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*Antanas Buracas**

GLOBALIZATION AND NATIONAL DIFFERENCES IN EDUCATION, COMPETENCIES & INNOVATIONS: VYŠEHRAD GROUP AND BALTICS

Abstract

How philosophical and ideological relations between globalism and national contents of activity are transformed through specific macro- and regional interaction parameters of HR impact on innovations? The comparative research is based on presumption that competencies and skills for innovations are becoming decisive factors in the multicultural society under globalization; but the core education is developed usually with account of nationally-defined traditions. The simplified multiple criteria assessment methodology based on cobweb diagrams was applied to the global and regional expert evaluations of education quality determining knowledge and innovation development. The attention is given to compare global (the EU) and national human resource (HR) potential on learning, also comparative interdependencies of education–knowledge–innovation components, the impact of those 4 EU freedoms within the Vyšehrad Group and Baltic States as moderate innovators. The task was to compare learning potential of selected countries and reveal how smart education indicators could be applied as driving forces determining their competitive innovativeness, also applicability of international criteria used by the INSEAD and European Innovation Survey for comparative evaluations of national labour & vocational skills development. The international division of work applied to integration and rational use of local HR potentials suggests the accounting of national culture and education achievements.

Keywords: Comparative education parameters; Competency determinants; Skills and innovations; Vyšehrad Group and Baltic States

JEL F61; O15; O35; O57

* Antanas Buracas, Lithuanian Academy of Sciences & Vytauti Mgn University. e-mail: antanas@buracas.com

1. INTRODUCTION: GLOBALIZED APPROACHES TO NATIONAL KNOWLEDGE AND SKILLS

How philosophical and ideological relation between globalism and national contents of activity is transformed through specific macro- and regional interaction parameters of HR impact on innovations? The competencies as a cluster of knowledge, skills, abilities and motivation [1] are between key factors not only for innovation in the future society but also for rational evaluation of the fundamental problem of interaction between globalism and nationalism. It is also important to evaluate how free flows of capitals, goods, services and workers as basic principles of the EU functioning are influencing the innovativity and competitiveness of the selected Vyšehrad Group and Baltic States. Both groups of the countries were selected as typical newly EU members feeling most the impact of globalization when integrating their national culture and education into joint euromarket surrounding.

Last years of antiglobalism and euroscepticism expressions seen most in Hungary and Poland also activate this approach. As different from professional competencies in narrow sense, the innovative HR development anticipates the special importance of creativity and enterprising, with account of national cultural traditions, perceiving forecast of globalization impact and managing change, smart education of personalities and wide application of decision support systems.

It is important to evaluate how reliable are international expert assessments of competency and skills impact on innovation presented on basis of multiple criteria and multiparametric methodology when concluding on applicability for the regional comparative evaluations of education quality modern knowledge society. The criteria of social utility and sustainability in HR development are inadequate if to account all movement freedoms (labour, capital, goods and services) within the EU, impact and limits of brain drain, HR skills quality for the society development, long-life learning, stability of the social pension systems etc.

The attention in this review is given to interdependencies in HR education and knowledge components within multiple criteria evaluations of the integrative Baltic and Vyšehrad Group states; not all the dates on both country groups are integrated in some of the international reports used for comparative analysis below. The task is to evaluate how much indicators used by experts for global evaluations and academic ratings could be applied for evaluations of the competencies determining competitive innovativeness of the social activity within national surrounding of countries under review, for more rational distributing of their resources determining of labour & vocational skills.

The global competitiveness research initiated by the World Bank Group (WB, such as WEF reports on innovation), also INSEAD experts included some important core competency determinants interconnected with professional abilities,

learning quality and innovativeness of both education and producing organizations [2], [3], [4], [5]. The *core competencies* are knowledge, abilities, skills, attitudes and value orientations used and having the impact on professional activity and ability to perform certain activities best possible way, also leadership, innovation, communication, ability to improve performance and ability to get things done [6].

The factors determining the competencies and innovative activity — both global and national — also the determinants of core competencies and capabilities are interconnected [7]. The competitive globalization generated the core competency orientation to permanent learning abilities of the employees participating in their direct activity, their initiative and “soft” skills such as communication and teamwork, also entrepreneurship skills and readiness to evaluate the risk. At the same time, the innovation-oriented and competitive HR policy has evaluated the real and perspective learning needs and abilities to enlarge their professional competencies, provide adequate information, use ICT nets and smart AI opportunities, also evaluate expected financial benefits [8]. In the nearest future, AI-based tutoring system will become one of most productive globalization intervention into traditional learning helping students adopt individualized productive learning — self-regulation and self-explanation. As result, it leads to self-optimizing of learning organization and radical changes in education management.

Some important aspects of interaction between the globalization and national development could be revealed by comparing the core competencies and skills both of teaching personnel and (former) students as evaluated by employers or education experts. Smart info nets and digital technologies are widely used in the communication of knowledge, its development and exchange, in curriculum and education management information systems: computer-aided and internet-based training, learning content management and e-assessment (both formative and summative, testing, grading, self-assessing etc.), flexible distance learning, online education, digital educational collaboration, distributed learning, computer-mediated communication, multi-modal instruction, virtual education, personalized adaptive learning, networked virtual learning environments etc. [9], [10]. Modern smart technologies also help to monitor and evaluate the differences between global competency parameters and its psychological or managerial components (such as recognition of needs, communicational, conflict managing, decision making, educational, cultural, etc.), determining the quality of professional services. It is also significant for R2R, i.e., for learning abilities and managing skills for providing strategic, financial and operational feedback to understand how a business is performing.

The key emerging bottleneck for the development of a knowledge-intensive business sector is the availability of skilled human resources for innovation

creation. Baltic states were ranked mostly better than Vyšehrad Group as moderate innovators between 190 reviewed countries: Estonia ranked 12th, Latvia — 14th and Lithuania 21st, when Poland — 24th, Czech Republic — 27th, Slovak Republic — 33rd, and Hungary — 41st [11]. The insufficient entrepreneurship competencies and productive innovativeness as surrounding are determined by quality of education and special professional practice, development of innovative business incubators, also promoting start-ups, tertiary enrollment rate, etc.

According to Eurostat, employment in knowledge-intensive activities (KIA) was 36% of total. Employment in high-tech manufacturing sectors (as share of total employment) was in most selected Vyšehrad Group countries higher than in EU-28 (1.1%) except Poland, and lower in Latvia and Lithuania (Table 1). But EU-28 level of employment in high-tech knowledge-intensive service (2.9%) was equal only in Czech Republic and only Estonia was surpassing this level by HR activities into knowledge-intensive service (4%); near to this level were also Slovakia and Latvia.

Table 1. Employment rates in high-tech sectors: EU, Baltics and Vyšehrad Group countries

Groups of selected countries, % of total employment	High-tech manufacturing	High-tech knowledge-intensive service
EU-28	1.1	2.9
Vyšehrad Group		
Czech Republic	1.6	2.9
Hungary	2.3	2.4
Poland	0.8	2.2
Slovakia	1.3	2.8
Baltics		
Estonia	1.1	4
Latvia	0.5	2.8
Lithuania	...	2

Source: selected from Eurostat, 2017.

The Baltic States prepared smart specialization strategy for 2014–2020 oriented to the innovative tasks affecting higher education, innovative specialization priorities, wide e-orientation with help of modern ICT infrastructure (content development, interoperability of nets, cloud computing solutions and services etc.). Researchers as % of R&D personnel in business enterprising sectors, according to Eurostat statistics, exceeded 70% in Lithuania, Estonia and Hungary, and was between 60 and 70% in Poland and Slovakia (higher than in EU-28; in Latvia — near to this level); Slovenia and Czech Republic — near 50%.

The innovation developments evaluated by special expert review are substantially depending of innovative technologies applied or innovative products or

services produced and/or exported, also expected results of patenting, publications or royalties per personnel (head). They are related to the overall level of education, the quality of the education system, personnel training and retraining, professional management adequacy, encouraging creativity.

The relationship between rewards and performance stability, the country's ability to attract talents from elsewhere and keep their own, impact of ICT, digital nets and e-education on competencies and innovations are also important [12], [13]. P. ex., the problematic factors for doing business in Lithuania and Latvia (besides inefficient government bureaucracy and taxation) are inadequately educated workforce, insufficient capacity to innovate [11]. The Czech Republic and Hungary are starting a business easier by reducing the cost and the time required to register companies directly through an online system. Hungary and Latvia also made paying taxes less complicated and less costly for SMB what is important for free innovative development. Poland made resolving insolvency easier by introducing new restructuring and remuneration mechanisms, reducing labour market and construction regulations.

The research below was based mostly on expert data presented in annual reports and evaluating the sustainable impact of HR competencies and innovations in selected countries published by the WBG, WEF, INSEAD, WIPO etc. experts. Special attention was given to Network Readiness Index (NRI), Global Talent Competitiveness Index (GTCI), Global Innovation Index (GII) [2] — [5], [10]. They revealed that the input and output of global innovations can be measured by employable (or labor) and vocational skills (LV) and global knowledge (professional, managerial or leadership — GK) skills developing with perspective tasks of one or other country. So, the general frame what indicators will be used is determined by the data presented by experts mentioned above.

The *purpose* of this review is to reveal some aspects of the skills formation and their impact on the core competencies by evaluating the comparative interrelations between regional education and integrative macro parameters of Vyšehrad Group and Baltic countries revealing impact of globalization on national innovation development. The prevailing *methods* include multicriteria approach to the Eurostat a/o expert social and economic evaluations characterizing innovative impact of education and ICT in the countries under review.

The *object* of the paper is globalization impact on HR development characterized by education, competency and skills parameters presented in the international evaluations of state competitiveness, growth and innovative activity. As the research revealed, the core innovation determinants applied in the international evaluations of sustainable macroeconomic development do not detail some sophisticated aspects determining the impact of professional competencies on innovativeness of business and education. As a result, they do not suggest the most rational solutions for the competitive education quality or business

policy in the selected country as well as do not assess the lifestyle differences and specific needs resulting from deep social differentiation. The review of multiparametric cobweb interactions revealed the criterial inadequacy of competence parameters used by international experts for some sustainable evaluations of innovation processes [2]–[5], [14].

2. MEASURING THE IMPACT OF EDUCATION AND SKILLS: BALTIC AND VYŠEHRAD GROUP STATES

The main education development level determines the innovation potential based on specific competencies, skills and abilities of the population, also possibilities of lifelong learning and training, including obstacles to education a/o parameters supporting sustainable social status of working HR. In the Vyšehrad Group states and Estonia, most of registered education parameters are substantially higher than average levels of the EU (Tables 2–5). Below, the Eurostat data presented by experts are characterizing the current situation and commented for comparative review purposes.

The main type of training in the EU is non-formal (36.8% of all 40,3%) with high level of educational achievement (61.3% with tertiary levels, Table 2). The

Table 2. Participation rate in education and training, by types and levels

Countries, 2011, %	Type of training			All types of training						
	All	Formal	Non-formal	Sex		Age		Level of education achievement (ISCED levels)		
				Men	Women	Age 25–34	Age 55–64	Lower secondary or less (levels 0–2)	Upper secondary & post-secondary (levels 3 and 4)	Tertiary (levels 5 and 6)
EU-27	40.3	6.2	36.8	40.7	39.9	48.5	26.6	21.8	37.7	61.3
Vyšehrad Group										
Czech Rep.	37.1	3.7	34.9	37.2	37	44.2	20.4	10.5	33.9	64.2
Hungary	41.1	6.5	37.6	43	39.4	51.8	21.7	24.7	39.8	58.1
Poland	24.2	5.4	21	23.2	25.2	36	9.6	5.8	16.7	51.7
Slovakia	41.6	5.8	38.3	41.4	41.9	49.4	21.9	...	35.5	63.5
Baltics										
Estonia	49.9	6.6	48.0	46.1	53.3	64.5	32.6	22.9	41.6	67.0
Latvia	32.3	4.3	30.0	26.9	37.3	38.0	19.7	10.6	24.6	54.3
Lithuania	28.5	4.0	25.9	23.4	33.1	37.3	16.2	7.2	16.0	54.5

Source: selected from Eurostat [15].

Vyšehrad Group states (except Poland) and Estonia have evidently levels similar to EU average, in all Baltic states the women participation in training outperforms the men. Poland, Latvia, Lithuania are lagging below EU average especially by training and all levels of education.

In selected countries, the differences between men-women participating in education and training were more significant in Poland, Latvia and Lithuania, i.e. countries where rate of all participants in training was also lower than in EU-27 a/o states. At the same time, the part of graduated professionals working in highly innovative education workplaces reviewed about decade before shown that: Poland and Lithuania were somewhat higher (adequately 22.6 and 21.9%) than the selected Europe-19 country mean (19.1), Hungary, Estonia and Czech Republic— lower (adequately 10.2; 17; 17.6%) [15].

It is important to identify and compare the main obstacles not permitting youngsters to participate in the education and training (Table 3). They are different in all compared groups esp. if to compare limited time due to a family (Hungary and Slovakia — about 6–7%, when Czech and Poland nearly EU average — 21–22%) and health or age problems (Estonia — 16.3%, Lithuania — 14.3%, Poland — 11.6% — and Hungary — 4.6%, Latvia — 3.8%). It looks some such differences could be resulted by some misunderstanding of the same formulations of questionnaires presented by reviewers. The low access to computer or

Table 3. Obstacles to participation in education and training, %

Selected countries and EU	Health or age	None within reachable distance	No time due to family	Did not have prerequisite	Expensive, could not afford	Lack of employer public service support	Conflict with work schedule	No need	Other personal reasons	Could not find what was wanted	No access to comput. or internet (distant learning)
EU-27	8.5	6.1	20.9	4.2	13.2	6.0	18.0	50.0	14.6	6.6	1.6
Vyšehrad Group											
Czech Rep.	7.1	3.7	22.1	2.1	7.6	4.9	11.1	41.6	16.3	7.9	1.2
Hungary	4.6	5.1	6.7	2.3	11.4	4.1	8.2	87.3	1.6	2	1.3
Poland	11.6	2.9	21.6	1.8	15.5	5.2	11.8	60.1	13.6	5.7	0.6
Slovakia	6.2	1.4	6	0.7	4.7	1.8	4.9	30	4.6	2	0.5
Baltics											
Estonia	16.3	14	14.6	1.4	22.0	4.8	24.0	...	15.9	15.4	2.8
Latvia	3.8	6.8	9.9	4.9	19.3	7.3	15.3	87.7	4.6	9.4	2.3
Lithuania	14.3	3.9	9.4	4.3	19.0	2.0	20.0	68.4	16.4	2.8	1.3

Source: selected from Eurostat [15].

internet is between minor obstacles — 1.3 — 2.8% (for distant learning; but in Romania it amounts 10.4%). The widest group of selected data identified the low motivation to continue education as main obstacle, based on conviction that there is no need for that (some expected to continue by individual ways of learning). Hungary, Latvia and Lithuania are leading by passive drive to motivation in education comparing with average for the EU at about 50%; that means anyway also low iniciativeness and inovativeness of less educated people. The lowest part of people not feeling need to continue study are in Norway and Finland. The conflict with work schedule was second group of obstacles by their significance level for the Baltic States.

The accelerated development of ICT and AI in about all the fields of productive and social activity within nearest future, quick changes of professions in active demand requires to develop the lifelong learning more actively. The comparative situation in the EU-28, both Vyšehrad Group and Baltics states is presented in the Table 4. It shows highest levels of lifelong learning in Estonia in both population groups. Also, medium level of lifelong learning in the EU-28 is higher than in both selected groups of countries (except Estonia, also Czech Rep. in 2011). The % of female participating in all countries is higher than % of males what is interconnected with continuous surpassing involvement of females into social working. The lowest participation was registered in Poland and Slovakia; there antiglobalistic opinions and traditional religious indoctrination perhaps influences the learning continuation of older generations more often than in the EU-28 average.

The data shows the trend of lifelong learning amelioration when comparing the participation rates (except Czech Rep., Slovakia and Poland). The percentage

Table 4. Lifelong learning in the EU, Vyšehrad Group and Baltic States, 2011 and 2016

	Total		Male		Female	
	2011	2016	2011	2016	2011	2016
EU-28	9.1	10.8	8.3	9.8	10.2	11.7
Vyšehrad Group						
Czech Rep.	11.6	8.8	11.4	8.6	11.9	9
Hungary	3	6.3	2.8	5.6	3.1	7
Poland	4.4	3.7	3.9	3.4	4.9	4
Slovakia	4.1	2.9	3.5	2.6	4.6	3.2
Baltics						
Estonia	11.9	15.7	9.2	12.9	14.5	18.4
Latvia	5.4	7.3	4.1	6.1	6.5	8.5
Lithuania	6	6	4.5	5.1	7.3	6.8

Source: selected from Eurostat [15]. Note: % of the aged 25 to 64 participating in education and training.

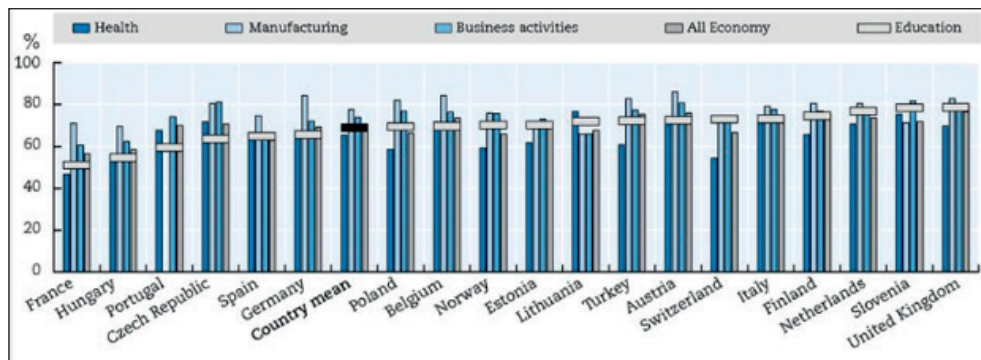


Fig. 2. Graduates in the innovative workplaces by main sectors of activity, %
 Source: EU [16].

of innovative workplaces by activity sectors in Lithuania, Estonia and Poland was nearly similar to the education sector country mean in the EU Community Innovation Survey and much lower — in Czech Rep. and Hungary (Fig. 2). The manufacturing and business were leading sectors by innovative workplaces in Poland and Czech Rep., and health sector — in Lithuania where % of working graduates was highest.

The statistics revealing changes in employment of recent young graduates within the EU states not in education sector last decade is important for evaluation of education quality and professional orientation (Fig. 3). It shows that situation detectably ameliorated in Lithuania, Estonia, Hungary, now they are mostly ameliorating its employment indicators. Also Czech Rep. and Estonia are nearly or achieved average 80% of employment (as EU-28 target for 2020).

The last 5 years the early leavers from education and training amounted to about 11–12% of the EU-28 population aged 18–24. Their comparative view characterizes additionally are their knowledge motivation and their interests ameliorating their situation in the future strong enough (Fig. 4). First-of-all, the national targets for ameliorating this indicator for Europe 2020 are different; the levels in Hungary, Estonia and Lithuania are below both national and EU-28 targets, they slowly ameliorated with diminishing % of leavers; Latvia just declined its national target level to the EU perspective level.

The comparison of the young employed people with motivation to work in the EU-28 reveals some potential possibilities of more rational learning stimulus reorientation (Fig. 5).

About 2/5 of young leavers in the EU average want to work and about the same part are employed (both groups in Hungary, Estonia amount even more than 2/3 and Latvia — more than 4/5); only in Lithuania the part of youngsters not wanting to work is about half (Fig. 5).

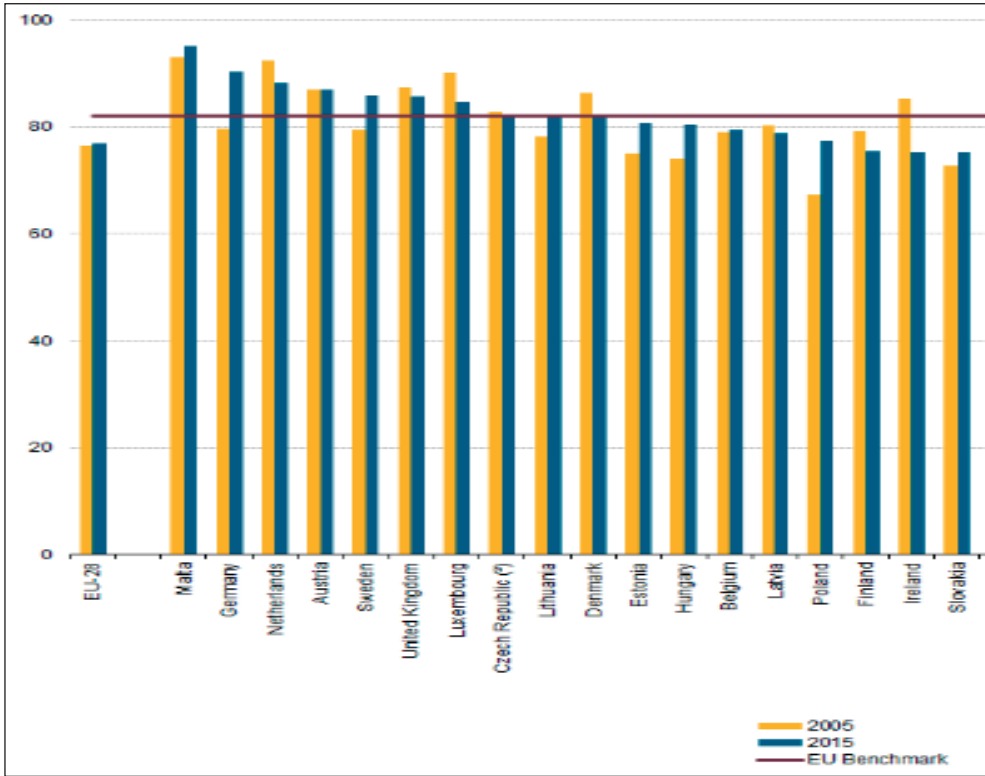


Fig. 3 Employment rates of recent graduates not in education and training, 2005 and 2015. Source: EU [16]. Note: in % of population, aged 20–34.

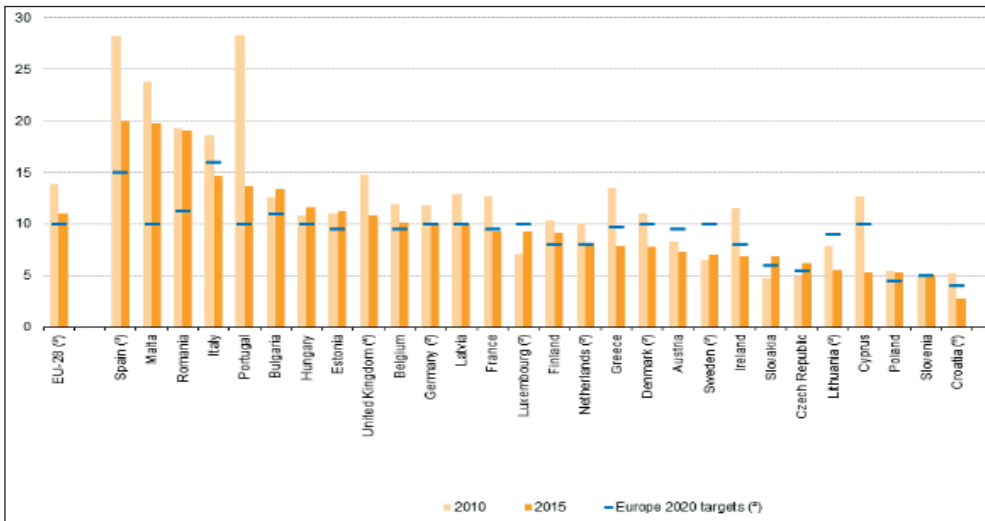


Fig. 4 Early leavers from education and training, 2010 and 2015. Source: EU [16]. Note: in % of population, aged 20–34.

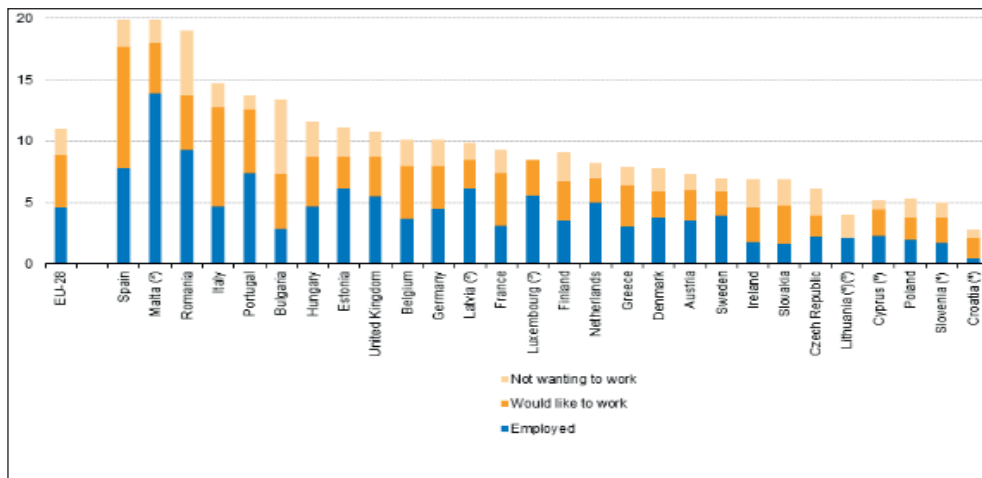


Fig. 5 Distribution of early leavers from education and training by labour status in EU-28, 2015. Source: EU [16]. Note: in % of population, aged 20–34.

Table 5. Distribution of early leavers from education and training by sex in EU-28

	Total (young men and women)					Young men				Young women					
	Total (employed and not employed)	of which				Total (employed and not employed)	of which			Total (employed and not employed)	of which				
		Employed	Not employed	of which			Employed	Not employed	Would like to work		Total (employed and not employed)	Employed	Not employed	of which	
				Would like to work	Not wanting to work									Would like to work	Not wanting to work
EU-28	10.7	4.5	6.2	4	2.2	12.2	5.9	6.3	4.8	9.2	3.1	6.1	3.2	2.8	
Vyšehrad Group															
Czech Rep.	6.6	2.7	3.9	1.6	2.3	6.6	3.4	3.3	2	6.6	2	4.6	1.2	3.4	
Hungary	12.4	5.2	7.2	3.9	3.3	12.9	7.3	5.7	4.3	11.8	3	8.8	3.4	5.4	
Poland	5.2	1.9	3.2	1.6	1.6	6.4	3	3.3	2	3.9	0.8	3.1	1.2	2	
Slovakia	7.4	2	5.4	2.6	2.8	7.6	2.8	4.7	3.2	7.2	1.1	6.1	2	4.2	
Baltic States															
Estonia	10.9	6.8	4.1	2.4	1.7	14.3	10.7	3.6	2.8	7.4	2.9	4.5	...	2.6	
Latvia	10	4.4	5.6	3.5	2.1	13.7	6.3	7.4	5.8	6.2	2.4	3.8	...	2.7	
Lithuania	4.8	...	3.1	6	...	3.8	...	3.6	

Source: selected from EU [15]. Note: in % of population aged 18–24.

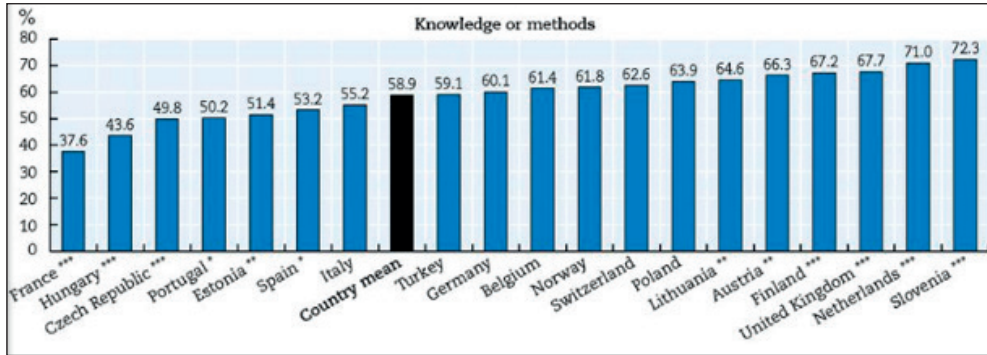


Fig. 6. Graduates working in the education innovative workplaces by knowledge methods (2016). *Source:* selected from EU [16].

More detailed distribution of the early young leavers in the EU-28 by their labour status, motivation to work and sex is presented in the Table 5. It fixed that % of not employed early young leavers in Slovakia and Latvia is near their level in the EU-28 (in Hungary higher this level and in Lithuania is about twice less). In EU-28 and Vyšehrad Group countries, part of young woman leavers was 1/3–1/4 less than part of young men, in Baltic States it was near 1/2 less. The more of young women early leavers not liked to work in Hungary and Slovakia comparing with the EU-28. The % of young men leavers in most of selected countries which would like to work was less than in the EU-28 (except Latvia).

The education professionals *by innovation knowledge type or methods* in the innovative workplaces were distributed in the European countries as shown in Fig. 6. The place of Slovenia (72.3%), also Lithuania (64.6%) and Poland (63.9%) is higher than European country mean level (58.9%), Hungary, Czech Rep. and Estonia — lower (43.6; 49.8; 51.4%). But *by output of innovative products or services* (Fig. 7) the view was different — besides Hungary and Czech Rep. (22.3;

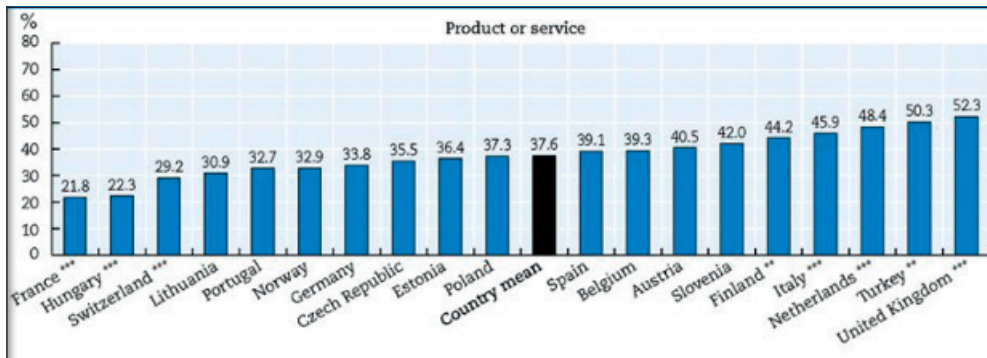


Fig. 7. Graduates working in the education innovative workplaces by product or service. *Source:* selected from EU [16].

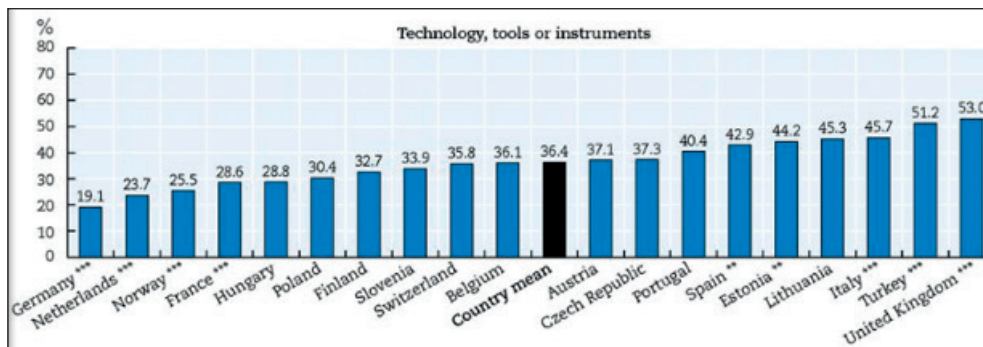


Fig. 8. Graduates working in the education innovative workplaces by technology or tools
 Source: selected from EU [16].

35.5%), also Lithuania (30.9%), and Estonia (36.4%) were lower than European country mean (37.6%), comparative data for Slovenia were also higher (42%).

By *technology or tools used* both Lithuanian and Estonian education professionals in highly innovative workplaces (Fig. 8) were on higher levels (45.3 and 44.3%) than European country mean (36.4%), Hungary, Poland and Slovenia were below the EU mean (adequately 28.8; 30.4 and 33.9%).

The distribution by activity sectors regarding *technology or tools used in main activity sectors* (Fig. 9) shown better situation of education in Estonia and Lithuania, the leading of Estonia in health sector, Poland — in manufacturing and Czech Rep. nearly country mean by manufacturing and business activities.

The Eurostat data presented above are rather important for comparative evaluation of main trends in education and training according to manpower demand changes and traditions of international division of productive activities in the EU. They are at least not sufficient for detailed recommendations for ameliorating the education policy according to perspective aims of national development

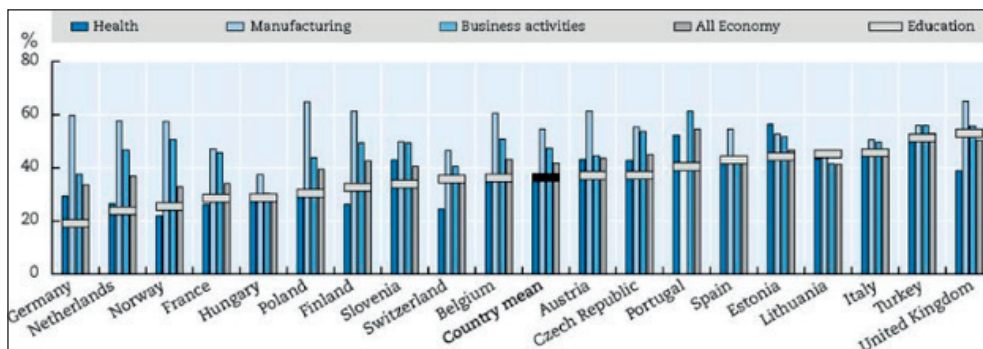


Fig. 9. Education graduates working in the innovative workplaces by activities regarding technology or tools innovation. Source: selected from EU [16].

within Baltic countries with urgent needs of continuing European economic integration and consequent specialization. However, they are significant for the multicriterial evaluation of EU and national HR sustainable development criteria and, at last, modelling of universal sustainability at macro level.

3. GLOBALIZATION AND RELATIONS BETWEEN COMPETENCIES AND INNOVATIONS IN THE BALTIC AND VYŠEHRAD GROUP STATES

The measurement techniques of skills, competencies and innovations are too generalized in all international development evaluations under review as result of lack of detailed comparative data for most actual content factors [2], [14], [17] — [20]. WEF subindex of education and skills is measured by adult literacy of the population, part of their overall secondary and higher education; NRI distinguishes the use of mobile phones and the wider Internet accessibility, use of ICT in education and e-management a/o [11], [20]. That is not enough for sophisticated review of impetus determining education quality, innovative potential and general innovative sustainable development.

A generalized review of the most important educational development factors affecting competitiveness in the Vyšehrad Group countries (Fig. 10–17) and their comparison shows that the number of education indicators (number of pupils per teacher, higher education, lifelong learning, part of foreign students, virtual social networking use in the learning process) is on similar interval (most lagging in technical or vocational training). Lithuania and Latvia performed below the average of the EU for most dimensions, except for: Human resources (HR), also Finance and support. Relatively worst performing indicators are: Public-private co-publications, NonEU doctorate students, License and patent revenues from abroad, PCT patent applications in societal challenges, and PCT patent applications. Performance above average is observed for such evaluations as: Non-R&D innovation expenditures, Population with completed tertiary education, Venture capital investments and Youth with upper secondary level education.

More detailed comparative indices of HR and education development for the Baltic and selected Vyšehrad Group States presented in the Fig. 10–17 are based on INSEAD [10] and European Innovation Scoreboard [9] expert evaluations. The comparative analysis of HR and education development revealed that the situation of Baltic and Vyšehrad Group States are different by such parameters as Vocational enrollment (first group significantly below except problematic Hungary), also by preparing Technicians a/o professionals; the levels of Formal education, International students, Relevance of education system to the economy, also R&D expenditures are problematic for all states.

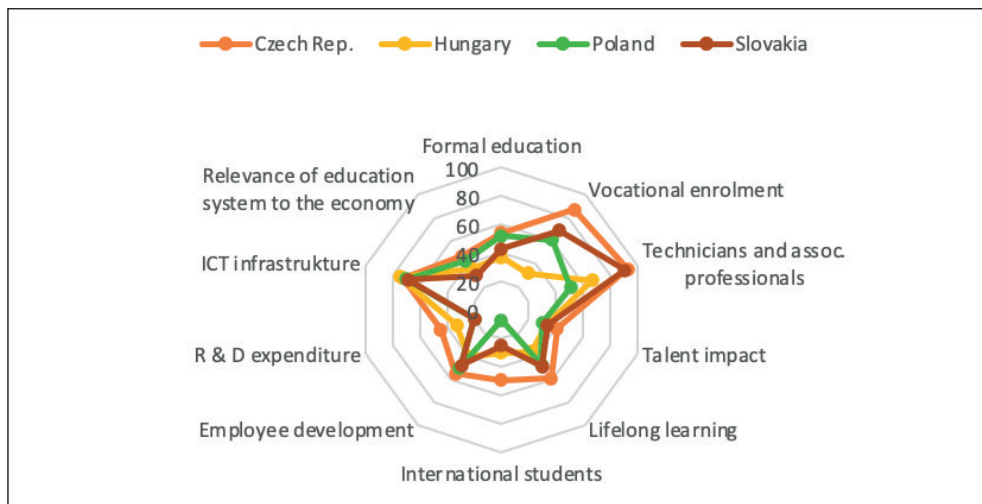


Fig. 10. Comparative factors of HR and education development in the Vyšehrad Group countries. *Source:* data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

For Estonia, skills gap as a major constrain is mostly accented factor, and significance of Talent impact is the highest between selected countries (Fig. 11).

The cause for concern is lag of about all selected states in national talent development and preservation; in the Baltic countries — as well as the formation of professional skills needed according to globalization and integration to the EU, increase of the funds for applied research because their lower level leads

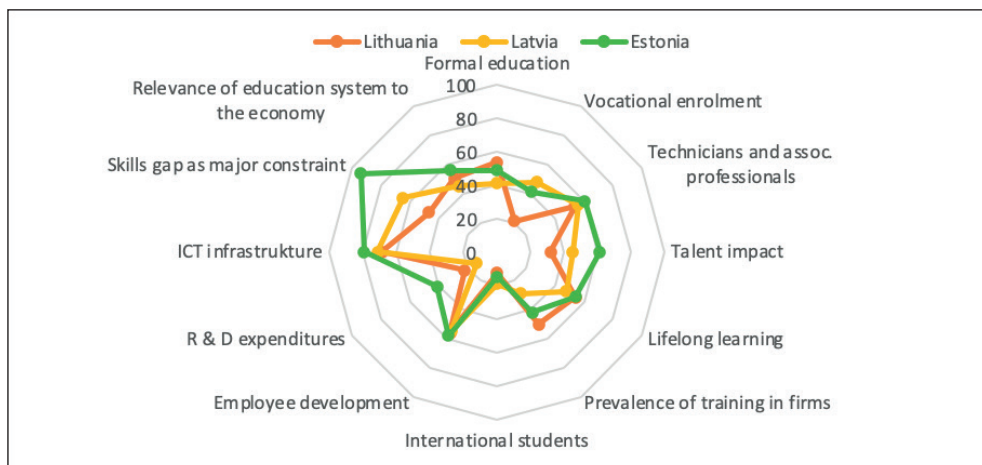


Fig. 11. Comparative factors of HR and education development in the Baltic countries. *Notes:* all sub-index rankings in expert evaluations used for cob-web diagram are between 0 and 100. *Source:* data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

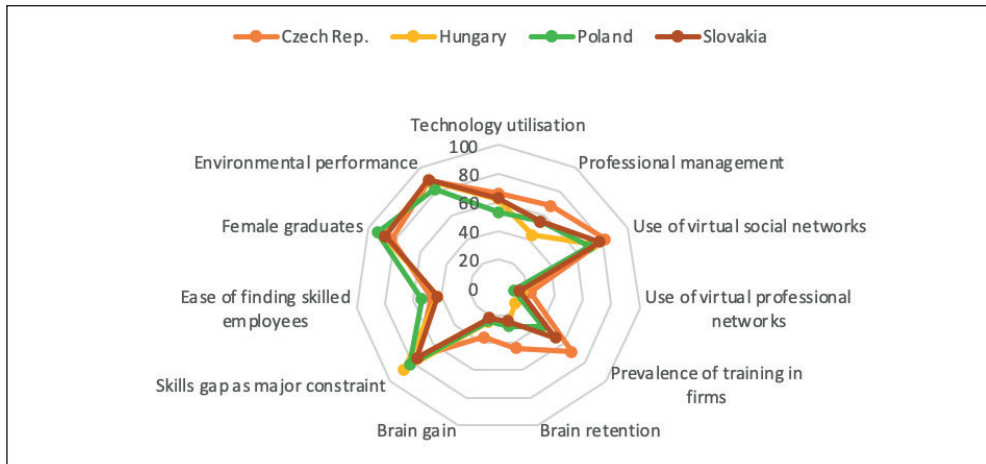


Fig. 12. Indices of professional education surrounding in the Vyšehrad Group countries.
 Source: data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

to backwardness by innovation performance (return). Fig. 12–13 revealed that many those problems are dependent from low level of R&D expenditures determining low brain gain, vocational enrolment and employable skills (especially in Lithuania). But both groups of countries achieved high level in use of virtual social nets within EU; use of virtual professional nets is on very low level (20–26 scores), when this indicator is so important for smart innovative and sustainable economies (Fig. 12).

By skills gap the scores of the Baltics differs from 94 scores in Estonia, nearly 80 — for Vyšehrad Group countries to 47 in Lithuania. Rather similar situation is with prevalence of training in firms: evaluation differs from low levels in Latvia (29) and Hungary (16) to 41 in Poland, 51 in Lithuania and 68 in Czech Rep. (Fig. 12–13).

Both more rapid development of professional education, management and retraining of specialists, along with the smart education and ICT infrastructure, should be given greater attention in the expert evaluations of the global innovation and talent competitiveness indices (together with the use of social networks for developing competence: [2], [9]). Between the global talent competitiveness components characterizing the professional education, the work efficiency and productivity indicators, the relationship of pay to productivity are also attributed to the factors hindering the ingenuity in Baltic countries. In addition, the export level of professional skills-intensive products and intensive services assessed by the experts was accounted.

The comparative data of *skills efficiency* are presented in Fig. 14–15. They revealed short bottlenecks specific for all selected countries in the labour productivity

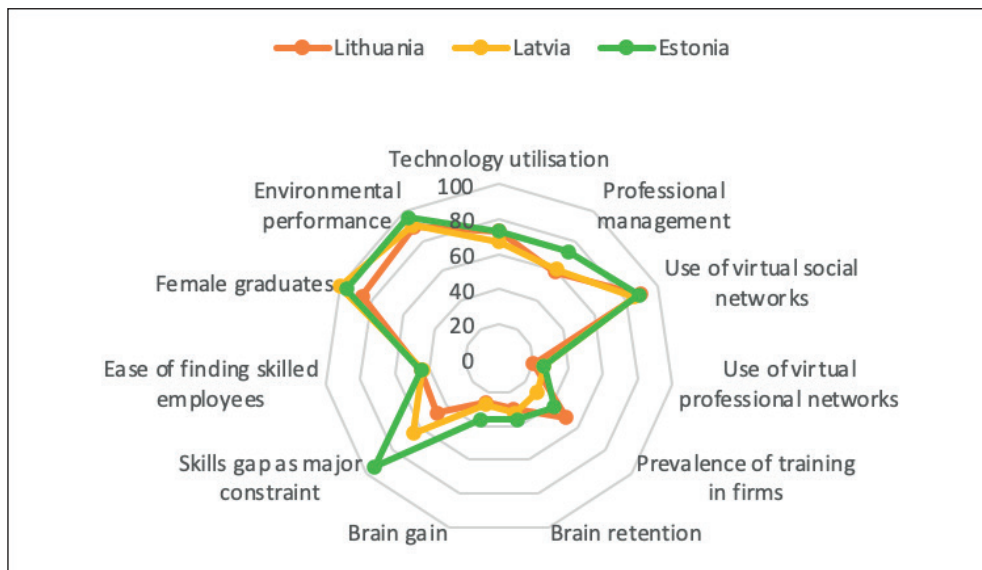


Fig. 13. Indices of professional education surrounding in the Baltic countries. *Source:* data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

per employee (Vyšehrad Group — between 30 and 35 scores; Baltics — 27 — 30), university rankings (Vyšehrad Group — 20–25 scores, Latvia — 19, Lithuania 22 and Estonia 30 scores). In both groups of countries, the problematic are

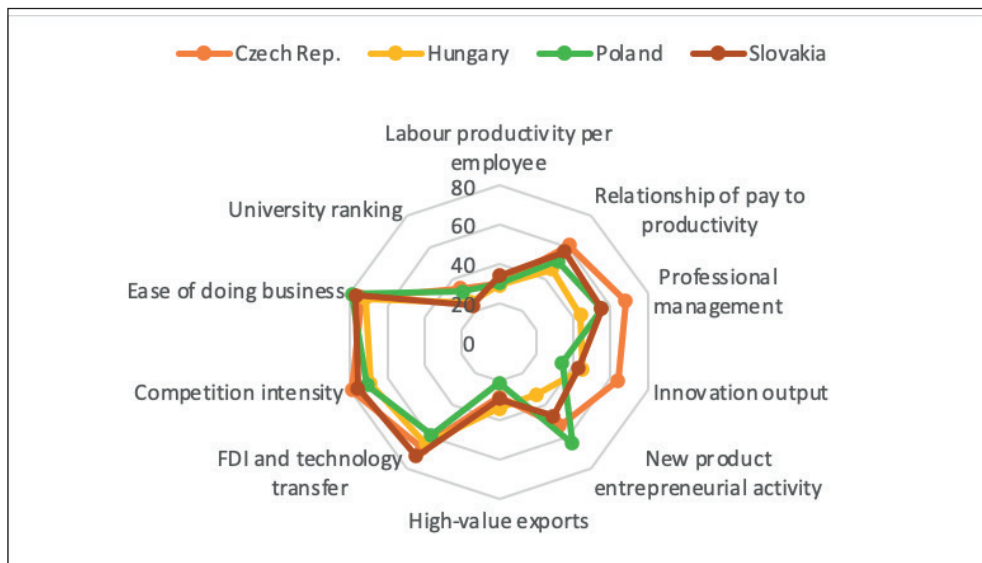


Fig. 14. Main factors of efficiency dependence from education and competencies in the Vyšehrad Group countries. *Source:* data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

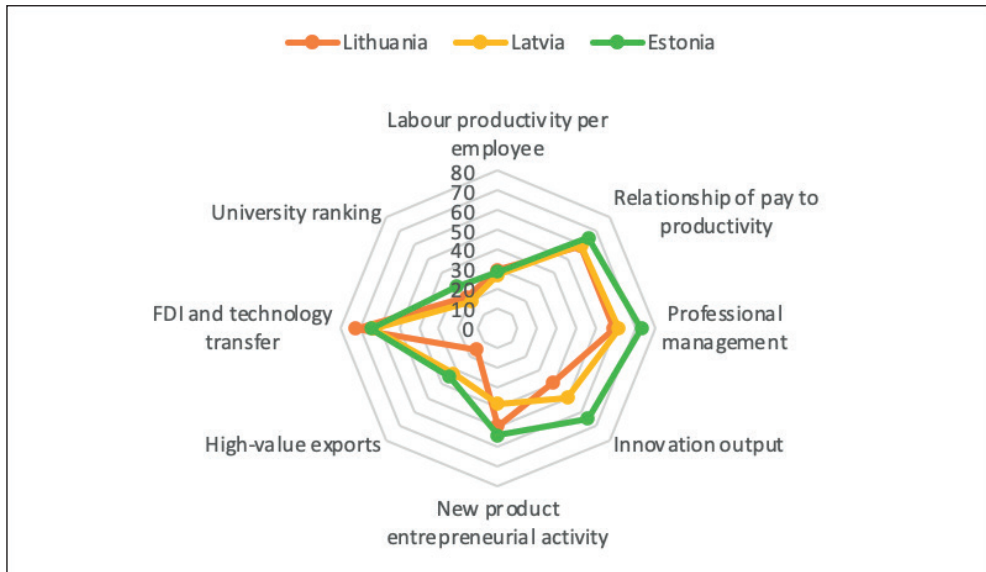


Fig. 15. Main factors of efficiency dependence from education and competencies in the Baltics. *Source:* data selected by author for the multicriterial diagram from INSEAD expert evaluations [3].

low level achieved in high-value exports and the differences in application of skills to this sector (Lithuania — 15 scores, Poland 21, Slovakia and Hungary — nearly 30, Latvia and Estonia — respectively 32 and 34 scores). The differentiation of countries by innovation output is moderate: highest level in Estonia — 65 scores and Czech Rep. — 64 scores, Slovakia and Hungary — about 43, Poland — 34 scores; other Baltics vary from 39 (Lithuania) to 49 (Latvia).

All selected countries are on rather high levels by FDI and technology transfer: Vyšehrad Group — between 72 scores (Slovakia) and 59 (Poland); Baltics — from 72 scores (Lithuania) to 63–64 respectively in Latvia and Estonia. The wide variation is in new product entrepreneurial activity: from 64 scores for Poland to 33 for Hungary; Slovakia — 47 scores; Baltics vary between 54 scores (Estonia) and 38 (Latvia). At the same time, innovation output fluctuates from 64 scores for Czech Rep. to 34 for Poland and from 64.5 scores for Estonia to 39 for Lithuania. Last years, less variation of the Vyšehrad Group countries is in rank by pay to productivity: between 46 scores for Hungary and 57 for Slovakia; and Baltics — between 59–60 (respectively Lithuania and Latvia) and 65 (Estonia) scores.

Student involvement in scientific research and related innovative business activities through specially prepared study programs, professional practices and other forms of cooperation with business smart specialization events, as well as the international exchange of knowledge DB and ICT packages, organization

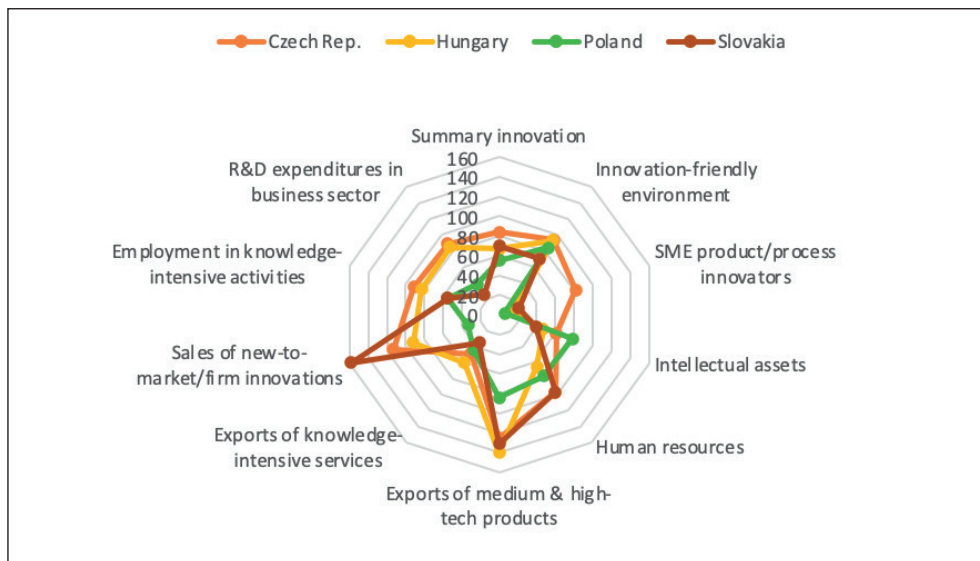


Fig. 16. Main factors of professional performance in the Vyšehrad Group countries relative to the EU, 2016. *Source:* data selected by author for the multicriterial diagram from [9].

(jointly with foreign academic institutions) of graduate courses for teachers and students, and recognition of common diplomas for specialists — all this makes a positive impact on the development of professional competence.

Better opportunities to continue professional studies and to use of smart infrastructure a/o latest digital technology for research and professional skills development, as well as grants and other incentives for young postgraduates are creating the necessary conditions for the wider development of perspective research and innovative business ideas [10]. The impact of globalization as important source of economic competitiveness influence the innovative efficiency by uneven modes and forms. So, both Vyšehrad Group and Baltic states are at distance from the EU average (except sales of new-to-market innovations in Slovakia): the economic efficiency of innovations of Czech Rep. was evaluated at 84%, Slovakia and Hungary — 70%, Poland — 55%. At the same time, Lithuania was only at 29%, Latvia — 44% EU level and Estonia — 56% (Fig. 16–17). This was determined by wide distribution of selected countries by sales share of new products and innovations — from Slovakia (respectively 131 and 158%) to Poland (84 and 33%); Estonia — 76 and 63%, Lithuania and Latvia (respectively in the interval between 57 and 40%), also by low levels of research expenditures in business (respectively 80–85% in Czech Rep. and Hungary, 57% in Estonia, about 40% in Poland, 26% Slovakia, 22% in Lithuania and 11% in Latvia).

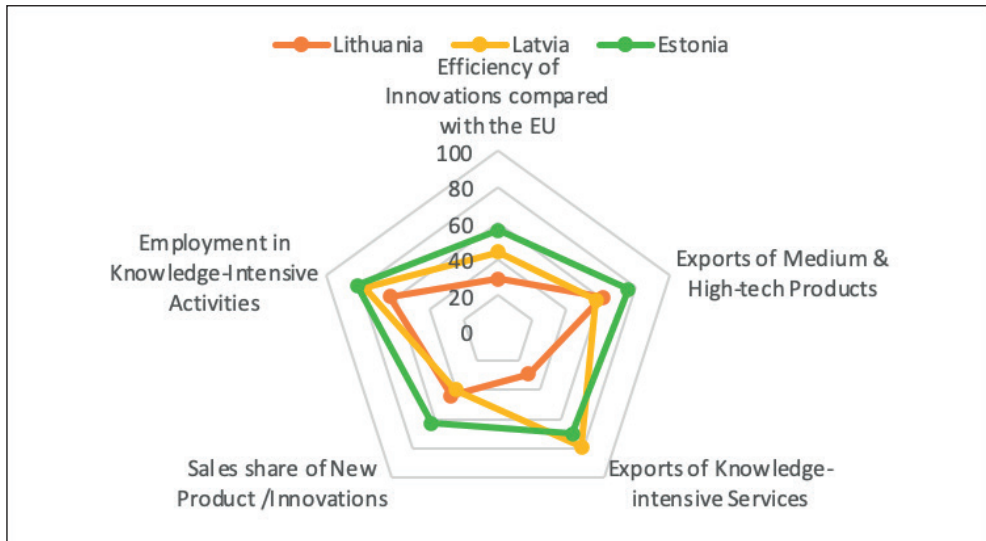


Fig. 17. Main factors of professional performance in the Baltic countries relative to the EU, 2016. *Source:* data selected by author for the multicriterial diagram from [9].

Significant variation of selected country levels comparing with the EU average is also detected by exports of medium and high-tech products (from 84% in Poland to about 130% in Slovakia and Hungary; more moderate are differences between the Baltics — from 57% in Latvia to 76% in Estonia). By export of knowledge-intensive services, the country levels range less: only 29% for Lithuania, 35–40% respectively for Slovakia and Poland, 60% — Hungary, 70 and 79% respectively Estonia and Latvia.

The expert evaluations presented in the international reports showed that Baltic states have unused reserves for developing new entrepreneurial activity in knowledge-intensive services; it is rather serious problem for Lithuania, it depends from rather low evaluation of researchers' productivity and talent impact on innovation. As a result, Lithuania is behind Estonia and Latvia by innovation output. Most of researchers (76.9%) in Lithuania worked in the public sector but only 23.1% of them were associated with the business enterprises [21]. The more detailed evaluation of institutional impact on the competency formation revealed the importance of cooperation between science and business in the Baltic states in the recent years. The expected changes must include not only academic organizations, like universities and colleges, but also integrate the technology transfer centers, science and technological incubators, parks or valleys participating in the implementation of innovative ideas, more widely adapt ICT infrastructure for the smart education.

In the process of consecutive development of competencies and skills, important attention must be devoted to online e-education, virtual reality, robotics,

digital transfer of knowledge and skills, expertise and ingenuity of assessment technologies [22], which should improve the quality of trained specialists and their adaptation to the globalization of society. Among the changes favored by higher educational institutions, the development of creativity, of interdisciplinary studies is allowing to better acquire and use the innovative professional skills [23]. The popular suggestions are to teach all innovative offspring of the simplified business, finance, management, sociology and similar enterprising courses; they would help engineers, technicians a/o leading specialists to become more quickly the wide profile managers and investors in professional fields effectively promoting perspective ideas [24]. Most of special skills or professional decisions necessary for the qualified innovation risk assessment can be developed by disposing relevant e.DB, modern ICT and AI. Rather important is to increase the use of so-called demonstration packages and other computer tools, experimental classes to consolidate the vocational skills. The new e-learning opportunities liberate in some degree both the students and teachers from the collective classroom work; the remote virtual studies, “brain battles” and so on are expanded. The special system of incentives for higher education institutions is based on deep e-learning processes (Hardesty, 2017). All these approaches are oriented both to innovative efficiency and sustainability of developing HR potential.

4. CONCLUSIONS

— The *global* innovation policy is based on the multiple criteria of HR education, competency and skills development in the countries under review with account of some *national* education and cultural traditions both in specific and general approaches within global dynamic process.

— *Globalization* transformed traditional *national* and even professional criteria of education: huge attention is given to informatics, management, law is in all selected countries under review; but integrative interdisciplinary approach withens the attention to some customary ethnic traditions by using multiple criteria approach.

— The technological innovations open doors to innovative productivity in the education studies and better integration of national traditions into humanities and culture. Modern education techniques are applied for converting the IP into professional IQ in most of the countries but with different success depending from funding and smart ICT infrastructure.

— The dictate of consumer society resulting as two-sided consequence of globalization is stimulating the growth of personal and societal needs, development of personalities and, at the same time, causes a person’s unilateral interest and degradation dangers.

— The economic efficiency of innovations in some Vyšehrad Group countries is higher than in Latvia and Lithuania, what is resulting from better professional education in developing sustainable HR potential. At the same time, the measured parameters of innovative efficiency varie in different countries as moderate innovators; Estonia and Slovenia are leading in more aspects than other selected countries.

— The modernization of competency education and skills training under globalization impact requires to integrate and develop more the critical, entrepreneurial, creative thinking and social capital skills by using more widely the innovative abilities of contemporary smart technologies.

— It is important to update systematically the smart techniques of self-learning, also personal training plans and aspirations, providing increasing access to the rapidly developing e. technologies for individual innovative skills development, initiativeness, rational competitiveness and entrepreneurship, also sense of community and teamwork by realizing new ideas not ignoring national traditions, customs and life styles.

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