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POSSIBLE DEVELOPMENT SCENARIOS OF INNOVATION MANAGEMENT IN TRANSITION COUNTRIES

The purpose of the paper is to analyze some factors relevant to measuring innovation process in the EU member states by using econometric tools and to point that these factors are not even indicated in candidateship and potential candidateship for the EU. These countries which are still in the process of transition or just have ended this process are practically start-up countries in the area of innovativennes. The authors advise some new cross-border activities which should increase innovation level of non-EU countries and push sustainable innovation flow thus creating a stabile and unique EU innovation platform. Political and institutional support is necessary to accelerate these processes.

Keywords: *innovation; policy making; sustainable development.*

JEL codes: *C1, O31, O33, O38, O43.*

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МОЖЛИВІ СЦЕНАРІЇ РОЗВИТКУ ІННОВАЦІЙНОГО МЕНЕДЖМЕНТУ В КРАЇНАХ ІЗ ПЕРЕХІДНОЮ ЕКОНОМІКОЮ

У статті проаналізовано набір чинників, які мають значення для вимірювання інноваційного процесу в країнах-членах ЄС, за допомогою економетричних інструментів і вказано, що ці чинники взагалі не враховуються при вирішенні питання щодо членства в ЄС. Країни, які все ще знаходяться в перехідному процесі або нещодавно закінчили цей процес, практично новачки в області інновацій. Запропоновано деякі нові трансграничні заходи, які повинні збільшити рівень інновацій в країнах, що не входять до ЄС, і стимулювати стійкий потік інновацій, таким чином створюючи стабільну й унікальну інноваційну платформу ЄС. Для прискорення цих процесів необхідна політична і інституційна підтримка.

Ключові слова: *інновації; розробка політичних заходів; сталий розвиток.*

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ВОЗМОЖНЫЕ СЦЕНАРИИ РАЗВИТИЯ ИННОВАЦИОННОГО МЕНЕДЖМЕНТА В СТРАНАХ С ПЕРЕХОДНОЙ ЭКОНОМИКОЙ

В статье проанализирован набор факторов, имеющих значение для измерения инновационного процесса в странах-членах ЕС, с помощью эконометрических инструментов и указано, что эти факторы вообще не учитываются при принятии решения о членстве в ЕС. Страны, которые все еще находятся в переходном процессе или недавно закончили этот процесс, практически новички в области инноваций. Предложено некоторые новые трансграничные мероприятия, которые должны увеличить уровень инновации в странах, не входящих в ЕС, и стимулировать устойчивый поток инноваций, таким образом создавая стабильную и уникальную инновационную платформу ЕС. Для ускорения этих процессов необходима политическая и институциональная поддержка.

Ключевые слова: *инновации; разработка политических мер; устойчивое развитие.*

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1. Introduction. Innovation is a sum of activities which should be undertaken in an organization to ensure its adaptation to quick changes caused by several factors and its continuous sustainability. Human being is changing through history and this systemic process is getting faster and faster. It seems that innovations based on new inventions accelerate changes in human beings and the surrounding and this results in new products, services and processes which again change people and everything around people thus making this process endless. Technology can be treated as one segment of innovations, but not its synonym. It is important for the existence of an organization to commercialize innovations by their market value which should bring profit to an organization. Having that in mind we must have insight into Schumpeter ideas, that innovation can be analyzed as "creative destruction" that restructures the whole market favouring those who grasp discontinuities faster (Schumpeter, 1942; McFarling, 2000; Langlois, 2005).

Such acceptance of innovation requires methodology for its measuring which is directly related to links between innovation, big improvements in competitiveness, growth of economy and well-being of societies. Empirical evidence extensively demonstrates this dependence (Lugones, 2009).

Measuring innovation (inputs, short-term and long-term results) is a challenging trial that should be continuously tuned. The authors of this paper try to give a new insight of some innovation measures that are officially used in the EU (in statistical reports) by decomposing them into more details.

We use European Innovation Scoreboard of the EU member countries to research its dependence of some factors which are considered significant inputs of innovation process success, such as: share of expenditure of ICT in R&D part of BDP, distribution of high educated employed people according to their age, expenditure for education as a share of GDP, number of venture capital firms.

Surprisingly, candidate and potential candidate countries don't even measure innovation effects. Innovations' outcomes are of special importance for these states. Due to such situation, the authors' research tries to overcome innovation gap between transition countries and the EU members and presents some bridges between the EU and non-EU countries.

The paper proceeds as follows. The next section deals with the literature review. The methodology is presented in the third section. The forth section explains the way the authors conducted the research and the empirical results with the analysis. The last section is the conclusion with the authors' suggestions on acceleration of innovation process in transition countries.

2. Literature review. Innovation outputs are to be measured thus enabling their control, evaluation and improvement. This involves investment of capital and time. Innovation requires a venture into the uncertain and if the results are too fast this can cause their harder recognition and realization. This fact could be called "innovation uncertainty principle" (Morris, 2008).

The organizations' environments are more and more dynamic (Eisenhardt et al., 2010). Technical innovation, competition in globalised world and human actions are the forces which make a surrounding increasingly unstable (Schreyongg, Sydow, 2010). Under such conditions organizations should perform their routine activities with steady performances and permanently innovate to face future requirements of

the market, consumers, processes. (Levinthal, March, 1993; Floys, Lane, 2000). A process which should be permanently performed within organizations defines continuous innovation (CI). This is an interaction between routine activities, incremental improvement and radical innovation with use of external and internal knowledge. Those facts constitute effectiveness in everyday operations and adaptability to changes (Boer, 2001).

OECD created OSLO Manual to provide guidelines on collection and interpretation of innovation data. Collecting innovation data is a base for better understanding of innovation and its influence on economic development. One of the purposes is to provide indicators for benchmarking of national performances. This is of highimportance for policy-making. Such data enable international comparison. There is a need to collect new indicators but also a desire to maintain existing indicators for comparison over time (OSLO Manual, 2005).

Bartel and Lichtenberg showed through empirical research that educated people have comparative advantage in adjusting to new technologies (Bartel, Lichtenberg, 1987).

Some articles tried to establish an innovation model and use it to estimate the facts related to measurement of innovation process (Mariesse, Mohnen, 2002). The article of Molero and Garcia had the aim to contribute to better understanding of factors affecting innovations by analysing Spanish manufacturing sector using microdata of Spanish Innovation Survey (2003). They proved that public grants enhance product innovation. Grants help solving problems with human resources' expenditures during project development. But they hamper the process of innovation, revealing weakness in human resources expenditure financing while for the process of innovation stability and temporal continuity are urgently required (Molero, Garcia, 2008).

Some papers pointed out that only those increases in ICT investments which can be translated into the same growth of the company's innovative products or services with commercial success should be measured as a result of influence of ICT as a share of innovation process. Furthermore, new or improved organizational arrangements, based on ICT platforms, bring higher product quality and improvements (Martin, Thue Uyen Nguyen 2010).

System innovations are transitions which are long lasting from one sociotechnical system to another. They involve changes in technology, user practices, regulation, industrial networks, infrastructure, and culture (Geel, 2004).

The paper of Junge at al. presents a research on the importance of educational composition of employment within a firm for the probability to perform innovation activities. They analyse the difference between 4 innovation types: product, process, organizational and marketing innovations, by considering 3 different groups of education: technical sciences, social sciences, and humanities. This refers to the employees who have at least 16 years of schooling employed within Danish firms. The authors concluded that intensive use of labor with such education increases the probability of implementing innovation and that different types of innovations are related to distinct educational groups. They show that product, organizational and marketing innovation can increase productivity by 30 to 40% (Junge at al., 2011).

A few studies assemble innovation survey data across national and industry boundaries. The paper of Sofka and Grimpe presented that besides having the focus on European countries it would also be interesting to compare results with other major economies like the US or Japan. This would enhance understanding of how firms interact with their environment and how institutional infrastructures for innovation shape the search behaviour. It is focused that different cultural, administrative and historical backgrounds cause various innovation flows (Sofka, Grimpe, 2009).

3. Methodology. There are many discussions on measuring innovations, especially in Oslo Manual (2005). First, should we do this measuring? The answer is yes. Like during a product lifecycle where we must control each phase by having data about the obtained results at the end of each phase, the same we must do with innovation process. But here we have a problem: how long is a duration of an innovation lifecycle, where is its starting point and where is the final? Are the same data relevant for different countries, or they are related to countries' level of development, demography, location, ageing, basic industries, administrative institutions, culture, belonging to state organizations (EU, EFTA, WTO)? No final answers exist, but for sure, official indicators of innovation process must be established. They should consist of limited number of significant, basic measures. These measures should be applied for all countries. But, further, diversificated indicators should be created, specialized for certain groups of countries, for example, transition countries, underdeveloped contries, the EU members, non-EU countries. It should be noticed that countries like Serbia which are at the starting point of implementation of innovations and which don't have official statistical data related to this process must consider what are specific facts could represent their innovation process. These could be: number of new knowledge clusters, technological incubators, implemented standards, notifying bodies for CE mark, testing laboratories for new products, or new innovation regulation, strategies, action plans.

Econometric tools, namely, statistical analysis, are applied by the authors to find coorelation between some specific factors which represent significant measures of innovation process and European Innovation Scoreboard (EIS). Measures which are used in calculation are not incorporated into the official calculation of EIS. Pearson correlation indicator represents the value of correlation.

EIS (European Innovation Scoreboard, 2009) consists of:

Enablers: captures the main drivers of innovation that are external to the firms:

- Human resources;
- Finance and support.

Firm activities: captures innovations that firms undertake recognizing the fundamental importance of firms activities in the innovation process.

Outputs:

- Innovators;
- Economic effects.

The paper presents the data about the dependence of EIS on:

-Percent of people with tertiary education in employment in two age groups: 25 to 39 and 40 to 64.

- Expenditure on education as share of GDP;
- Share of ICT of R&D in GDP;
- Number of venture capital firms.

In further investigation, the authors try to find how the innovation process and its outcomes influence well-being of people in a society. Human Deveopment Index (HDI) represents well-being. It is a composite statistics used to compare countries by levels of human development, or standards of living. Values of HDI could be used to distinguish whether a country is a developed, a developing or an underdeveloped one. It shows the impact of economic policies on lify quality. Actually, leverage of competitiveness based on the introduction of technological or organisational innovations have a strong impact in the proportion of goods with the highest knowledge content in the production and commercial structure. Growth in that proportion does rise in workers' average incomes by employing relatively more skilled human resources. So, innovations make an improvement in well-being of society as a whole (Lugone, 2009).

The authors test the following hypothesis:

H1: If there is any influence of the age of high educated workers on outcomes of innovation process across the countries.

H2: If there is any dependence between standard of living in countries and their innovation process outcomes.

4. Empirical data and analysis. The EU member states are in the focus of the authors' analysis. The outcomes of the use of the previously described methodology will be discussed in this section.

1. Significant dependence, with Pearson correlaton factor of r=0.69, is between the following data:

-share of ICT investments in research and development (R&D) expeditures of countries and

-share of ICT income in countries' GDP.

This is presented in Figure 1.

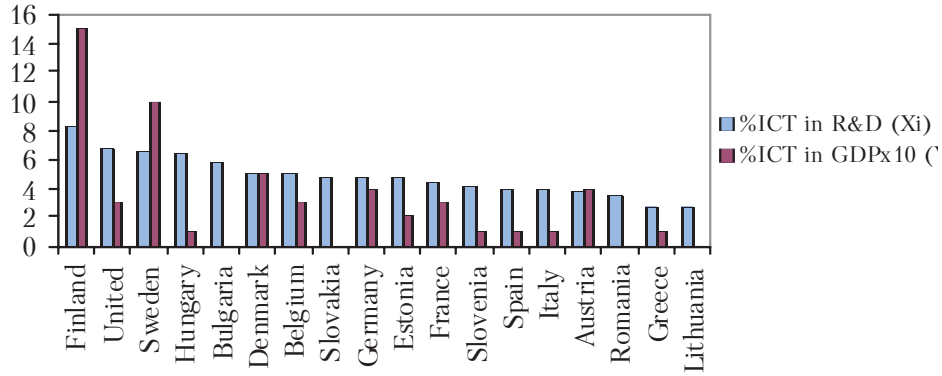

Figure 1. **Correlation between share of ICT sector in R&D expenditure and share of ICT sector in GDP of European countries (2010)**

Source: Europe's Digital Competitiveness Report, 2010

As expected, investment in research and development of ICT has strong impact on a country's GDPs. The results of the analysis of the relation between investments in research and development of ICT sector and European innovation scoreboard give data that there is a lack of their dependance (r=0.12). The reason for this could be that R&D investments into ICT sector are still too small and can't be measured as a

factor that generates innovations.

2. The research was done about the posible dependence of the age of employees with high education and European innovation scoreboard (success in innovation). Two age groups are discussed (according to the official statistical data):

a) 25 to 39

b) 40 to 64.

The correlation between European innovation index and these two groups is significant and in both cases almost the same:

a) r(a)=0.448 (Figure 2);

b) r(b)=0.485 (Figure 3).

drawing to the interesting conclusion that qualified, knowledgable workers, beginners and experienced, have their role in the innovation process. Not only young, nor only experienced workers can complete the innovation activities with success.

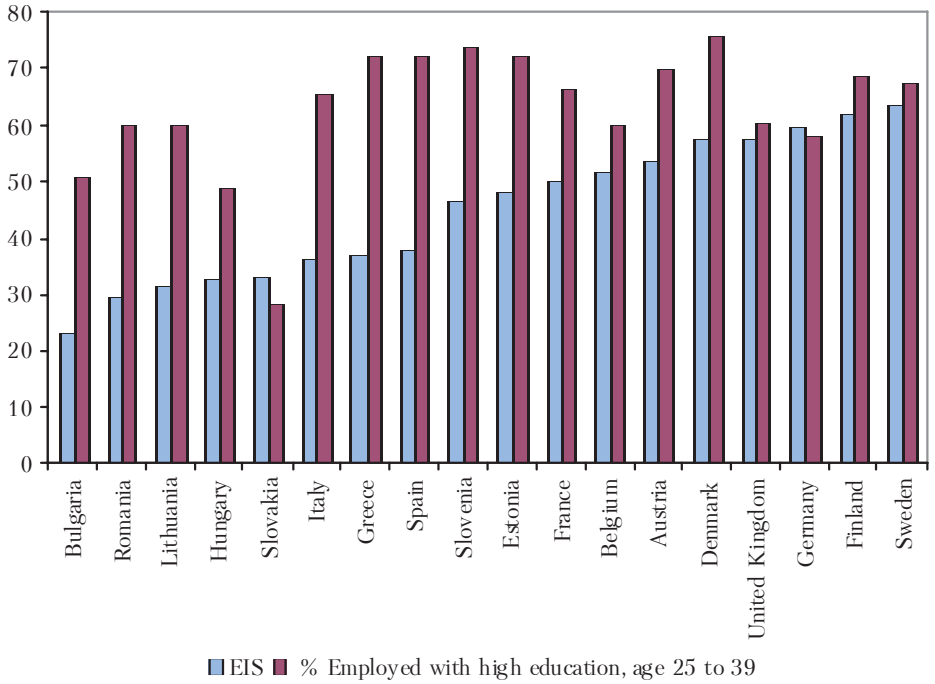

Figure 2. **Correlation between EIS countries and percent of high educated employees, aged 25 to 39.**

Source: Key data on education in Europe 2009; European innovation scoreboard (EIS), 2009

3. Continuing of the previous research is the investigation of how expenditures on education influences EIS. The data are shown in Table 1. The results bring us to the significant correlation of these two values. Correlation coefficient is r=0.63, as shown in Figure 4. It is worth to invest into education of employees.

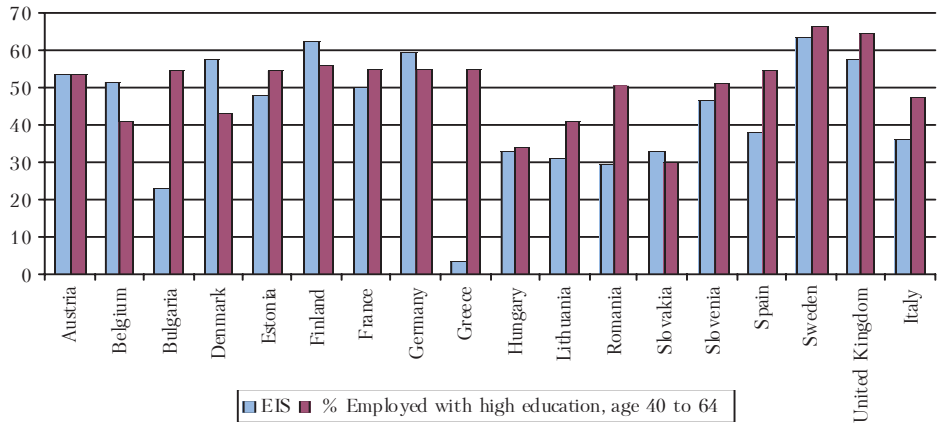

Figure 3. **Correlation between EIS countries and % of high educated employees, aged 40 to 64 (2010).**

Source: Key data on education in Europe, 2009; European innovation scoreboard (EIS), 2009

Table 1. **Data about EIS countries and expenditure on education as share in their GDPs (2009)**

Countries	EIS	Expenditure on education, % to GDP
Austria	5,36	5,4
Belgium	5,16	6
Bulgaria	2,31	4,2
Denmark	5,74	8
Estonia	4,81	4,3
Finland	6,22	6,1
France	5,01	5,6
Germany	5,96	4,4
Hungary	3,28	5,4
Lithuania	3,13	4,8
Slovakia	3,31	3,8
Slovenia	4,66	5,7
Spain	3,77	4,3
Sweden	6,36	6,9
United Kingdom	5,75	5,5
Italy	3,63	4,7

Source: Key data on education in Europe, 2009; European innovation scoreboard (EIS), 2009.

4. There are no successful innovating organisations and thus no innovative societies without investment capital. At the market there can be found many sources for investment in innovation process like angel investors, venture capital, start up investors, edge funds. The authors researched the impact of number of venture firms on EIS, data are in Table 1. There is a positive corelation, r=0,41. Venture capital pulls innovations and innovations which are confirmed at the market and bring profit to investors pull new, bigger investments. The obtained reasults are presented in Figure 5.

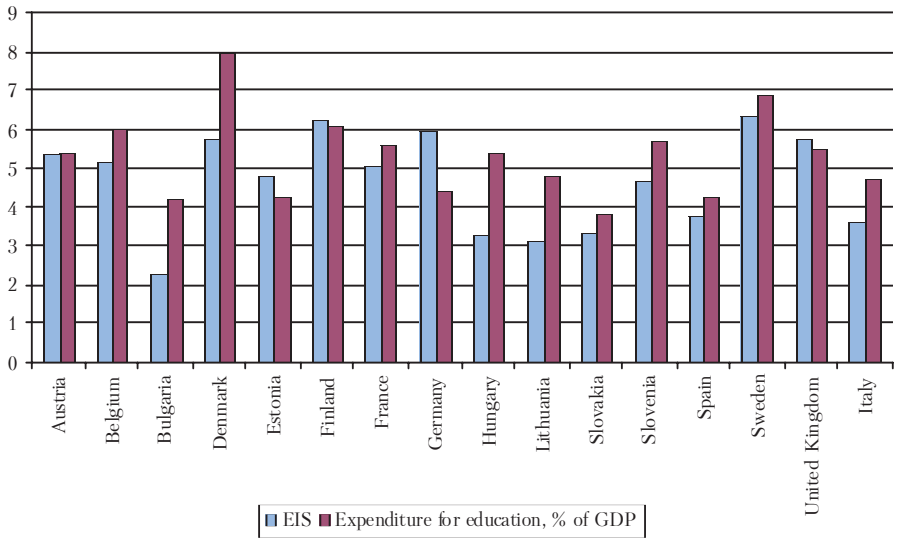

Figure 4. **Correlation between EIS countries and expenditure on education as % to GDP.**

Source: Key data on education in Europe, 2009; European innovation scoreboard (EIS), 2009.

Table 2. **EIS and number of venture capital firms (2009)**

Countries	EIS	Venture capital firms
Austria	11,6	38
Belgium	8,6	30
Bulgaria	0,4	3
Denmark	15,2	35
Estonia	9,1	1
Finland	20,2	32
France	10,6	91
Germany	8,1	130
Greece	1,2	4
Hungary	5,1	13
Romania	-2,9	7
Slovenia	3,7	6
Spain	10,3	23
Sweden	15,6	70
Italy	2,1	23

Source: Venture capital, 2009; European innovation scoreboard (EIS), 2009.

5. Analysis of effects of investment in R&D of ICT sector on innovation outputs is presented through its impact on EIS. The results prove there is still no impact (r=0.12) of the capital invested in R&D of ICT sector on European innovation scoreboard. Investments are still to small to push EIS or EIS is not enough sensitive to them.

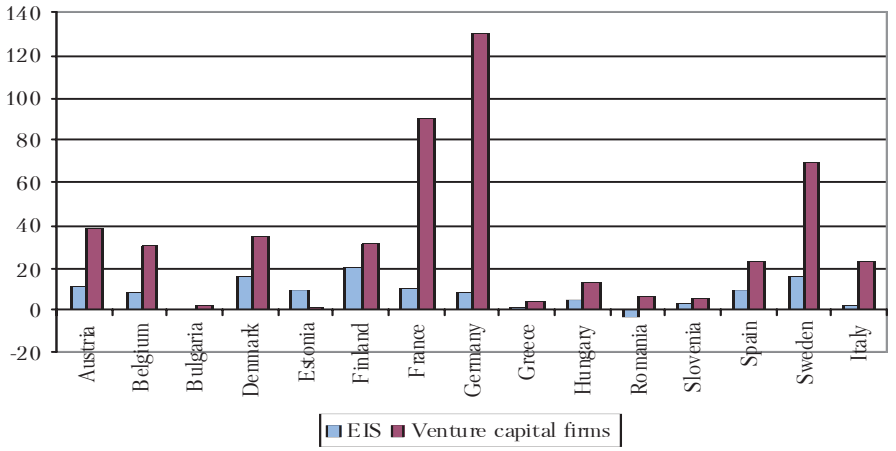

Figure 5. **EIS and number of venture capital firms (2009)**

Source: Venture capital, 2009; European innovation scoreboard (EIS), 2009

6. Breakdown of the effects of innovation on the countries' welfare (standard of living) and countries sustainable development is discussed too. Comparison is made by using indices: Human Development Index HDI (Human Development Report, 2009) and Happy Planet Index, HPI (The Happy Planet Index, 2009) which is the outcome of the levels of countries' sustainable growth. The investigation gives the following:

a) There is a strong dependance between HDI and EIS. Fruitfull innovation activities bring higher standard of leaving like presented in Figure 6.

b) There is no correlation between HPI and EIS. Innovations are not based on sustainable principles and "don't care" about the exhaustion of natural resources.

The results of the investigation of hypotheses accuracy are:

-For H1: There is a lack of influence of the age of high educated workers on outcomes of innovation process in the countries.

-For H2: There is a significant dependence between standards of living of citizens in the countries and their innovation process outcomes.

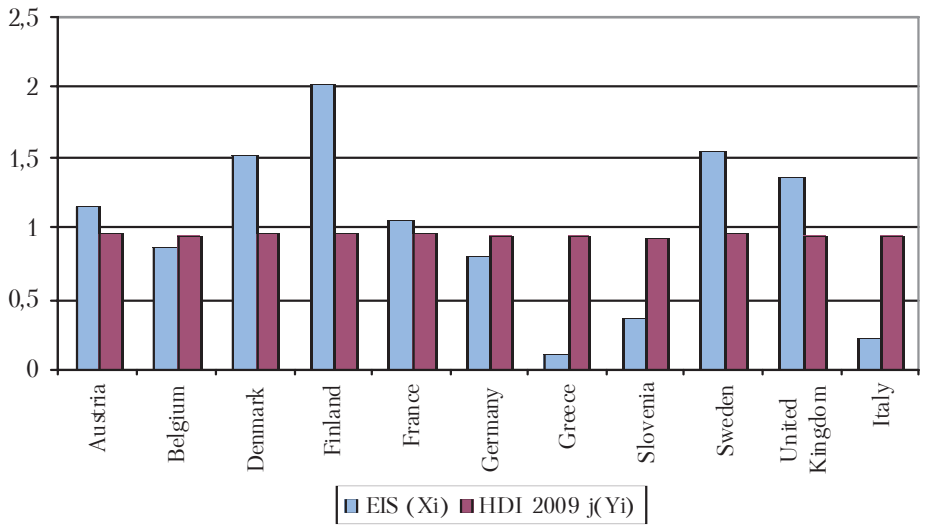

Figure 6. Countries' EIS and their' human development indices (2009)

Source: Human development Report, 2009; European innovation scoreboard (EIS), 2009.

5. Conclusion. The aim of this article is to discuss some aspects of innovation in more detail than usually. We introduce some factors which could be accepted as interesting measures of effects of innovation process, like some indices that are used in other discussions. Our intention was to analyze innovation results of the countries which are not members of the EU, like candidate and potential candidates. But innovation in these countries is completely at the beginning or rebeginning after or at the end of their transition processes and they even do not measure inputs and outputs of innovation activities. So, a deeper analysis is not acceptable at the moment. Innovation of production process is the most important for these countries which could be called innovation pioneers. Pre-accession assistance of the European Union through various funds which finance projects could be a good financial resort for innovation projects in transition countries. The authors' proposals for those countries with the aim to support and intensify their inventions, innovations and competitiveness are:

1. Intensive use of the EU funds (cross-border funds) for innovation projects.
2. Establishing cross-border laboratories where pilot, newly invented or improved products/services will be developed, tested, standardized and certificated through required EU procedures (recommendations). So, the costs would be reduced and member states of the EU will pull the innovation activities of future EU states. This will bring their faster matching into the EU and stronger homogeneity of the European Union in the long term.
3. Do not allow big sums of severance pays for workers who are redundant disappear in everyday spending. Policy institutions should emit shares of attractive innovation projects and this could be the way to collect capital for future innovation projects.
4. Institutions should organize permanent education on innovation processes with practical skills for it. Knowledge about basic definitions of innovation and especially about its flow is at the very low level in these countries. Innovation skills could

be develiped and such practices should bring visible results.

5. The EU must raise awareness on innovation in non-EU countries long before their entrance into the Union.

6. Standardization and certification could be done in cross-border bodies. They could be centers of technology transfers and innovation activities. The cost of these processes which are necessary and requested by the EU could be reduced through cross-border distribution.

7. Permanent education in the area of innovations is necessary. It must begin very early, at the age of kindergartens and elementary schools.

The suggested measures could be implemented rather quickly and would be a base for countries' preparation to entering the EU. So the EUs homogeneity and power will continuously strengthen and new incomers will not cause notable disbalances.

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