

# MEASURES OF LEARNING REGIONS

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**Abstract:** *In the paper the importance of regional innovation systems and learning regions in regional development is discussed. The basic notions of regional innovation systems and learning regions are presented. The indicators are proposed for the measurement of learning regions' characteristics. Additional input variables (social inclusion and social capita) are proposed compared to previous studies. Moreover, the other characteristics of learning region are quantified using economic, R&D, and educational indicators. The selected indicators are presented by means of geographic information systems.*

**Keywords:** *Learning regions, research and development, regional innovation systems, measures.*

## 1. Introduction

The concept of regional policy, based on endogenous growth theory and linear model of innovation, lies primarily in the growth of public expenditure on R&D and investment in education [19]. By contrast, institutional approaches are primarily concerned with the institutional aspects of the process of learning and making innovations. Learning ability and innovations making are considered key factors of the regional development in institutional economics. The basis of these concepts lies in the observation that innovations do not arise in isolation of one company, but the potential of their creation is related to the process of learning determined with the relationship of the company and its environment [4]. The environment is considered as a network of relationships among firms and among firms and institutions, as well as a general framework for company operations, i.e. the institutional structure, social values and culture of political and economic relationship between the state and the region in which the firm is embedded. Thus, internal organization of firms, their rooting in the network of formal and informal relationships among themselves as well as the existence of supporting institutions, and the overall socio-cultural environment of the region are important factors for the innovation potential and the learning capacity of firms. The complex defined this way is known as a regional innovation system (RIS) or learning region [12]. Previous studies have been focused on identifying RIS primarily by economic, R&D and educational indicators. However, other factors such as social and cultural capital and infrastructure were not considered. The values of selected variables represented inputs into the models based on statistical methods in previous studies. These methods, however, are constrained with many requirements which are difficult to meet in praxis.

The aim of this study is a proposal input variables for the identification of learning regions. The variables concern following characteristics of regions: economy, R&D, education, and social inclusion and social capital.

The work is structured as follows. First learning region is defined. Then an overview of previous studies in the identification of RIS and learning regions is provided. Furthermore, the

methods used for the modeling are characterized. On the basis of learning regions characteristics the input variables are designed for their identification.

## 2. Learning Regions Characteristics

The competitiveness of modern organization is based on knowledge. The concept of learning region, in this context, shows the way how to mobilize and then use the potentials of all the regional actors for regional development "bottom-up". The model of learning region assumes that regional actors will organize themselves autonomously, and that they take the integral responsibility for regional development [20]. In the field of regional development, tools and policies are searched to ensure economic growth and development [34]. In this context, concepts are discussed such as regional clusters, regional innovation systems, regional innovation networks and learning regions which are attributes of successful development of a number of economies [28,29,30]. These concepts can be represented using hierarchical structure as shown in Tab. 1.

**Tab. 1: Stages of development of regional cooperation**

Regional cluster	The concentration of interconnected companies of the same or related industries in a small geographic area.
Regional innovation network	Widely organized cooperation (on the basis of agreements) between firms, stimulated by trust, norms and conventions.
Regional innovation system	Cooperation between companies and institutions in the development and dissemination of knowledge in innovation processes.
Learning region	Widely organized cooperation of a broader range of civic organizations, companies, institutions and public authorities, which are embedded in social and regional structures.

*Source: [33]*

The theory of learning regions is based on the idea that regional development depends on positive feedbacks in the field of learning especially. Learning regions are formed by companies, institutions and RISs.

Participants are included in interactive learning in RISs. Actors closely cooperate at the institutional level in the preparation and implementation of regional innovation strategies. Regional innovation systems are constituted as a combination of collective political decisions and local bottom-up activities. The creation of regional development coalitions has strategic importance. Regional development coalitions are long-term models of multilateral cooperation to promote innovation including partners such as local trade unions, economic chambers, venture capital, educational organizations, research institutes and local and regional authorities.

Kulhánek [23] warns of the definition of learning regions in the strict sense of the word, namely as broad activities for the benefit of life-long learning and networking of educational capacities of regions. Therefore, it is more suitable to define learning region as a lasting and

continuous investment pointing the integration of all regional subsystems and institutions into the functional process of mutual learning and innovation in the long term [23].

The most relevant characteristics of learning regions can be defined as follows [22]:

- Existence of the higher number of regional actors (municipalities, towns and cities, enterprises, firms, NGOs etc.). Their interactions can facilitate the exchange of information and new ideas.
- Existence of consulting, R&D institutions and transfer centres that cooperate with the other regional actors.
- Regional culture and institutions. This category is the most problematic one since it is hardly possible to stipulate normatively, what should be the character of the culture and the institutions in the region in order to maximize its capacity to learn and to innovate.

Learning regions function as collectors and repositories of knowledge and ideas, and provide the underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning [15]. Learning regions are increasingly important sources of innovation and economic growth, and are vehicles for globalization [16]. Key processes of learning regions can be divided into 3 categories [23]:

- The generation and improvement of the level of know-how at the individual, organisational and regional level.
- The cooperation between regional subjects and diffusion of human capital and know-how in organizations and between organizations.
- The transfer of human capital and the new know-how into practice. In terms of the regional output or economy it means growth of GDP and employment, a higher quality of services, and welfare in the region.

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Complex relations among subjects within regions result in the fact that learning regions were largely based on case studies so far [23,27]. Another problem in identifying learning regions is related to different approaches to their definition. One is represented by [10] where only Silicon Valley, Emilia-Romagna, and Baden-Württemberg are regarded as actual learning regions. Similarly, in [21] it is indicated that the characteristics of learning region are not met in any region. The alternative approach presented in [13] points to the fact that all regions have some elements of learning regions, they dispose of learning systems respectively. Clearly, it depends on the definition of conditions the region has to meet to be considered as a learning region. Only the synergic effect, resulting from the compliance of all defined requirements, makes growing competitiveness, social inclusion and economic growth possible in these regions.

In [37] four characteristics are defined which are typical for learning regions and, therefore, they can be used to differentiate them from other regions. These characteristics include:

1. Sustainable economic growth coupled with an increase in employment-intensive skills;
2. Social inclusion and social capital formation;

3. Role of different educational strategies for promoting learning regions;
4. An integrated approach to achieve "good governance".

### **3. Identification of Learning Regions in the EU**

In the literature, it is possible to find several studies analyzing RISs in European regions [1]. Indicators considering social inclusion and social capital were not included in these studies. Despite of this fact, I will present the overview of the mentioned studies as they preserve most of the information useful for learning regions identification.

There have been two approaches for obtaining a RIS typology [1]. The first one deals with authors who used case studies in order to test previous conceptual works. Complex relations among subjects within regions justify this approach. The main objective of these studies is to understand how regional innovation systems function, to specify desirable factors and mechanisms for promoting competitiveness and innovation, and to assess the implications for policy [27]. These studies provide a state-of-the-art review with respect to conceptual clarification and application vis-a-vis regional innovation systems, in particular focusing on the impact of different types of regional innovation systems in different countries. It is important, analytically as well as politically, to distinguish between different types of RISs.

Cooke [9] combined three types of RIS governance (grassroots, network, and interventionist) with other three dimensions of entrepreneurial innovation (localist, interactive and globalised). A typology of 9 groups of RISs has been obtained. Asheim [2] distinguishes between three types of RISs: territorially embedded, regionally networked and regionalised nationals. The first type is represented by a territorially embedded regional innovation network, where firms base their innovation activity mainly on localised learning processes stimulated by geographical, social and cultural proximity without much interactions with knowledge organisations. The innovation networks may be further developed into regional networked innovation systems. The firms and organisations are still embedded in a specific region. The networked system is regarded as a regional cluster of firms surrounded by a local 'supporting' institutional infrastructure. Regionalised national innovation system stands for the third type of RIS. Industrial branches and the institutional infrastructure are more functionally integrated in national or international innovation systems. The cooperation of the main actors is conducted in order to develop more radical innovations with the use of scientific, formal knowledge. While the networked innovation system represents an endogenous development model, the regionalised national innovation system represents an exogenous development model.

Tödting and Trippl [36] classify regions in peripheral, mature industrial and metropolitan regions. The second way to create RIS taxonomies is realized using statistical analysis for a set of regions.

Within the EURODITE project [6] a set of indicators for learning regions' analysis at NUTS 2 level. This set involves the following areas: science (number of publications, public R&D expenditures), technology (patents, private R&D expenditures, share of researchers), education (number and share of students, tertiary students, life-long learning) and performance (GDP, unemployment, long-term unemployment). Moreover, specialization and performance of selected sectors were measured to provide additional information. This report presents the typology of European regions according to their involvement in the knowledge economy. The analysis was, however, not realized for all European regions. For each area (science, technology, etc.) regional profiles were found. Finally, the correlations between these areas were studied and the results show that there can be recognized following regional profiles

concerning knowledge economy: Metropolitan regions, North high-tech regions, North scientific regions, British services profile, German high industrial profile, Secondary metropolitan profile, North industrial regions, North Italian and Spanish Industrial Regions and French agro-industrial profile.

Further, Clarysse and Mulder [7] found 6 groups of EU regions considering their GDP, unemployment, R&D expenditures, and patents. Similar variables were studied also by [5] with similar results (6 groups – very strong position in knowledge services..., staying behind). In [14] 5 types of regions were discovered based on their innovation potential (lack of capacity, average capacity, rich innovation, rich R&D, and knowledge centres). In [18], indicators from science and education were used for a hierarchical cluster analysis. The results showed that there are 12 groups of regions according to innovation performance in the EU (NUTS 1 and NUTS 2). A large set of 29 variables (including national environment, regional environment, innovative companies, universities, public administration, and demand) was used by [24] resulting in 10 groups of regions.

In [25], the authors studied new EU member states using 25 variables (5 areas – knowledge creation, knowledge absorption, diffusion of knowledge, demand of knowledge and governance). The results of factorial analysis showed 5 specific groups, i.e. capitals, with tertiary growth potential, qualified manufacturing platforms, with industrial challenges, agricultural laggards. New member states were also studied by [1]. Patents, R&D expenditure, employment, education, and economic performance were included in the analysis. The features of the three groups were summarised in the following titles: Regions with a weak economic and technological performance, Restructuring industrial regions with strong weaknesses and Capital-regions specialized in high value-added services. An extension for the EU-25 was published in [26]. For the whole EU, 7 types of regions were recognized including Restructuring industrial regions with strong weaknesses, Regions with a weak economic and technological development, Regions with average economic and technological performance, Advanced regions with a certain industrial specialisation, Innovative regions with a high level of economic and technological development, Capital-regions with a certain specialisation in high value-added services, and Innovative capital-regions specialised in high value-added services.

Recently, we conducted our research with the objective to identify learning regions [17] in the EU. However, we have been unable to involve all the characteristics of learning regions through the selected input variables. It will be necessary to include appropriate social and cultural capital proxies in these input variables in order to achieve the desired outcomes.

At the level of NUTS 3 regions different indicators are monitored in different EU countries. So, innovative potential of regions, e.g. [38], was analyzed at national level in the literature.

#### **4. Quantification of Learning Regions' Characteristics**

Based on presented facts I propose a set of 15 indicators for the measuring of learning regions covering the following categories: economy, R&D, education, and social capital and social inclusion, Tab. 2.

The first three indicators were selected to reflect the socio-economic characteristics of a region. They include indicators such as per capita GDP, which can be considered as proxies of the stock of knowledge of a country [3,32] and the degree of sophistication of its demand [25]. As Stern, Porter, and Furman [35] mention, GDP per capita measure the overall state of a

country's technological development. The employment rate is proxy of the "social filters" of a region and of the regional ability to transform R&D into innovation and economic growth [32,11].

In addition to these socio-economic indicators, I present also the indicators linked to R&D. Indicators on expenditure on R&D and patents, as in most other studies, are included as proxies for knowledge creation. I distinguish between public and private R&D, as they may carry out different types of research. It is expected that R&D investment has a positive effect on the level of innovation. However, the impact on innovation in general, and patents in particular, may follow different trends according to the sector undertaking the investment [3]. The results obtained by [3] indicate that R&D investment, as a whole, and higher education R&D investment in peripheral regions of the EU, in particular, are positively associated with innovation. The existence and strength of this association are, however, contingent upon region-specific socio-economic characteristics, which affect the capacity of each region to transform R&D investment into innovation and, eventually, innovation into economic growth [3]. Innovation can be quantified to some extent the expenditure on R&D (both public and private) and the proportion of employees in R&D. The number of patents serves as a measure of technological development. Moreover, the number of patents represents a proxy of the innovation capacity in a given region and evaluates the productivity of investments in R&D. The value of R&D intensity shows the relative effort of a region to create, disseminate, and exploit knowledge, and it is thus meant to be the main input in the knowledge production function [3].

**Tab. 2: The design of learning regions' measures**

<b>Economy</b>	
x <sub>1</sub>	Regional GDP per capita
x <sub>2</sub>	Real growth rate of regional GDP
x <sub>3</sub>	Employment rate
<b>R&amp;D</b>	
x <sub>4</sub>	Patent applications per capita
x <sub>5</sub>	Public R&D expenditure
x <sub>6</sub>	Private R&D expenditure
x <sub>7</sub>	R&D employment
x <sub>8</sub>	Employment in High-Tech industries
<b>Education</b>	
x <sub>9</sub>	Population with secondary education
x <sub>10</sub>	Population with tertiary education
x <sub>11</sub>	Participation in life-long learning
x <sub>12</sub>	Regular internet users
<b>Social inclusion and social capital</b>	

x <sub>13</sub>	Long-term unemployment share
x <sub>14</sub>	Disposable income of households
x <sub>15</sub>	Crude death rate caused by assault

My study also introduces indicators to proxy the knowledge and technological absorptive capacity of a region. The four indicators related to education and human resources in science and technology virtually match those included in the European Innovation Scoreboard 2006, and distinguish, the same as [14], between general education and the qualification of human resources linked to R&D activities. Proportion of population with tertiary education is another important variable while technical skills are usually distinguished from the academic. It is also important to take into account qualitative parameters such as the readiness of people to a change and further education. This analysis adopts a measure of educational attainment as a proxy of the level of skills. The higher the level of attainment, the greater the skills in a society and, therefore, the greater its capacity to transform R&D into innovation. This study uses the share of the adult population that has attained secondary education as a proxy to denote the skills in a region. The use of the Internet for learning is compelling for students of all ages. The internet facilitates inter-connectiveness between students and knowledge sources in other ways. Combined with other digital technologies, the Internet gives a major boosts to lifelong strategies and facilitates the home schooling movement as well [8].

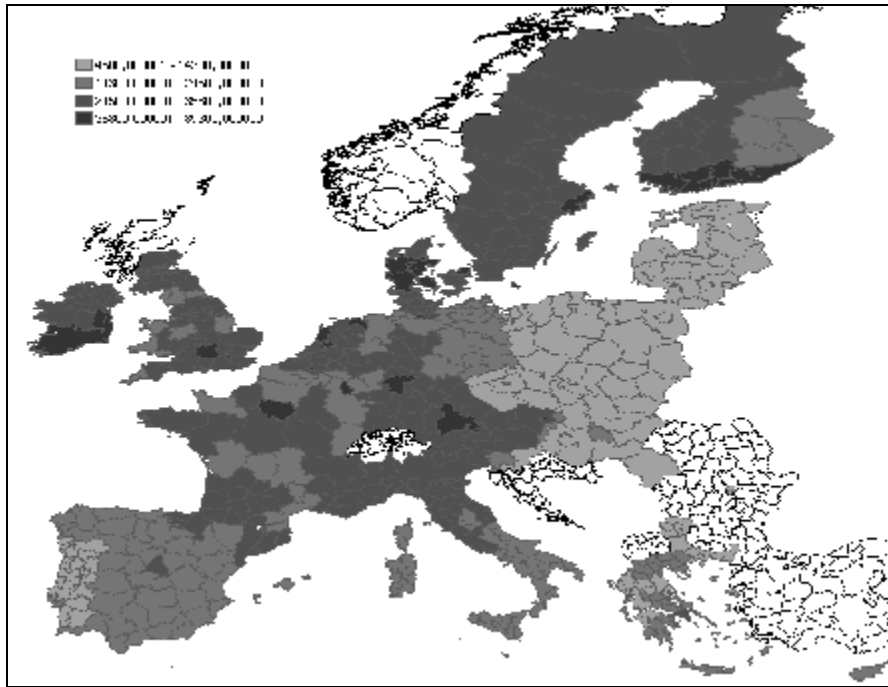
Social inclusion and social capital can be measured in several ways, e.g. by the crime rate or the participation of people in voluntary associations. A higher disposable income of households and a lower long-term unemployment rate have also shown to be positively correlated with social capital measures in prior studies, e.g. [31].

The examples of the selected measures of learning regions are presented in Fig. 1 – Fig. 4 for NUTS II and NUTS III regions of the EU in the year 2006. GDP per capita is positively correlated with the number of patent applications per capita. A high share of population with secondary education is located in central, eastern, and northern EU regions, while a high long-term unemployment share prevails in central, eastern, and south-eastern EU regions.

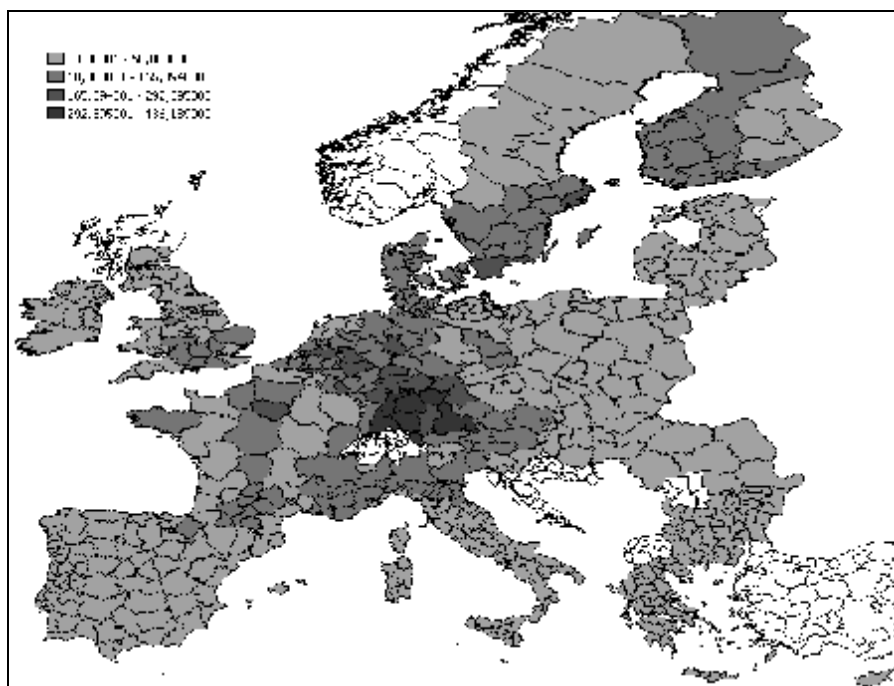
## 5. Conclusion

In this paper I discussed the importance of learning regions and the methods for their identification. In the field of regional development, tools and policies are searched to ensure economic growth and development. In this context, concepts are discussed such as regional clusters, RISs, regional innovation networks and learning regions which are attributes of successful development of a number of economies.

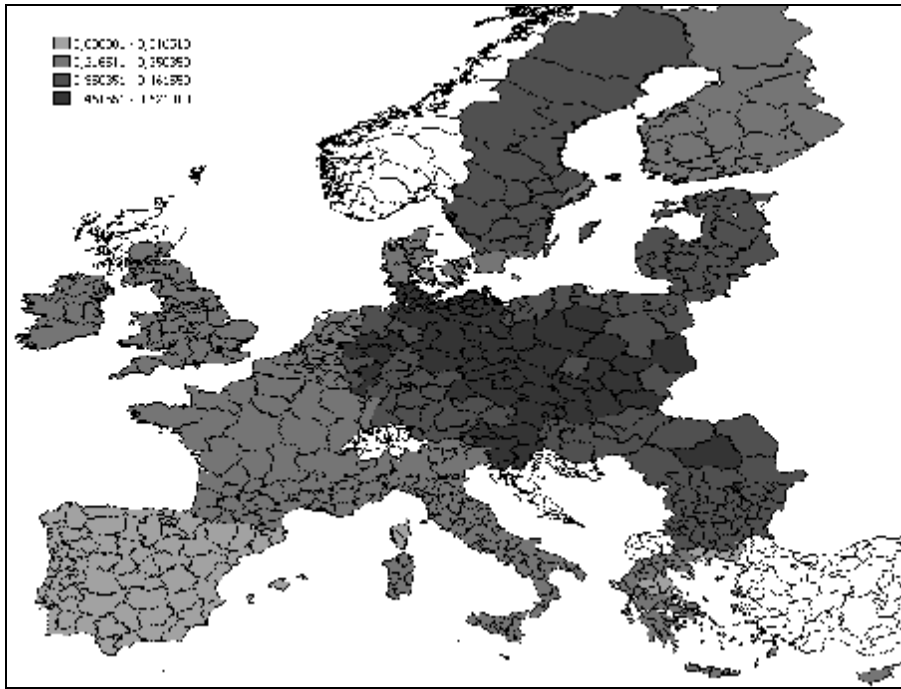
In the literature, it is possible to find several studies analyzing RIS in European regions. Following the discussion on previous research, a design of measures for the quantification of learning regions' characteristics was realized. Moreover, slightly different indicatorss are used in my study when compared to prior studies. I included additional indicators like social capital and social inclusion. In future research I will use statistical methods to analyze the data collected for the EU regions.



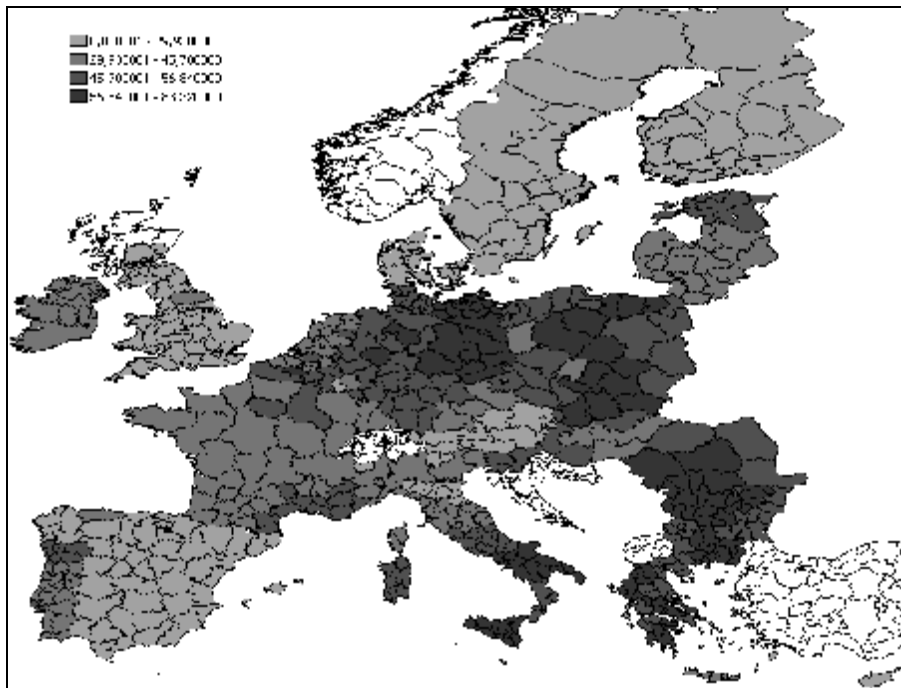
*Fig. 1: GDP per capita in 2006*



*Fig. 2: Patent applications per capita in 2006*



*Fig. 3: Population with secondary education in 2006*



*Fig. 4: Long-term unemployment share in 2006*

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