

EUROPEAN INNOVATION SCOREBOARD VS ENTREPRENEURIAL FRAMEWORK CONDITIONS BASED ON THE GEM

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Abstract: *The leaders in the creation of innovations in European Union countries, taking into account innovative enterprises, are Germany, Luxembourg, Belgium, Ireland, United Kingdom and Austria. The aim of the article is to answer the question: what is the relation between the European Innovation Scoreboard and entrepreneurial framework conditions based on the GEM and additionally innovative enterprises divided into product, process, organizational and marketing? This article provides a comparative assessment of innovation performance of the EU Member States in 2016 through the prism of factors determining the level of entrepreneurial activity based on the Global Entrepreneurship Monitor (GEM) model of economic development. The article presents 28 EU countries as leader, strong, moderate and modest countries in innovations and entrepreneurship.*

Key-words: *entrepreneurial activity, GEM, European Innovation Scoreboard, innovative enterprises JEL: F62, O31*

INTRODUCTION

European Innovation Scoreboard is a composite indicator obtained by taking an unweighted average of the 27 indicators grouped into the mentioned 10 dimensions. It allows dividing UE countries into four groups: innovation leaders, strong innovators, moderate innovators and modest innovators. The aim of this article is to present the relation between the European Innovation Scoreboard and entrepreneurial framework conditions based on the GEM.

The research questions are as follows: Can 28 EU countries be divided into groups, similar to EIS, taking into account their entrepreneurial activity based on the GEM model? What is the relation between European Innovation Scoreboard and entrepreneurial framework conditions based on the GEM? This study is based on primary data on the case – Eurostat (Community Innovation Survey), Summary Innovation Index, which is presented by the European Innovation Scoreboard and data of the Global Entrepreneurship Monitor. This study examined the relationships between creation of innovations in the European Union and entrepreneurial activity - the factor affecting that innovation, based on the GEM model. The methodology is as follows: Calculating the aggregate value for all factors determining the level of entrepreneurial activity in European Union countries; calculating the EU average of entrepreneurial activity; assuming that this average is 100 calculating values for all EU countries.

The performance of EU national innovation systems is measured by the Summary Innovation Index and presented by the European Innovation Scoreboard, which is a composite indicator obtained by taking an unweighted average of the 27 indicators grouped into 10 dimensions (see Table 1). If we assume that, the most important factors from the point of view of the analyzed problem are innovators (especially including two indicators: SMEs introducing product or process innovations and SMEs introducing marketing or organisational innovations), linkages (the indicator: innovative SMEs collaborating with others) and additionally the innovation-friendly environment (the indicator: opportunity-driven entrepreneurship) it will be possible to compare importance of dimensions (relative strengths of the innovation system) in the leading countries presented by EIS.

Table 1: European Innovation Scoreboard's indicators

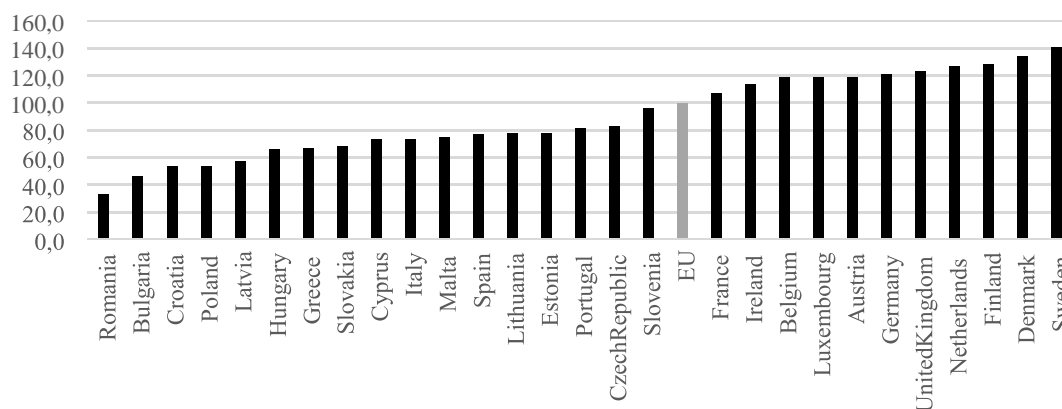
measurement framework	dimensions	indicators
1. Framework conditions	1.1. Human resources	1.1.1. New doctorate graduates 1.1.2. Population aged 25-34 having completed tertiary education 1.1.3. Population aged 25-64 participating in lifelong learning
	1.2. Attractive research systems	1.2.1. International scientific co-publications 1.2.2. Top 10% most cited publications 1.2.3. Foreign doctorate students
	1.3. Innovation-friendly environment	1.3.1. Broadband penetration 1.3.2. Opportunity-driven entrepreneurship
2. Investments	2.1. Finance and support	2.1.1. R&D expenditure in the public sector 2.1.2. Venture capital investment
	2.2. Firm investments	2.2.1. R&D expenditure in the business sector 2.2.2. Non-R&D innovation expenditures 2.2.3. Enterprises providing training to develop or upgrade ICT skills of their personnel
3. Innovation activities	3.1. Innovators	3.1.1. SMEs introducing product or process innovations 3.1.2. SMEs introducing marketing or organisational innovations 3.1.3. SMEs innovating in-house
	3.2. Linkages	3.2.1. Innovative SMEs collaborating with others 3.2.2. Public-private co-publications 3.2.3. Private co-funding of public R&D expenditures
	3.3. Intellectual assets	3.3.1. PCT patent applications 3.3.2. Trademark applications 3.3.3. Design applications
4. Impacts	4.1. Employment impacts	4.1.1. Employment in knowledge-intensive activities 4.1.2. Employment in fast-growing enterprises in innovative sectors
	4.2. Sales impacts	4.2.1. Medium and high technology product exports 4.2.2. Knowledge-intensive services exports

4.2.3. Sales of new-to-market and new-to-firm innovations

Source: based on the European Innovation Scoreboard 2017, Methodology report, p. 25.

The innovation leaders in EU-28, in the year 2016, were 6 countries (the indicator is higher than 120% of the EU-28 average): Sweden, Denmark, Finland, the Netherlands, the United Kingdom and Germany (see Figure 1).

Fig 1: European Innovation Scoreboard 2017



Source: Own study based on the European Innovation Scoreboard 2017.

The relative strengths of the innovation system in Sweden, Denmark, and Finland are in the innovation-friendly environment, human resources, and attractive research systems. It is similar in the Netherlands and the United Kingdom. Except of the innovation-friendly environment there are linkages in the Netherlands and employment impacts in the United Kingdom. In Germany the most important dimensions are as follows: firm investments, innovators and intellectual assets.

According to EIS countries are divided into four groups: innovation leaders, strong innovators, moderate innovators and modest innovators (see Table 2).

Table 2: Groups of countries based on EIS

Innovation leaders	Sweden, Denmark, Finland, Netherlands United Kingdom, Germany
Strong innovators	Austria, Luxembourg, Belgium, Ireland, France, Slovenia
Moderate innovators	Czech Republic, Portugal, Estonia, Lithuania, Spain, Malta, Italy, Cyprus, Slovakia, Greece, Hungary, Latvia, Poland, Croatia
Modest innovators	Bulgaria, Romania

Source: Own study based on the European Innovation Scoreboard 2017.

Determinants of entrepreneurial activity based on the GEM model

The Global Entrepreneurship Monitor is the world's foremost study of entrepreneurship. The GEM collects primary data on entrepreneurship and focuses on the individual entrepreneur. The GEM's approach is the same throughout the world. The GEM recognizes entrepreneurship as a process. The GEM's historical global dataset is extremely comprehensive and it is an impressive global network of expertise. The GEM is able to track the informal entrepreneurial activity which official statistics do not capture (Daszkiewicz, Wach, 2013, pp. 83-86).

The GEM defines entrepreneurship as "any attempt at new business or new venture creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business" (<http://www.gemconsortium.org>). A lot of factors determine entrepreneurial activity. In other words there are a whole host of determinants affecting how

easy or how difficult it is to run entrepreneurial activity. According to Global Entrepreneurship Monitor there are 12 groups of determinants of entrepreneurial activity: financing for entrepreneurs, governmental support and policies, taxes and bureaucracy, governmental programs, basic school entrepreneurial education and training, post school entrepreneurial education and training, R&D transfer, commercial and professional infrastructure, internal market dynamics, internal market openness, physical and services infrastructure, cultural and social norms. Entrepreneurial framework conditions and their general description are presented in Table 3.

Table 3: Factors determining the level of entrepreneurial activity based on the GEM

Determinants	Description
Financing for entrepreneurs	The availability of financial resources - equity and debt - for small and medium enterprises (SMEs) (including grants and subsidies)
Governmental support and policies	The extent to which public policies support entrepreneurship - entrepreneurship as a relevant economic issue
Taxes and bureaucracy	The extent to which public policies support entrepreneurship - taxes or regulations are either size-neutral or encourage new and SMEs
Governmental programs	The presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal)
Basic school entrepreneurial education and training	The extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels
Post school entrepreneurial education and training	The extent to which training in creating or managing SMEs is incorporated within the education and training system in higher education such as vocational, college, business schools, etc.
R&D transfer	The extent to which national research and development will lead to new commercial opportunities and is available to SMEs
Commercial and professional infrastructure	The presence of property rights, commercial, accounting and other legal and assessment services and institutions that support or promote SMEs
Internal market dynamics	The level of change in markets from year to year
Internal market openness	The extent to which new firms are free to enter the existing markets
Physical and services infrastructure	Ease of access to physical resources- communication, utilities, transportation, land or space - at a price that does not discriminate against SMEs
Cultural and social norms	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income

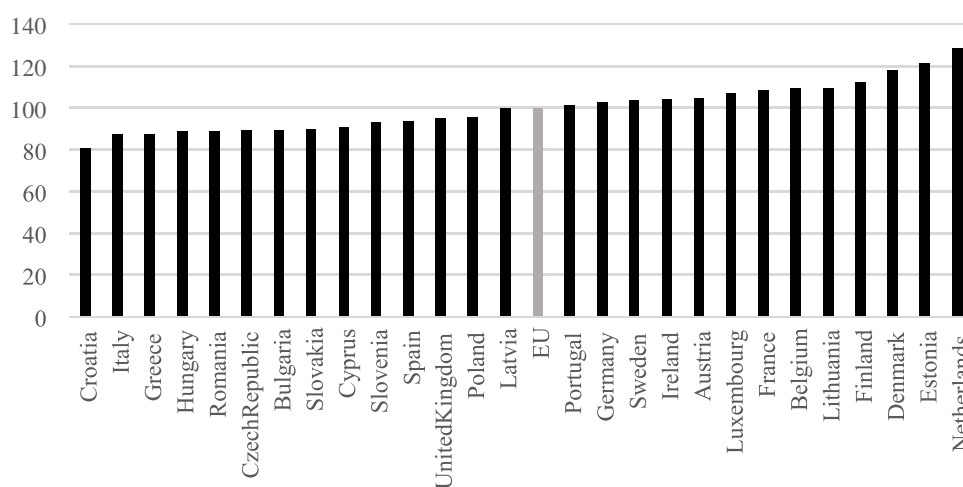
Source: <http://www.gemconsortium.org/wiki/1376>

The highest values in the case of financing for entrepreneurs belong to: the Netherlands, Lithuania and Belgium. The highest extent to which public policies support entrepreneurship (entrepreneurship as a relevant economic issue) is in Belgium, France and Denmark. The highest extent to which public policies support entrepreneurship (taxes or regulations) is in Estonia, the Netherlands and Denmark. In Austria, Luxembourg, Denmark and Germany are the best presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal). The highest extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels is in the Netherlands, Denmark, and Estonia. The best post school entrepreneurial education and training is in the Netherlands, Denmark and Estonia. In the Netherlands, Luxembourg and France is the highest extent to which national research and development will lead to new commercial opportunities and

is available to SMEs. In case of the presence of property rights, commercial, accounting and other legal and assessment services and institutions that support or promote SMEs the first three places belong to Lithuania, Belgium, and Latvia. In the internal market dynamics the highest values are in Poland, Sweden and the Netherlands. The highest extent to which new firms are free to enter the existing markets is in the Netherlands, Denmark, and Estonia. The best physical and services infrastructure in EU countries is in the Netherlands, Estonia and Finland. The highest values in the field of cultural and social norms are in Estonia, Netherlands, and Lithuania.

Table 4 presents the values concerning determinants of entrepreneurial activity in European Union countries, generally in the year 2016 (the Czech Republic – year 2013, Denmark, Lithuania – year 2014, Belgium, Romania – year 2015, Malta – data not available). Taking into account the aggregate value (arithmetic mean) of factors determining the level of entrepreneurial activity in European Union countries the highest quality belongs to the Netherlands and Estonia (see Figure 2).

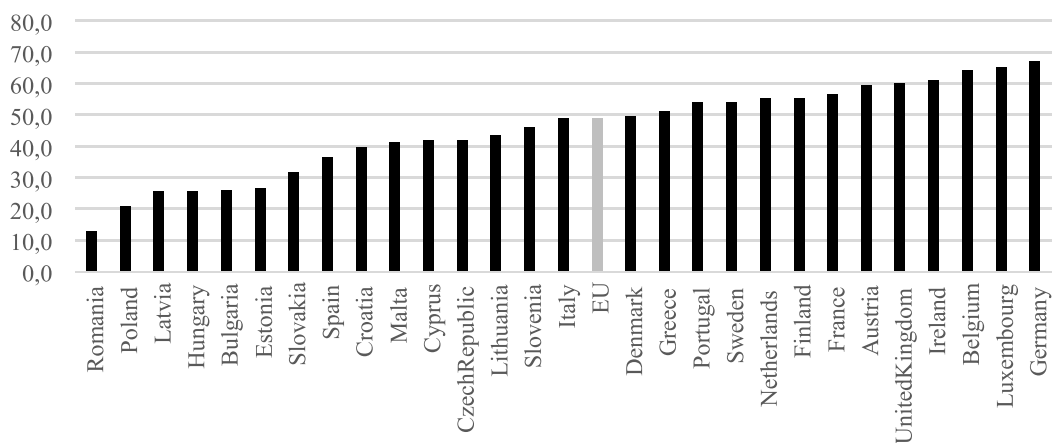
Fig 2: Ranking of EU countries based on the GEM determinants of entrepreneurial activity



Source: Own study based on <http://www.gemconsortium.org>

The leaders in the creation of innovations in the European Union, taking into account innovative enterprises (including enterprises with abandoned/suspended or on-going innovation activities), are Germany, Luxembourg, Belgium, Ireland, United Kingdom, and Austria. These countries belong to those where the level of innovative enterprises as a percentage of all enterprises is above 120% of the EU-28 average.

Fig 3: Innovative enterprises in EU countries (percentage of all enterprises in 2014)



Source: Own study based on Eurostat (inn_cis9_type)

Taking into account the aggregate value (arithmetic mean) of factors determining the level of entrepreneurial activity in EU countries, the highest quality belongs to the Netherlands and Estonia.

The methodology is as follows: calculating the aggregate value for all factors determining the level of entrepreneurial activity in European Union countries; calculating the EU average of entrepreneurial activity; assuming that this average is 100 calculating values for all EU countries and presenting the ranking on the figure 3.

Table 4: Factors determining the level of entrepreneurial activity in European Union countries

	Financing for entrepreneurs	Governmental support and policies	Taxes and bureaucracy	Governmental programs	Basic school entrepreneurial education and training	Post school entrepreneurial education and training	R&D transfer	Commercial and professional infrastructure	Internal market dynamics	Internal market openness	Physical and services infrastructure	Cultural and social norms	Aggr va
Sweden	2,71	2,31	2,38	2,87	2,5	2,54	2,56	2,99	3,49	2,68	4,07	3,04	34
Denmark	2,73	3,33	3,31	3,43	3,1	3,43	2,77	3,56	2,43	3,44	4,49	2,82	38
Finland	3,13	3,26	3,18	2,86	2,36	3	2,77	3,35	2,82	3,04	4,58	2,73	37
Netherlands	3,29	3,19	3,38	3,4	3,28	3,57	3,18	3,49	3,46	3,67	4,69	3,77	42
United Kingdom	2,67	2,22	2,78	2,39	1,77	2,5	2,27	2,87	2,45	3,05	3,61	2,8	31
Germany	2,94	2,37	2,48	3,43	1,7	2,59	2,49	3,34	3,13	3,08	3,76	2,59	33
Austria	2,81	2,56	2,23	3,75	1,38	2,9	2,77	3,49	2,6	3,23	4,53	2,27	34
Luxembourg	2,31	3	2,86	3,48	1,96	3,12	3,07	3,48	2,33	3,13	4,08	2,44	35
Belgium	3,17	3,96	1,95	2,86	1,95	3,24	2,74	3,76	2,91	3,09	3,88	2,5	36
Ireland	2,85	2,78	2,83	3,37	2,18	2,7	2,78	3,06	2,47	2,9	3,31	3,02	34
France	2,67	3,57	3,25	3,32	1,7	3,24	3,01	3,14	2,82	2,47	4,38	2,25	35
Slovenia	2,39	2,45	1,89	2,59	1,71	2,61	2,3	3,05	3,17	2,49	4,15	1,98	30
Czech Republic	2,47	2,04	2,02	2,29	1,58	2,4	2,24	3,1	2,61	2,62	4,01	2,04	29
Portugal	2,95	2,85	1,77	3,07	2,1	3,1	2,76	3,27	2,17	2,45	4,41	2,47	33
Estonia	2,93	3,01	3,77	3,18	2,76	3,29	2,85	3,42	2,93	3,4	4,68	3,78	4
Lithuania	3,19	2,39	2,46	2,72	2,37	3,07	2,61	3,9	3,38	2,66	4,19	3,09	36
Spain	2,37	1,9	2	3,09	1,74	2,15	2,69	3,25	2,73	2,83	3,48	2,71	30

Italy	2,57	2,06	1,78	1,94	1,85	2,91	2,43	2,6	2,69	2,47	3,07	2,38	28
Cyprus	2,02	2,29	2,46	2,01	1,75	2,79	2,18	3,06	2,74	2,6	3,66	2,4	29
Slovakia	2,91	1,77	1,92	2,06	2,06	2,77	1,96	2,9	2,63	2,45	4,04	2,21	29
Greece	2,15	1,78	1,49	1,77	1,84	2,62	2,49	2,79	3,38	2,49	3,77	2,25	28
Hungary	2,7	1,86	1,78	2,07	1,46	2,59	2,28	2,93	3,11	2,5	4,03	2,06	29
Latvia	2,76	2,37	1,97	2,46	2,29	2,89	2,2	3,68	2,81	2,49	4,22	2,75	32
Poland	2,85	2,6	1,98	2,43	1,64	2,05	2,21	2,73	3,75	2,69	4,19	2,37	31
Croatia	2,3	1,73	1,48	2,14	1,61	2,33	1,7	2,56	3,29	1,95	3,77	1,82	26
Bulgaria	2,64	1,67	2,87	1,92	1,64	2,3	1,94	3,04	2,91	2,27	4,08	2,18	29
Romania	1,97	2,09	2,06	2,18	2,35	2,73	2,16	3,64	2,5	2,38	2,9	2,41	29

Source: Own study based on <http://www.gemconsortium.org>

Relation between the European Innovation Scoreboard and entrepreneurial activity

Let's assume that entrepreneurial activity means the best entrepreneurial framework conditions (determinants of entrepreneurial activity) based on the GEM model. The best entrepreneurial framework conditions have the Netherlands and Estonia (higher than 120% of the EU average). Indicators higher than 100% of the EU average are in 11 countries, while lower than the EU average (and at the same time more than 80% of the EU average) are in 14 countries. It is possible to divide EU countries into three groups presented in Table 5. Entrepreneurial leaders mean the indicators higher than 120% of the EU average, strong entrepreneurs – 90-120% of the EU average, moderate entrepreneurs – 50-90% of the EU average. There are no modest countries (table 5).

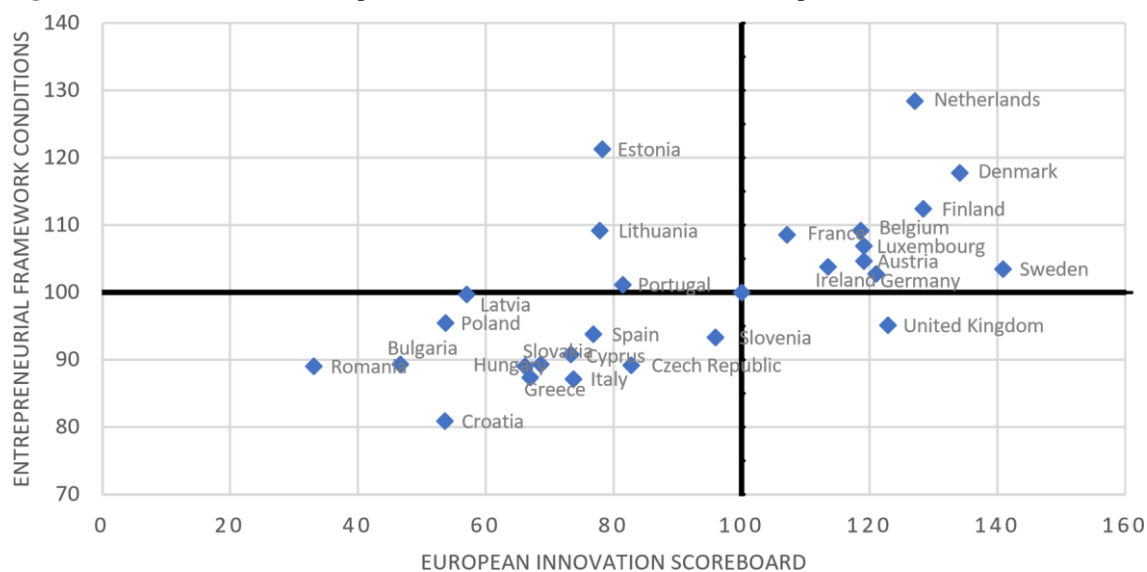
Table 5: Groups of EU countries based on factors determining the level of entrepreneurial activity

Entrepreneurial leaders	Netherlands, Estonia
Strong entrepreneurs	Denmark, Finland, Lithuania, Belgium, France, Luxembourg, Austria, Ireland, Sweden, Germany, Portugal, Latvia, Poland, United Kingdom, Spain, Slovenia, Cyprus
Moderate entrepreneurs	Slovakia, Bulgaria, Czech Republic, Romania, Hungary, Greece, Italy, Croatia

Source: Own study based on <http://www.gemconsortium.org>

Figure 3 presents the relation between the European Innovation Scoreboard and the entrepreneurial framework conditions based on the GEM model. Thirteen countries are above the EU-28 average of EIS and eleven countries are above the EU-28 entrepreneurial framework conditions average. Most of EU member states are below both average lines. Ten countries (the Netherlands, Denmark, Finland, Belgium, France, Luxembourg, Austria, Ireland, Germany, and Sweden) are above the EU-28 average both for the European Innovation Scoreboard and the Global Entrepreneurial Monitor. These countries belong to innovation-driven economies. Thirteen countries (Latvia, Poland, Spain, Slovakia, Cyprus, Slovenia, the Czech Republic, Hungary, Greece, Croatia, Romania, and Bulgaria) are below the EU-28 average both for the European Innovation Scoreboard and the Global Entrepreneurial Monitor. And seven of them (Slovakia, Latvia, Poland, Hungary, Croatia, Romania, and Bulgaria) belong to efficiencydriven economies. Although it should be noted that Portugal, Lithuania, and Estonia are above the EU-28 average in entrepreneurial framework conditions and at the same time below the EU28 average of the European Innovation Scoreboard. On the other hand, the United Kingdom is above the EU-28 average of EIS and below the horizontal line which means the EU-28 average of entrepreneurial framework conditions.

Fig 4: Relation between the European Innovation Scoreboard and the entrepreneurial framework conditions



Horizontal line – entrepreneurial framework conditions, EU-28 average

Vertical line – European Innovation Scoreboard, EU-28 average

Source: Own study based on the European Innovation Scoreboard and the GEM (year 2016)

Summary

As the summary, Table 6 is presented. The country is counted to the leader (innovation, entrepreneurial) when the indicator is higher than 120% of the EU-28 average. The country is a strong innovator/strong entrepreneur when it is near the European average (90%-120% of the EU average). Moderate innovators or moderate entrepreneurs have their indicators between 50% and 90% of the EU-28 average. Lower than 50% of the EU average means modest innovators (there are no modest entrepreneurs in European Union countries). Additionally there is a column presenting countries divided into four groups taking into account innovative enterprises, based on the same methodology as earlier.

Table 6: Leader, strong, moderate and modest countries in innovations and entrepreneurship

	European Innovation Scoreboard (EIS)	Global Entrepreneurial Monitor (GEM)	Innovative enterprises (Community Innovation Survey - CIS)
Leader	Sweden, Denmark, Finland, Netherlands, United Kingdom, Germany	Netherlands, Estonia	Germany, Luxembourg, Belgium, Ireland, United Kingdom, Austria
Strong	Austria, Luxembourg, Belgium, Ireland, France, Slovenia	Denmark, Finland, Lithuania, Belgium, France, Luxembourg, Austria, Ireland, Sweden, Germany, Portugal, Latvia, Poland, United Kingdom, Spain, Slovenia, Cyprus	France, Netherlands, Finland, Sweden, Portugal, Greece, Denmark, Italy, Slovenia
Moderate	Czech Republic, Portugal, Estonia, Lithuania, Spain, Malta, Italy, Cyprus, Slovakia, Greece, Hungary, Latvia, Poland, Croatia	Slovakia, Bulgaria, Czech Republic, Romania, Hungary, Greece, Italy, Croatia	Lithuania, Czech Republic, Cyprus, Malta, Croatia, Spain, Slovakia, Estonia, Bulgaria, Hungary, Latvia
Modest	Bulgaria, Romania		Poland, Romania

Source: Own study base on European Innovation Scoreboard, Global Entrepreneurial Monitor and Eurostat (Community Innovation Survey).

Summarising, the same countries, which are leaders or strong innovators, are also leaders or strong entrepreneurs and have the higher level of innovative enterprises. Except Lithuania, Portugal, Latvia, Poland, Spain, and Cyprus, which belong to moderate innovators, but according to the GEM there are strong entrepreneurs and at the same time four of them (Lithuania, Latvia, Spain, and Cyprus) are moderate in the category of innovative enterprises, but Portugal is strong and Poland is modest. Generally there is a relation based on the fact that countries, which are leaders or strong entrepreneurs, are also leaders or strong innovators. Although it should be underlined that Estonia, which is strong entrepreneur with favourable entrepreneurial framework conditions, belongs to moderate innovators and the moderate group of

innovative enterprises. There is a relation between entrepreneurial activity and innovations, but while there are four groups of countries in the EIS (leader, strong, moderate, modest), there are no modest taking into account the GEM. At the same time there are four groups according to CIS. Relations between entrepreneurship and innovations is not always the same. For example Poland which is in moderate group of EIS is only modest according to CIS and strong in GEM and Czech Republic or Slovakia are always moderate. No country is always leader. It means that to be the best in innovative enterprises and entrepreneurship is not always mean to be a leader in EIS. So maybe EIS is not the best measure of innovativeness and entrepreneurial activity?

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