica/

EUROPEAN COMMISSION, 2014d. *JEREMIE: Joint European Resources for Microloans to Small and Medium Enterprises* [online]. Luxembourg: Office for Official Publications of the European Communities [accessed 2018-05-02] Available at: http://ec.europa.eu/regional_policy/en/funding/special-support-instruments/jeremie/

FAGERBERG, J., 2003. Schumpeter and the revival of evolutionary economics: an appraisal of the literature. *Journal of Evolutionary Economics*. **13**(2),125-159. ISSN 0936-9937

FRITSCH, M. and SLAVTCHEV, V. 2008. Determination of the efficiency of Regional Innovation Systems. *Regional Studies*. **45**(7), 905-918. ISSN 0034-3404

GRANIERI, M. and A. RENDA, 2012. *Innovation Law and Policy in the European Union*. Milano: Springer Verlag Italia. ISBN 978-88-470-1916-4.

HENDERSON, D., 2000. EU Regional Innovation Strategies: Regional Experimentalism in Practice? *European Urban and Regional Studies*. **7**(4), 347-358. ISSN 0936-9937.

IZSAK, K. and S. RADOŠEVIČ, 2017. EU research and innovation policies as factors of convergence or divergence after crisis. *Science and Public Policy*. **44**(2), 274-283. ISSN 0302-3427.

LUNDVALL, B. A., 2010. *National systems of innovation: towards a theory of innovation and interactive learning*. London: Anthem Press. ISBN 9780857286741.

ROMER, P., 1990. Endogenous Technological Change. *The Journal of Political Economy*, **98**(5), 71-102 [online]. Chicago: The University of Chicago Press [accessed 2018-04-25]. Available at: <http://links.jstor.org/sici?sici=0022-3808%28199010%2998%3A5%3CS71%3AETC%3E2.0.CO%3B2-8>.

WAMSER, G., C. V. NAM and A. SCHOENBERG, 2013. The Lisbon Agenda and innovation-oriented cohesion policy: A new challenge for economic integration among the EU regions. *Journal of Economic Integration*. **28**(1), 37-58. ISSN 1225-651X.

Contact address of the authors:

Ing. Petr Jiříček, Ph.D., Department of Economic Studies, College of Polytechnics Jihlava, Tolstého 16, 586 01 Jihlava, Czech Republic, e-mail: petr.jiricek@vspj.cz

Mgr. Zdeňka Dostálová, Department of Technical Studies, College of Polytechnics Jihlava, Tolstého 16, 586 01 Jihlava, Czech Republic, e-mail: dostalov@vspj.cz

JIŘÍČEK, P. and Z. DOSTÁLOVÁ, 2018. Financing Innovation, Neo-Schumpeterian Theory and the Reduction of Regional Disparities in the European Union. *Littera Scripta* [online]. České Budějovice: Institute of Technology and Business in České Budějovice, **11**(2), 95-105 [accessed: 2018-12-20]. ISSN 1805-9112. Available at: http://journals.vstecb.cz/category/littera-scripta/11-rocnik-2018/2_2018/.