DEVELOPMENT PATHS OF MORE- AND LESS-DEVELOPED EUROPEAN REGIONS IN THE 21ST CENTURY

Korneliusz Pylak – Elżbieta Wojnicka-Sycz

Abstract

The aim of this paper is to determine the development paths of more- and less-developed regions in the European Union in the 21st century. Based on the literature review, we characterised development paths through different economic and social indicators, particularly those related to innovativeness. We hypothesized that specific factors support growth in regions, but these factors differ according to the level of regional development. The results indicate that less-developed regions with high growth rates are characterised by very positive changes in the intensity of high-tech industries, the level of education of the society as a whole and the level of employment in science and technology as well as by fixed assets in manufacturing industries that may indicate increases in technology transfer. Relatively higher increases in employment in medium-high-tech and low-tech industries and knowledge-intensive services characterise more-developed regions with high growth rates. In both less- and more-developed regions with high growth rates, an increase in the share of research and development in GDP was observed, as was an increase in the rate of the employment of women. Therefore, we confirmed that factors inducing growth in various regions differ.

Key words: development path, less-developed regions, more-developed regions, regional development

JEL Code: O21, O31, R11

Introduction

The growth rate of regions has always been uneven, and the gap between regional development levels has increased in size in both the past (Allen, 2011) and the present (De Dominicis, 2014). Therefore, evolutionary and institutional economic geographers and geographical political economists are still pursuing a better understanding of the evolution of different regions' development paths (Martin & Sunley, 2015). Various scientific studies

reveal distinct differences in the characteristics of development paths between regions and countries (Zukauskaite & Moodysson, 2016). Thus, the aim of the paper is to determine the development paths of more- and less-developed regions in the European Union in the 21st century and find differences in factors influencing growth. The paper is structured as follows: After the introduction in the first section, the second section explores and clarifies the theoretical background of development paths. The third section lays out the empirical design of the research, including the general approach, hypotheses and data and measurement. The fourth section presents and discusses the empirical results of the analysis regarding the comparison of different development paths and the factors influencing growth in these paths. The fifth section offers a conclusion.

1 Characterisation of development paths

Different variables can characterise development paths. The crucial variables relate to innovativeness, as Schumpeter (1934) described the impact of technical progress caused by innovative entrepreneurs on regional growth. Solow (1988) indicated the role of exogenous technological progress in maintaining long-term growth. Thus, regional development is a place-based phenomenon (Boschma, 2015), since the absorption of knowledge from better-developed areas was discovered to be a foundation for different growth processes (Capello & Nijkamp, 2009; Wojnicka-Sycz, 2013). However, regional absorption ability depends on human capital advancement, learning skills and new knowledge exploitation possibilities (Lucas, 1988; Romer, 1986), and thus in less-developed regions, endogenous potential for growth is usually not sufficient to achieve a high level of development (Pylak & Majerek, 2014a).

Based on the literature review, we characterised development paths through different economic and social indicators, particularly those related to innovativeness. These indicators refer to the structure of the economy as it relates to knowledge intensity and sectors, the gender division of the labour market, employment in science and technology, unemployment and compensation level, the structure of research and development (R&D) expenditure, patent applications related to knowledge intensity, fixed capital expenditure, gross value added and gross domestic product (GDP) level. This set of indicators covers not only regional absorption

potential but also the availability, creation, absorption and diffusion of knowledge in the region (Pylak & Majerek, 2014b).

2 Research design

2.1 General approach

This present situation has inspired us to take a more in-depth look at the development paths in different regions. We divided regions into four groups: less-developed with high GDP growth (LDGR), more-developed with high GDP growth (MDGR), less-developed with a constant GDP (LDCO) and more-developed with a constant GDP (MRCO). Subsequently, we analysed the differences in a number of variables and their levels in the periods 1994–2000 and 2011–2014 in the two groups of regions with strong growth (determined by an increase in the ranking of regions according to GDP per capita in purchasing power standard (PPS) of at least 10 positions). These two groups are: the weak group with GDP per capita below median in 2000 (18,300 PPS) and the strong group with GDP per capita over median (18,300 PPS).

2.2 Hypothesis

Previous findings have revealed factors influencing growth in regions with different levels of development (see for example: Pylak & Majerek, 2014a; Pylak & Majerek, 2014b). These factors were related to innovativeness and absorption potential. However, they were not related to growth per se; thus it is extremely important to analyse less- and more-developed regions that are experiencing high levels of growth. Such analysis will separate the impact of regional potential on the success of the development process from factors influencing growth regardless of the regional environment. Nevertheless, factors influencing growth may refer to absorption potential as well and differ regarding the level of regional development. Therefore, we may hypothesize that there are specific factors supporting growth in regions but that they differ according to the level of regional development and growth rate. If the hypothesis is confirmed, we could create recommendations for policymakers regarding which factors they should enhance in different regions to accelerate growth.

2.3 Data and measurement

We used available Eurostat data standardized according to the distance to benchmark method from 1994 to 2014 for regions at the second level of the Nomenclature of Units for Territorial Statistics (NUTS2) to determine which variables in each group of regions are statistically significantly and thus which factors cause high growth and if they differ in more- and less-developed regions. We applied a t-test, which is commonly used to determine if two data sets are significantly different. The data was standardized using equation 1. Standardization means expressing a value in terms of the maximum distance from the benchmark, as all of the analysed variables were stimulants.

$$x_i = 1 - \frac{(-1)(z_i - max_z)}{(max_z - min_{z)}} \quad (1)$$

In this equation, x_i is the standardized variable, z_i is the original value of the variable *z* for *i* region and max_z / min_z is the maximum/minimum value of variable *z* for all analysed regions. The standardized variable shows the relative position of *i* region concerning variable *z* within the scale, in which 1 is the best and 0 is the worst. The standardization is useful for showing changes in the relative position of a region in two periods and also allows for a comparison of the relative position of a region (the distance from the benchmark) in terms of different variables.

The analysis of the change in distances from the benchmark in each group of regions was used to indicate factors influencing growth in different development paths. The changes were calculated between the beginning and the end of the time period. The analysis was conducted for two groups, LDGR and MDGR, which are the most important to the aim of the research. Factors influencing growth were assigned to the group if the change in the value of the given factor relative to the benchmark was statistically significant.

3 Empirical results

3.1 Comparison of the groups of regions

The most significant differences in groups were observed in regions with high growth levels, whether they were more- or less-developed. In addition, these groups are the most interesting when it comes to shaping regional development policies. The comparison of the LDGR and

MDGR groups (see Tab. 1) shows that in 1994 the share of employment in high-tech industries in the LDGR group was lower than in the MDGR group, but in 2013 the share in both groups was similar. In contrast, in 1994 the share of employment in medium-high-tech industries was approximately equal in both groups. However, in 2013 the share was significantly higher in the MDGR than in the LDGR group.

In 1994 the share of employment in medium-low-tech industries was significantly higher in the LDGR group than in the MDGR group, but until 2013 the MDGR group significantly increased its share of these industries, when its share equalled that of the LDGR group. In the 1994–2013 timespan, the LDGR group was changing its innovation model to include a greater involvement of technology-intensive industries, and regions in the MDGR group started to base structure of their economies on less technology-intensive industries to a greater extent. Nevertheless, the MDGR regions started to use more and more new technologies even in medium-high- and medium-low-tech industries and thus changed their knowledge intensity and perception of these industries. The share of employment in services in both groups is similar; however, the LDGR group had a significantly higher share of less knowledge-intensive market services than the MDGR group.

In analysed period (1994–2014), the MDGR group was characterised by a greater share of people with higher education, more people employed in science and technology, more women employed and a greater number of patent applications to the European Patent Office (EPO) per million inhabitants than the LDGR group. In turn, LDGR group was characterised by a greater unemployment rate (although it declined more significantly in the analysed period than in the MDGR group), a lower share of intramural R&D expenditures in the business enterprise sector of total R&D expenditures (although this share significantly increased in the analysed period) and a greater share of R&D expenditure in the government sector, lower productivity, lower GDP per capita and lower compensation than in the MDGR group, although we can observe a convergence of the levels of these variables in both groups.

Tab. 1: Average values of variables describing development paths of LDGR and MDGR regions

Variable	Year	LDGR average [17]	MDGR average [27]	*p*
Share of employment in high-tech industries as a percentage of total employment	1994	0.96	1.44	**
	2013	1.3	1.49	·
Share of employment in medium-high-tech industries as a percentage of total employment	1994	4.27	5.34	·
	2013	4.26	7.8	**
Share of employment in medium-low- and low-tech industries as a percentage of total employment	1994	11.77	6.89	**
	2013	10.31	10.71	·
Share of employment in other knowledge-intensive services as a percentage of total employment	1994	15.77	14.1	·
	2013	26.21	27.94	·
Share of employment in less-knowledge-intensive services as a percentage of total employment	1994	19.95	12.35	**
	2013	28.3	26	**
Share of persons employed in science and technology as a percentage of total active population (HRSTO)	1999	24.02	27.76	**
	2013	30.89	34.91	**
Share of women employed as a percentage of total employment	1999	54.81	56.44	·
	2014	63.61	67.42	**
Compensation in euro per employee	2000	15,206.18	25,569.26	**
	2011	23,830.66	31,912.48	**
Reverse unemployment rate	1999	–12.86	–7.11	**
	2014	–9.84	–5.66	**
Reverse long-term unemployment rate	1999	–49.4	–44.2	·
	2014	–47.08	–38.61	**
Share of intramural R&D expenditure in the business enterprise sector as a percentage of GDP (BERD)	2000	40.92	68	**
	2011	47.38	67.36	**
Patent applications to the EPO per million inhabitants	2000	39.43	196.48	**
	2010	24.11	126.74	**
GDP per capita in purchasing power standard (PPS)	2000	13,735.29	21,314.81	**
	2011	22,594.12	30,677.78	**
Gross value added at basic prices in euro per employee in manufacturing	2000	29,541.77	50,897.29	**
	2011	52,399.27	78,870.84	**
Gross value added at basic prices in euro per employee in wholesale and retail trade	2000	21,114.10	31,631.86	**
	2011	33,390.88	42,413.99	**
GDP growth per inhabitant		171.78	143.75	**

Note: *p* stands for significance of differences between group averages, ** – significance at the 0.05 level, · – lack of statistically significant differences between averages. Numbers in brackets indicate the number of regions in each group.

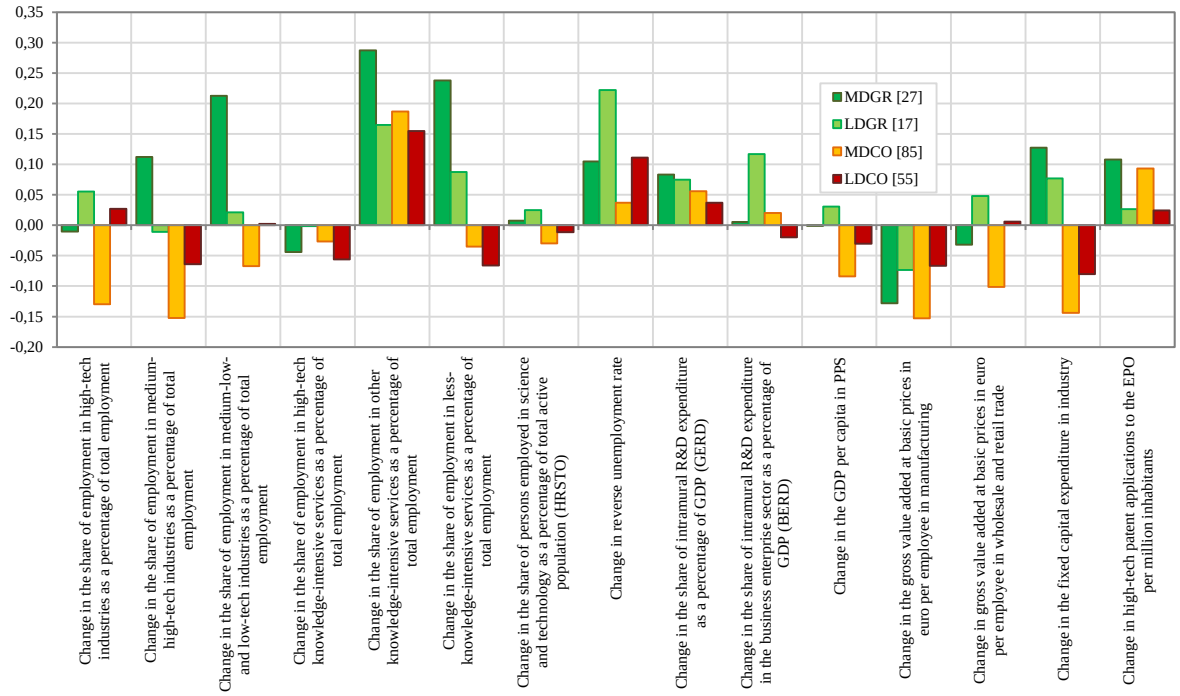
Source: own estimation based on the Eurostat data.

The analysis shows that the increase in GDP in the LDGR regions was mainly caused by the development of new technologies in both the manufacturing and the service industries, as well as the development of market services. In addition, these regions increased expenditures on R&D and the business share in total R&D expenditure compared to the LDCO and MDCO groups. However, in 1994 the LDGR regions already had high levels of indicators, such as percentage of people with higher education and persons employed in science and technology (HRSTO) compared to other less-developed regions (the LDCO group). Therefore, the strongest growth can be observed in less-developed regions, which in 1994 were relatively more efficient and better equipped with the resources necessary for developing their innovation systems. There were no significant differences in levels and changes in employment density or entrepreneurship between the regions in the LDGR and MDGR groups.

3.2 Factors influencing growth in different development paths

The analysis of standardized values revealed the factors influencing growth in the LDGR and MDGR groups. These factors derive from the change of standardized variable averages referring to benchmark in the end of the time period compared to the beginning of the period broken down by groups of regions. The findings are presented on Fig. 1.

Fig. 1: The change in standardized variable averages over time by groups of regions



Source: own estimation based on the Eurostat data.

The most distinctive features of the LDGR group (see Tab. 2) are positive changes in employment in high-tech manufacturing, high-tech services and science and technology, as well as in the level of people education. Furthermore, this group of regions stood out in terms of increasing fixed asset investments in the manufacturing industries, which usually involves transfer of technology and thus reflects improvement in the innovativeness level. Moreover, in the LDGR group, the process of de-industrialization was weaker than in more-developed regions, yet we can still observe increased productivity in wholesale and retail trade (added value per employee). Both the LDGR and the MDGR groups experienced an intensification in R&D activities, especially as financed by the business sector. As far as the MDGR group is concerned (see Tab. 2), the huge growth rate seems to be caused mainly by innovative efforts, industrialisation and widespread R&D, which fuelled not only high-tech but also more traditional industries and resulted in growth in GDP, compensation and employment.

Tab. 2: Factors influencing growth in LDGR and MDGR regions

Less-developed region experiencing high growth	More-developed region experiencing high growth
The biggest relative growth of variables concerned: • the share of people with higher education • the share of employment in high-tech manufacturing • the share of employment in science and technology among the active population • the reverse unemployment rate • the share of R&D expenditure in GDP • the share of business R&D expenditures in total R&D • GDP per capita • added value in wholesale and retail trade per employee Huge relative growth of variables (albeit to a lesser extent than in the MDGR group) concerned: • the share of employment in less-knowledge-intensive services • outlays on fixed assets in the manufacturing industries, which means technology has been transferred to the industry Remaining on the high level compared to the benchmark concerned the share of employment in high-tech services (while other groups distanced themselves from the benchmark) The weakest convergence to the benchmark (not counting the LDCO group) concerned the value added per person employed in manufacturing and construction.	The biggest convergence to the benchmark concerned: • the share of employment in medium-high-tech industries • the share of employment in medium-low- and low-tech industries • the share of employment in other knowledge-intensive services • the share of employment in less knowledge-intensive services • fixed capital expenditures per person employed, which reflects technology transfer in industry • the share of R&D in GDP and high-tech European patent applications, which means these regions are strong in terms of innovativeness and are still growing

Source: own estimation based on the Eurostat data.

Conclusion

We analysed the development paths of more- and less-developed regions that experienced a strong increase in GDP per capita in PPS in the 1994–2014 timespan. However, less-developed regions had significantly stronger GDP growth than did more-developed regions. The factors influencing growth in less-developed regions (LDGR) included positive changes

in the intensity of high-tech industries, the level of education of the society as a whole and the level of employment in science and technology as well as an increase in fixed assets in manufacturing industries that may indicate intensification of technology transfer. However, strengthening high-tech manufacturing in less-developed regions is not always successful (Pylak & Majerek, 2014a) and has to be supported by the development of human capital and R&D, which influence growth in such regions (Pylak & Majerek, 2014b).

More-developed regions with strong growth (MDGR) experienced statistically higher increases in employment share in medium- and low-tech industries, as well as in other knowledge-intensive services. These regions were also characterised by a stronger increase in high-tech European patent applications. In addition, productivity in manufacturing remained higher than in less-developed regions with strong growth (LDGR), but relative differences became much smaller due to the stronger growth of productivity in the LDGR group. In both groups of regions (LDGR and MDGR), an increase in the share of R&D expenditures in GDP was observed, which confirms the findings of previous studies (Pylak & Majerek, 2014b) and impact of this variable on regional growth, as does the increase in the rate of employed women.

The results also show that increases in innovativeness and industrialisation or less-intensive deindustrialisation were the main sources of GDP growth in regions with high growth rates, but the industries themselves differed in LDGR and MDGR regions. Therefore, we confirmed that factors inducing growth in more- and less-developed regions differ. Clearly, regional development policies have to be tailored to regional potential, and regional authorities should implement different development paths, as discussed in this paper.

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References

Allen, R. C. (2011). *Global economic history: A very short introduction*. New York: Oxford University Press.

Boschma, R. (2015). Towards an evolutionary perspective on regional resilience. *Regional Studies, 49*(5), 733–751. doi:10.1080/00343404.2014.959481

Capello, R., & Nijkamp, P. (2009). *Handbook of regional growth and development theories*. Cheltenham: Edward Elgar.

De Dominicis, L. (2014). Inequality and growth in European regions: Towards a place-based approach. *Spatial Economic Analysis, 9*(2), 120–141. doi:10.1080/17421772.2014.891157

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*(1), 3–42. doi:10.1016/0304-3932(88)90168-7

Martin, R., & Sunley, P. (2015). Towards a developmental turn in evolutionary economic geography? *Regional Studies, 49*(5), 712–732. doi:10.1080/00343404.2014.899431

Pylak, K., & Majerek, D. (2014a). Regional context in technology transfer and patents inducing growth: Structural models for more- and less-developed regions. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI2014 Proceedings. 7th International Conference of Education, Research and Innovation* (pp. 5735–5745). Seville, Spain: IATED Academy.

Pylak, K., & Majerek, D. (2014b). Why should support for innovative processes differ regionally? Are less developed regions so different? In P. T. Löster T. (Ed.), *8th International Days of Statistics and Economics. Conference Proceedings* (pp. 1254–1264). Prague: Libuše Macáková, Melandrium.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy, 94*(5), 1002–1037.

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press.

Solow, R. M. (1988). Growth theory and after. *The American Economic Review, 78*(3), 307–317. doi:10.2307/1809135

Wojnicka-Sycz, E. (2013). Growth pole theory as a concept based on innovation activity development and knowledge diffusion. *Research on Enterprise in Modern Economy Theory and Practice, 2013*, 17–33.

Zukauskaite, E., & Moodysson, J. (2016). Multiple paths of development: Knowledge bases and institutional characteristics of the Swedish food sector. *European Planning Studies, 24*(3), 589–606. doi:10.1080/09654313.2015.1092502

Contact

Korneliusz Pylak
Lublin University of Technology
Nadbystrzycka 38D St., 20–618 Lublin, Poland
korneliusz.pylak@pollub.pl

Elżbieta Wojnicka-Sycz
Gdansk University and Gdansk University of Technology
Bażyńskiego 8 St., 80–309 Gdańsk, Poland
elzbieta.wojnicka-sycz@ug.edu.pl