
Education as a Precondition in Knowledge Economy

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Abstract

Man equipped with knowledge acquired in life-time education is a bearer of a creative process in science, which generates new knowledge and in applied research and development that transform knowledge into innovated products and services. Knowledge economy requires a permanently learning society in which each individual person will create their qualification in accordance with changing needs of society. The life-time jobs typical for industrial age cease to exist. In the paper we outline the characteristic of major features of education in the Slovak regions and point out the relation between education and knowledge. The existence of this relationship is also presented on the example of the Polish regions.

Key words: education, knowledge, regional dimension of education, empirical example

JEL Classification: I21, I29

1 The lead - in

In the EU in the course of ten years approximately 80% of technologies become obsolete. Consequently around 7% of jobs were discontinued and approximately the same number of new jobs was created.

The most significant intellectual asset from the aspect of the value-formation process is explicitly the human capital. In knowledge-based economy at the beginning of every process people are bringing new ideas and knowledge to meet the demands of a customer. Hence the human capital is the most important source of innovations.

The potential for transferring information and knowledge into a final value in demand arises from their polarization, distribution and intelligent utilization and there lies the quality of every individual who can use information and knowledge in the way that the innovation potential through the learning process can be transformed into an optimum value.

The shift to knowledge economy produced the growing interest in knowledge-intensive labour force. To have such labour force it is inevitable to invest into the quality of primary, secondary and tertiary national educational systems.

There is a lot of professional literature devoted to recreation of the importance of education as a base of new global knowledge economy [1], [2].

OECD and the World Bank stress the importance of education and a professional instruction of human resources as a key element in the enhancement of new global knowledge-based economy.

Educated, competitive labour force should meet the following requirements:

- It should be able to work with information, to process information in scientific and mathematical ways to meet the needs of the global economy, and an acquired literacy should meet the requirements of a modern global society,
- It should be able to pursue life-long education.

If we believe that knowledge is a key determinant of productivity, competitiveness and economic growth, then its sustainable competitive advantage lies in the ability of labour force to learn and transfer the knowledge as soon as possible.

The objective of the paper

The attention is paid to characteristic of fundamental issues of education in the Slovak regions and the existence of the relation between education and knowledge in a region. The existence of the relationship is shown on the example of the Polish regions.

The regional structure of education in Slovakia

The enhancement of education in Slovakia in the previous decade was not a growth priority that consequently reflects the quality of manpower. In 2002 the share of public expenditure in human resources was the third lowest in the EU and equalled 83% of the 25 EU countries' average. In order to retain comparative advantage in labour force supply in Slovakia when compared with other member states it is urgent to raise the education level, increase the proportion of population with university education and to tailor its purport to the market in all stages of education. Despite the rising problems with labour potential quality in recent years, Slovakia remains an attractive location due to a flexible labour market and low wages.

The enhancement of competitiveness in knowledge economy pursued in EU Lisbon strategy cannot be materialized without educated population or life-long learning workforce.

The school reform aimed at the development of analytical and creative skills together with ever increasing intellectual potential of teachers will facilitate Slovak education to approximate to the level of the education systems in the advanced EU countries in the years 2007 – 2013.

EUROSTAT divides the educational level of the population into three basic levels:

1. Persons with low education level - the lower secondary education;
2. Persons with a higher education level – the comprehensive or higher secondary education;
3. Persons with university education.

A good education structure is when the share of active population with the basic or lower secondary education is the lowest. It means that in the country is a significant share of population with comprehensive education the number of which will continue to study at the university or college or will pursue life-long education. The knowledge economy should primarily address the population with comprehensive education that from the aspect of further education is flexible and can meet the requirements of the knowledge economy.

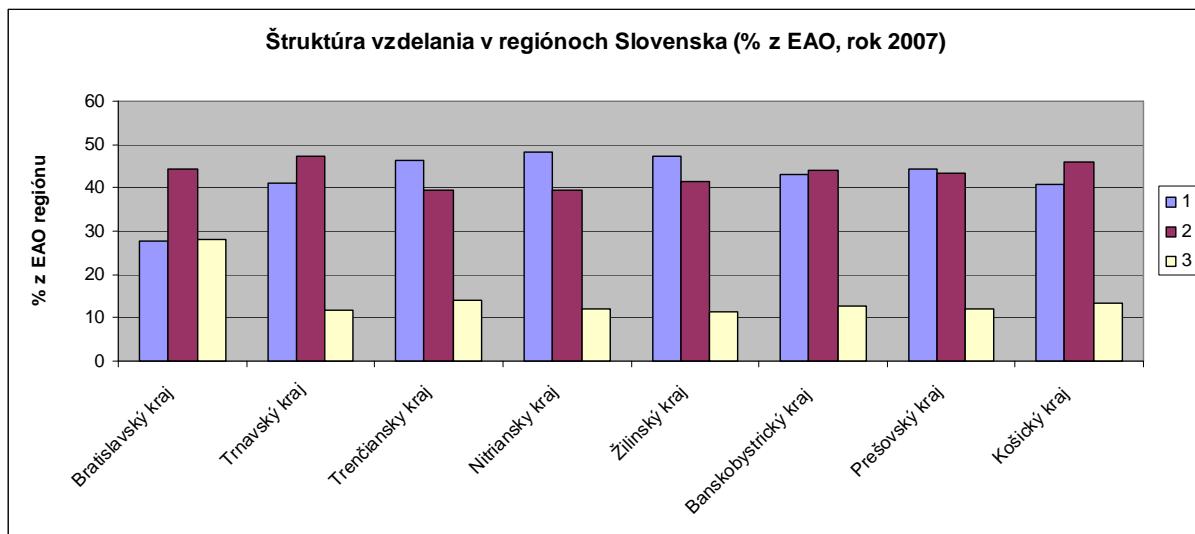
Disparities in the educational structure of the Slovak regions can be a stimulus for their activation and orientation. The table 1 and the graph 1 show the structure of education in 2007.

Table 1: The education structure in the SR regions
 (% of economically active population, EAP 2007)

	EAP in 000s	1	2	3
SR total	2649	42	43	14
Bratislava region	339	28	44	28
Trnava region	290	41	47	12
Trenčín region	295	46	39	14
Nitra region	350	48	40	12
Žilina region	333	47	41	11
Banská Bystrica region	325	43	44	13
Prešov region	376	43	44	12
Košice	344	41	46	13

Source: *Statistical Yearbook of the SR regions, Statistics Office SR, 2008*

- Legend:
1. Basic and lower secondary education
 2. General secondary education (secondary vocational with GCSE, secondary technical, comprehensive, higher secondary education)
 3. University or college education (1st to 3rd level)



Graph 1: The education structure in the Slovak regions (% from EAP, 2007)

Source: *Statistical Yearbook of the SR regions, Statistics Office SR, 2008*

The Slovak regions can be divided into:

- The regions with insufficient potential for the requirements of knowledge economy, that means they have a high share of basic and lower secondary education. The group includes Trenčín, Nitra and Žilina regions.
- The better potential (the lowest share with basic and lower secondary education) can be found in Trnava, Banská Bystrica, Košice and Prešov regions.
- The required potential of education to meet the demand of knowledge economy, that means a high share of university education, is present only in Bratislava region.

As we have stated before it is vital for regions with the prevailing economically active population with basic education to increase the number of population with general secondary education, because it is this group that is perspective for the growth of knowledge

economy. The Lisbon strategy stipulates that by 2010 at least 85% of 22 year-old population will have secondary education.

How can we explain these regional differences in education and what is it that restrains these regions to adapt to sustainable economic growth? It is the path dependence of industrial and institutional structures and as it is stated by R. Durable (2002) [3] this has an impact on learning potential.

The regional policy should address the following areas to improve education capacities:

- Individual learning - regional public and private investments can be aimed at tailor-made education for the economic activity in the particular region;
- Organization education - employee education at various education institutions. Universities play the key role in organization education, especially in the area of research and development.

Individual learning refers to a personal acquisition of knowledge, information and skills (school learning), while organization education refers to employees in various organizations and businesses who learn at workplace to improve their qualification.

The regional policy serves as a significant incentive for individual and organization education. The changing structure of industries and institutional ‘unlearning’ change the procedures and knowledge base of individuals and organizations in a particular region. These issues should be addressed by the regional policy. Learning has become an instrument of the regional growth.

Education as a source of knowledge

Educated and competitive labour force should be able to work with information and process it for the needs of knowledge economy.

In the past, an easy access to raw materials, good transportation routes, big markets and a cheap labour constituted the competitive advantage. Today innovations and entrepreneurship based on knowledge, advanced information infrastructure such as Internet, databases, telecommunication present the potential of a new economy.

The readiness of wide strata of population to employ and utilize modern information and communication technologies (ICT) in everyday life is one of the key preconditions for the successful transition of the SR to information society.

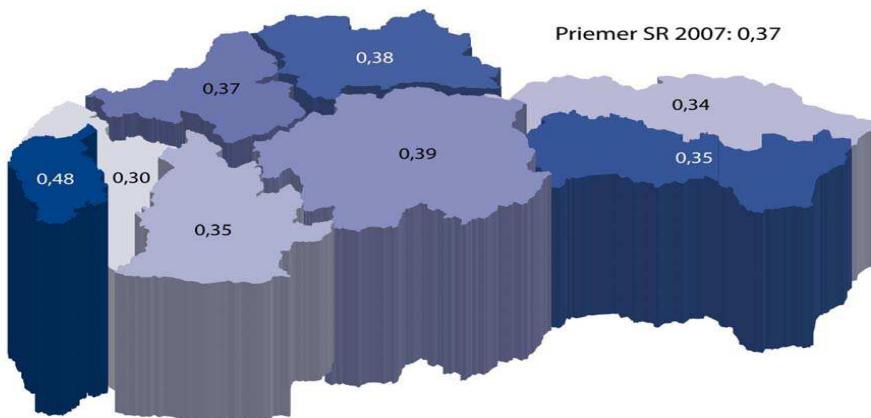
Knowledge and skills oriented at only one particular situation get obsolete and ineffective [4]. It is therefore important to develop competences that are employable in majority of jobs and that will enable an individual to work at different posts and hold various functions, to solve unpredictable problems and to become more flexible. The key competences embrace, among others, also information skills, i.e. information and computer literacy.

If we address the information and computer literacy in the relation to educational level of population in different regions of the SR we would arrive at the following conclusion:

Let us define a digital literacy (it, in general, is involved with the ability to understand information and use it in various spheres) by four major segments – ability to work with hardware, software and virtual information and the communication skills in information and communication technologies (ICT). The digital literacy index shows the value on the scale from 0 = digital illiteracy to 1= maximum digital literacy. In 2007 the digital literacy index was 0.37, in other words it was 37 points out of 100. In percentage scale, the digital literacy of population of Slovakia aged over 14 reached 37 % level.

Map 1: Regional digital literacy

The SR average in 2007: 0.37



Source: IVO, august 2007 [12].

The digital literacy average is in Trenčín region. Trnava, Nitra, Prešov and Košice are below average. Žilina and Banská Bystrica are above average. Bratislava region shows a noticeable dominance over the rest of Slovakia. This regional variation can be explained by the different economic, infrastructure and social parameters. Bratislava region boasts the highest share in GDP, the highest influx of the foreign capital, the highest average wage, the lowest unemployment rate, etc. The higher level of infrastructure, the scope and better access to ICT, the more favourable level of social capital of population, such as education, language competence, etc. rank among other criteria.

The digital literacy level depends on particular abilities and skills and these in turn on many different factors. For example from social-demographic parameters the digital literacy is influenced more by the economic status of a household and the type of economic activity of a person rather than the age or education.

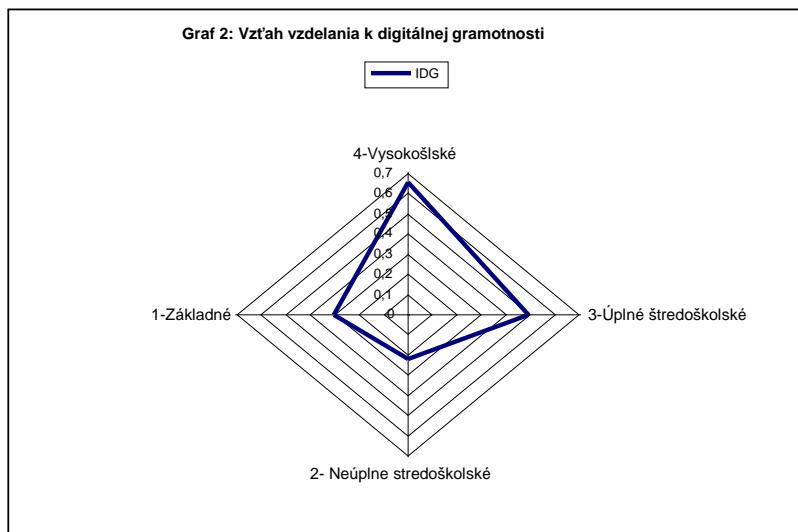
The better financial position of the household and a more demanding job, the higher occurrence of digital literacy. Only then come education and age [5].

The digital illiteracy of the older, less educated, economically inactive and rural population that evidently does not have a sufficient motivation, or real possibilities to overcome this handicap presents a serious problem.

On the other hand, more progressive group of population, i.e. the younger, educated and qualified urban population is permanently learning.

From the social-demographic aspect the digital literacy is also interlinked with the education level. The higher education with a lucrative job and ensuing better economic status of a household enhances the quality or level of digital literacy in a considerable degree [12].

2007 survey shows that the young generation, people with higher education, economically active people (especially white collar workers), students, affluent households, young families and inhabitants of bigger towns and cities represent the most advanced and progressive component.



Graph 2: The relation of education and digital literacy

Source: Data from [12]

Legend: 4-university education
 1-basic education
 3-secondary comprehensive education
 2-basic secondary education

2 Interaction of education and knowledge – the Polish example

The structure of education in Poland is marked by big differences and spatial differentiation. The growth of knowledge economy also fits this model with the exception of a less developed eastern part of Poland.

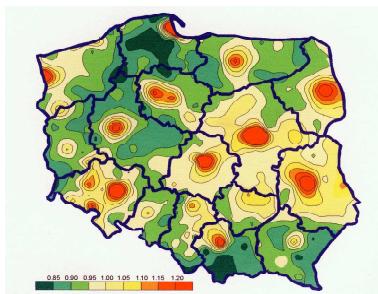
In his study Guzik, R. [6] argues that the education structure at the regional level is the factor influencing the enhancement of knowledge economy. In the long run economically advanced regions are more capable of improving and learning and can seek for new knowledge and skills and apply the existing knowledge in economy.

The regional disparities in relation to education were investigated. The research ensued from spatial context and the regional disparities in the field of secondary and tertiary education were scrutinized. The existing variations of knowledge economy indices in spatial units were assessed and the access to education and the level of knowledge economy were compared inside and between the spatial units.

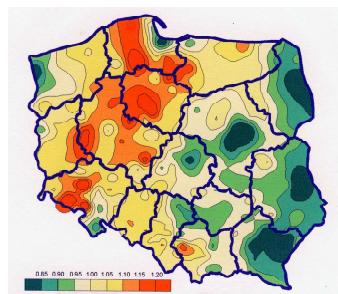
The analysis showed (Maps 2 and 3) that the highest concentration of secondary education in Poland is around all big urban settlements. Even these settlements are differentiated, the privileged position being held by Warsaw. In general the central and eastern parts of Poland have higher proportion of secondary education. The citizens with technical education are concentrated in the south-western part of Poland (Slaskie, Dolnoslaskie, Malopolskie). It is evident that metropolitan areas have a higher concentration of secondary education.

Map 2: Spatial disparities in secondary education (2001)

Mapka 2: Priestorové rozdielnosti stredoškolského vzdelania (rok 2001)

**Map 3: Spatial disparities in basic vocational education (2001)**

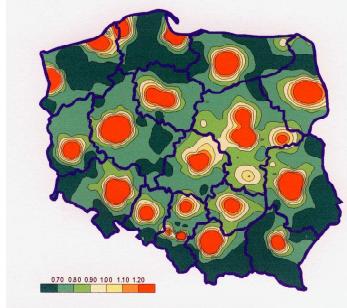
Mapka 3: Priestorové rozdielnosti základného odborného vzdelania (rok 2001)



The highest concentration of the tertiary education (mainly university) (Map 4) is in three voivodships - Mazowieckie (Warsaw), Małopolskie (Krakow) and Zachodniopomorskie (Szczecin, Koszalin). The average concentration can be found in the regions with traditional academic centres [7]. Similar to the secondary education the tertiary education is mostly concentrated in metropolitan regions with the dominant position of Warsaw. This concentration is closely interlinked with a higher level of services.

Map 4: Spatial disparities of university education (2001)

Mapka 4: Priestorové rozdielnosti vysokoškolského vzdelania (rok 2001)



Based on the analysis of spatial concentration of secondary and tertiary education the synthetic education index (SEI) has been devised, where the values of individual indicators were summarised and measured for the purport of regional comparison.

The analysis of knowledge economy in spatial projection was aimed at the assessment of knowledge from the spatial aspect. It was not an easy task due to a deficiency and low comparability of indices [8]. The following three, generally accessible indicators show the essence of knowledge economy.

The first indicates the number of enterprises in ICT sector for every 10,000 inhabitants in a region (x_1) according to the OECD definition [9]. This indicator shows only the quantity of enterprises, not employees or production. It is the most useful and accessible indicator to be utilized to assess knowledge.

The occurrence of cash machines per 10,000 inhabitants (x_2) is the second indicator. The access to cash machines in Poland is still very low and can be the starting point for technological modernization of the regions.

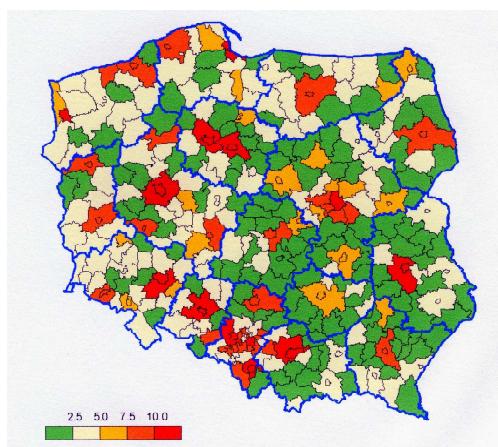
The third indicator was used to measure the advance of information society. E-governance is expressed as a percentage of the local administration which possesses official Internet and web side (x_3).

The analysis of the maps 5 and 6 indicates that the highest values were found in Warsaw powiat (region) and in several powiats in Pomorskie vojvodship. This can be attributed to a very high concentration of ICT firms in Pomorskie. Sopot powiat which is on the second place is at the same time the seat of the biggest Polish IT firm – Prokom. The highest cluster of powiats with the highest values can be found in southern Poland from Malopolskie to Dolnoslaskie region. These regions are connected with the highway A4 which is sometimes referred to as ‘knowledge highway’. Further concentration is around the Warsaw metropolis and Poznan, in agglomeration Torun-Bydgoszcz, along the Baltic Sea and in the eastern part of Lubuskie vojvodship. Lodz, the second biggest Polish city was ranked as 17th with the worst values. The regions with low index and big contrasts are situated in

central and eastern Poland. Also the correlation between education and knowledge indices and the share of GDP in the particular regions were analysed.

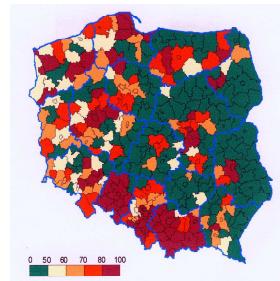
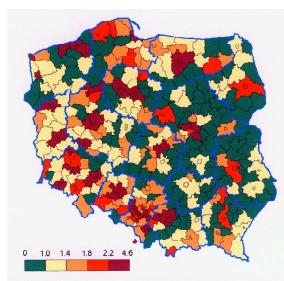
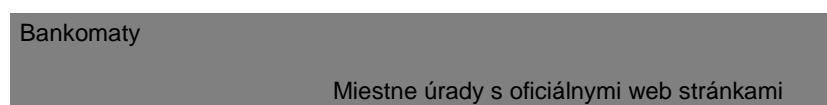
Map 5: ICT enterprises per 10,000 inhabitants

Podniky (spoločnosti) informačných a komunikačných technológií na 10 000 obyvateľov



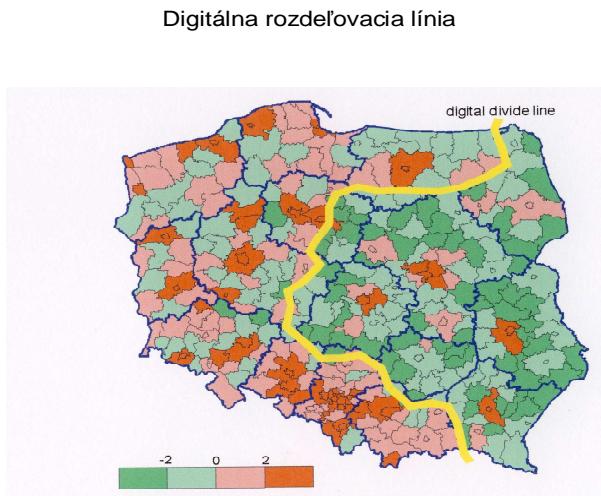
Map 6: Regional disparities of cash machines per 10,000 inhabitants and regional disparity of the local administration with official web sides (in%)

Mapka 6: Regionálna diferenciácia bankomatov (prepočet na 10 000 obyvateľov) a regionálna diferenciácia miestnych úradov používajúcich oficiálne web stránky (% z miestnych úradov)

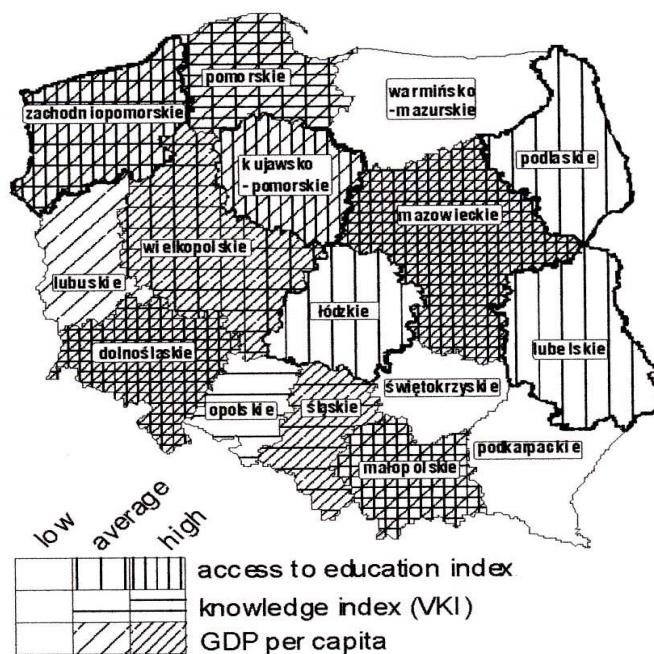


Map 7: Knowledge index in the region

Digital divide line



Map 8: The relation between knowledge index (KI) and access to education index (AEI), and GDP per capita



Spatial variations in KI, AEI and GDP per capita show that only in Mazovieckie and Dolnosliezskie vojvodships all three variables are classified as high. On the other side of the scale are Warminsko-mazurskie, Swietokrzyskie and Podkarpackie regions (low values for all variables). Next three regions were better only in education. The position of Lubuskie vojvodship is surprising since it is the only region where GDP is at the level of national average while in other two dimensions the index is very low.

Using this methodology it is possible to determine inter-regional variations as well as intra-regional characteristic that in the case of Poland form specific patterns. Though the major region with Warsaw is evidently a leader in many aspects, the rest of Poland cannot be considered as a periphery. Knowledge economy offers chances for success also to other regions, especially to Dolnosliezske, Malopolskie and Pomorskie with a high potential for the growth of knowledge base.

According to Gorzelak, G. [10] big urban agglomerations in Poland are leaders in economic transformation at the expense of neighbouring regions. The argument is confirmed by the fact that the good access to education is accompanied by the adequate growth of knowledge economy while the concentration of secondary and university education decreases with the bigger distance from metropolitan areas.

3 Conclusions

In the paper we focused on the fundamental relation between education and knowledge creation in a region and on the diversities ensuing from this relation.

Empirical data are presented on the example of Polish regions. The measurements and the enhancing of the education level in the regions are operative for assessment and design of the future development of regions and are becoming a key factor of the regional policy success.

Education, knowledge and skills have always been a component part of economic growth but only now their role underwent a radical change. At present the following trends can be seen [11]:

- the growing importance of technological education at all levels and all products,
- the growing demand for educated labour force and sophisticated services,
- computerization of knowledge storage, its processing and dissemination through digital means,
- increasing formalization of knowledge.

The impact of knowledge upon different and uneven economic development of the European regions and their contribution to knowledge based growth of their home countries and at the same time to the European Union as a whole is under a permanent investigation.

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