

Katarzyna Żukrowska*

NEW CHALLENGES, CURRENT PRIORITIES IN THE EDUCATION AND RESEARCH: HOW TO FINANCE THEM?

Abstract

The article shows the role of human capital in the current stage of development of all the EU Member States. This means that education at all levels should be tailored following the guidelines specific to this stage of development and its requirements. The qualified workforce should be more innovative and creative. This means different requirements than at the stage which was dominated by industrial production. Such requirements call for more cooperation in R&D, teaching and education, which along with rapid technical changes bring the demand of all-life learning. Without such changes social inclusion will be impossible, same as catching up by less developed states. The mentioned changes have to be stimulated by a specific interventionist approach to the financing of education, R&D, innovativeness and creativity. The money allocation to that purpose should come from national budgets, which have to change their structure, as well as from the EU budget. In both cases, allocations should be increased. Such approach falls within the concepts of J. Williamson concerning the Washington Consensus. This matching pattern derives from the fact that education and R&D are seen as activities worthy of investment if one looks into the effectiveness of different expenditures and their outcome. In the long run, the expenditures allocated in R&D and education bring much higher return than the expenditures coined in response to current requests addressed to the state or Union authorities.

Keywords: education, R&D, innovation, public policies, highest stage of development, creativity

Introduction

This article points at the need to reshape the priorities in the states and EU's policies, namely to change the areas of intervention by replacing the areas where policies generate cost and don't bring any revenue with policies which generate cost, but at the same time bring revenue to the budget. This is, among others, the case with schools,

* Collegium Collegium of Socio-Economics, Warsaw School of Economics; kzukro@sgh.waw.pl

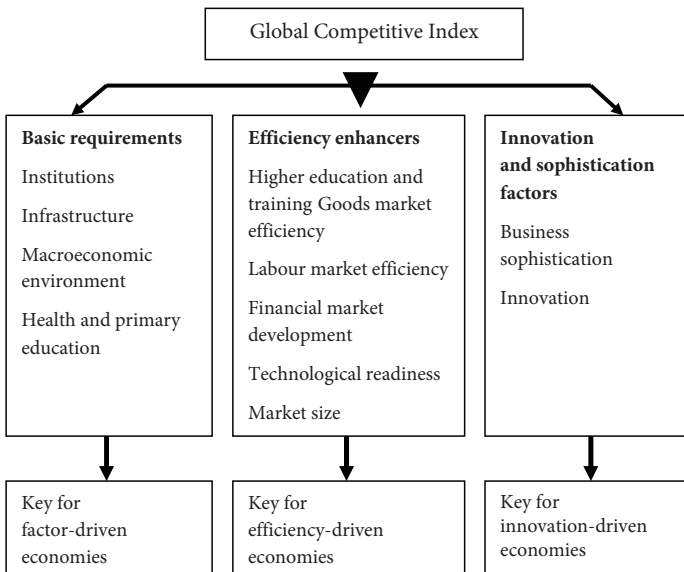
the higher education system and research. Schools of all levels need to go through revolutionary changes if they expect (or are expected) to prepare young, active people to be able to create, invent and find solutions not by cutting the Gordian knot but by undoing it. This means that school education has to lead to a new approach to education, where experts on memorising, linking facts, abstract thinking, creative thinking and innovative approaches will be given space to work and inspire others to follow them. This revolution has to take place also at the preschool level, as teaching and learning starts before the age of 5–6 years old. All consecutive stages of development which each country has to go through require a different type of support, specific institutions, specialised and educated labour force. They also require new, adjusted methods to evaluate the effectiveness of the educational system, and the effectiveness of its final “product” which supplies the market and its institutions. This product is human capital (educated people) able to meet the requirements of a specific stage of development of the economy.

This article argues that national educational systems still face limited competition which is the result of the fact that they were shaped mainly by national conditions. Although the situation is changing, this process requires time and understanding why changes are needed and in what direction they should go. Nowadays, while educational institutions employ international teaching staff and compete to attract foreign students, they don't permanently compete with each other either at the national or international level. Each nursery, school, university or polytechnics has its own place on the national market. Comparing them internationally, we can notice that some are better or are perceived as better, which makes a big difference (Scalling PISA 2012). This is shown by different rankings based on information concerning graduates, their earnings and workplaces. Moreover, educational systems are evaluated by national and international bodies which check first of all the ability to read, write and understand what one reads or writes. They also test managerial skills, the ability to solve problems, to take on the role of a leader or team member, or both such roles as they can change at various stages of education and work. All this shows a big range of solutions, none of which are universal and fully sufficient. The goal of this analysis is to show at least a framework for further cooperation among universities and schools in Europe, as well as teaching staff, scholars, students and administration.

1. What is Needed, Where and Why?

Each stage of development requires specific features from the education system which in turn enables proper quality supply of the labour factor. At the early stages of development, the requirements are simple and limited to the availability of the labour force. At more advanced stages the requirements become more sophisticated, which means that a certain quality of the labour force, measured by specific skills, is expected. This simple rule can be easily seen in the diagram presented by Klaus Schwab and Sala-i-Martin (K. Schwab, Sala-i-Martin 2014) (Figure 1).

Figure 1. Three Consecutive Stages of Development and Their Features



Source: Schwab, Sala-i-Martin (2014): 9.

Each of the three listed phases of development is driven by different factors, which does not mean that the remaining ones do not matter. They do as well, but the leading role changes and with consecutive stages, traditional growth drivers are replaced by new ones, characteristic to more advanced stages of development. With development, productivity increases is followed by higher costs of labour. This process is clearly shown in the table below (Table 1).

Table 1. Subindex Weights and Income Thresholds for Stages of Development

| | Stage of Development | | | | |
|---|-----------------------------|--|---------------------------------|--|---------------------------------|
| | Stage 1 factor driven | Transition from stage 1 to stage 2 | Stage 2 Efficiency driven | Transition from stage 2 to stage 3 | Stage 3 Innovation driven |
| GDP per capita (USD) thresholds* | <2.000 | 2.000–2.900 | 3.000–8.900 | 9.000–17.000 | > 17.000 |
| Weight for basic requirements | 60% | 40–60% | 40% | 20–40% | 20% |
| Weight for efficiency enhancers | 35% | 35–50% | 50% | 50% | 50% |
| Weight for innovation and sophistication | 5% | 5–10% | 10% | 10–30% | 30% |

* For economies with high dependency on mineral resources, GDP *per capita* is not the sole criterion for determining the stage of development.

Source: Source: Schwab, Sala-i-Martin (2014): 9.

Comparing the stage of development of the EU Member States according to the indicators listed above, we can find that overwhelming majority is classified as stage 3: innovation-driven economies. 21 of the EU Members can be found at this stage. These are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Malta, Netherlands, Portugal, Slovenia, Slovakia, Spain, United Kingdom. Five further economies are in transition from the efficiency-driven to the innovation-driven stage of development. These are Hungary, Latvia, Lithuania, Poland and Croatia. Two remaining economies are at the efficiency-driven stage of development. These are Bulgaria and Romania. This list shows that Europe represents states at relatively diversified stages of development, although the majority of economies are classified as the core of the group of countries at the most advanced stage of development, in which innovation is of fundamental importance.

In this context, we can ask a well known question concerning the economic and education policies: “does one size fit all?”. The answer is “generally, yes”. There are guidelines, financial support given by the EU and money from the budget general, which is followed by national polices, adjusted to the needs and abilities of each state.

Europe has well-defined goals, which are designated by the priorities of the research projects financed by consecutive research programmes (Horizon 2020), as well as goals set within the EU Europe 2020 Strategy (*Europe 2020. A European Strategy for smart, sustainable and inclusive growth*). There are also some good guidelines which indicate how the goals could be realised. Nevertheless, the policies applied in the Member States can still be seen as blockers which halt a better use (not to say: effective or sufficient use) of the financial, human and physical resources, followed by infrastructure.

What are those goals? Inclusive growth, increasing the share of youth in the human capital, increasing the share of elderly people who continue their work, raising the share of those who complete all levels of education: primary, secondary and tertiary,

etc. Those goals are oriented on statistical results, but the EU Member States in their policies should focus more on the quality of education. This should be adjusted to the new requirements of the educated society principle, with nurseries, preschools, schools and universities preparing for a life in the era of Knowledge Society. This means abstract thinking, combining, creativity and innovativeness. This means that such a person should be demanding, critical, constructive, able to use ICTs and cooperate with others (also on long distance and abroad).

All this can be bettered with the completion of the internal market of services, but at a same time there is need to put a special emphasis on education. Some moves in that direction are being made, which can be seen in the launch of the ERA project (European Research Area). This seems a natural sequence after common European Research, followed by programmes financing students and research exchanges. On top of that, the creation of SEA started in 1987 and was supposed to be completed in 1992. The completion process of SEA was quietly approved, which was a precondition to accepting the the Maastricht Treaty, introducing a common currency. Convergence in macroeconomics, if it is supposed to be sustainable, also requires convergence in sciences, especially when all economies of the Member States are moving towards or are already at the most advanced stages of development. This element of the service sector also conditions the liberalisation requirements to be met in order to make the single market work in all areas, not only in selected ones.

Sciences, teaching, education, research – all can be considered as services. It is very clear that services are more protected nowadays. All the EU Member States are in the post-industrial phase of development. This means that the majority of jobs are created not by the industry but by the service sector. More than 73% of the GDP is created by services. In the US economy the share of services is still higher developed, ranging 80% (Eurostat). As far as the share of services in world trade is concerned, we can see that 34% of trade is covered by the EU services, while in the case of the US it is higher by 10% in comparison to the EU.

Strong push forward can also be obtained by accepting the fact that internationalisation of the educational scene can be stimulating, same as the approval of educated people's immigration (Criga, Hadjar 2013).

2. How to Achieve Such a Goal?

It seems that we need more openness in educational systems, which has to be followed by more competition and cooperation at the same time. The position of scholars has

improved in all OECD economies. The OECD is not limited to European states, it also includes the US, Canada, Australia, New Zealand, Japan and Mexico. This fact already indicates that competition in R&D is not limited to competition of TNC (transnational corporations), but also includes education and research programmes conducted and financed from international sources. This means that on the one hand they can concentrate on research, analysis, teaching, while on the other, the situation shows that stabilisation in a way eliminates their willingness to look for new solutions.

The idea of common financing of European research, introduced in the 1970s within the industrial policy of the then EEC, was a good idea that stimulated research, accelerated dissemination of the results of the research among wider audience, finally established contacts between different university centres in Europe. This process continues, although both teaching and research should be more open to outsiders of the EU. Looking at the abilities to innovate – skills in that area are much higher in Asia than in Europe. Moreover, higher than European are also the abilities to innovate in the US. This finding leads to several simple conclusions:

- Europe has to change its educational system on all levels, teaching entrepreneurial behaviour, solution of problems, active changes, etc. This has to replace the system which teaches passiveness, acceptance of definitions, ready-made evaluations and opinions;
- Europe has to cooperate closer with the US (the US takes part in the framework projects) but TTIP can be considered a good kick for R&D and the educational system, not to mention S+Ms, which prevail on both markets (EU and US);
- Europe has to open up for students coming from all over the world to study at the European universities, which has to be supported by international transfers of scholars (exchange, scientific cooperation, writing textbooks together, preparing projects), etc.

The mentioned remedies are not at all new, although they are marginal in comparison to the needs in this specific area. The scale of the mentioned solutions has to be much bigger, which does not seem to be a big problem as demography creates new space for such solutions. All the EU Member States possess, in this specific area, a big potential which differs from one country to another, which should be considered not as an obstacle, but as a merit. The relations within the educational system and in R&D should not be seen as fixed relations between the Patron and the Agent, according to the theoretical relationship within a company or in international relations. The relationship should be flexible and changing, replacing the former partner who played the role of an Agent by the former Patron and the other way round. Why this seems to be more advisable than a fixed relationship? Simply because when something is predictable it cannot be seen as a stimulating solution. It can only be seen as a setup

which creates background for repeated solutions, which traditionally turn into habitual and repeated stable activities. Changes in this area would be more effective because they would break the routine, which in some cases is important while in others it is seen as an obstacle or a restraint.

This is also the case with research conducted within the EU financing. New Member States don't use the share of the common cake to the same extent as old Member States. It is even difficult to find out if the new Member States take from the common cake what they put into it. It is impossible to calculate such an indicator as MS make payments to the EU budget general following certain obligations. From that money international projects are also financed. It was fair that they started to participate in the Common EU Research before the Membership was concluded. The projects were open to non-EU Member States years before they became full Members of the EU. This prepared them to apply for EU finances available for R&D. Nevertheless, the number of grants which they receive as leading researchers is not big and often does not represent a similar share in comparison with successful applications from old Member States. Of course this can be explained by the difference in the quality of submitted projects, but these general remarks do not explain such big difference.

Moreover, despite declarations concerning openness of the procedures behind the process of evaluation, it is very hard to obtain detailed information what the mutual transfers are from Member States to the EU budget and from the EU Budget General to the states in the area of science. Such data is lacking. Financing research from the EU budget general is not fuelled by money allocated to that purpose by national budgets. National obligations are calculated as obligations resulting from the size of the VAT collected, level of GDP, sugar levies and part of the duties custom collected from imported goods. Finally, it is also a type of membership fee introduced at the beginning of the financial system of this international organisation in Europe. Information on contributions from those sources is available, nevertheless, it is difficult to find out what amounts are transferred in the case of each state for the research programmes. This information can be found in national reports but not in the reports prepared by the EU's responsible DG. The easiest-accessible statistics concern the numbers of units from each country which participate in the research financed from the budget. This is not the most open information in this area. Here, this refers also to the statistics given by the EU.

The Seventh Framework Programme is still ongoing, although new competitions are not launched and research continues within the projects commenced in the last year of the VIIth FP, that is 2012. The VIIth FP started in 2007 (Table 2).

Table 2. Transfers to Poland as Compared With Total Allocations for the EU and Non-EU, EU-27 in Millions of Euro (2007–2012)

| Contents | Total | | Earmarked | Other | Non-EU | EU-27 | Poland | |
|--|---------|---------|-----------|--------|--------|---------|--------|---------|
| | 2007 | 2012 | 2012 | 2012 | 2012 | 2012 | 2007 | 2012 |
| Sustainable growth | 43713.0 | 61684.7 | 896.3 | 1108.4 | 881.7 | 58698.4 | 4331.3 | 10681.0 |
| Competitiveness for growth and environment | 6738.2 | 13094.4 | 892.3 | 1028.8 | 878.7 | 10294.5 | 114.2 | 162.5 |
| Seventh Research Programme (including commitments) | 4059.4 | 8538.5 | 520.0 | 838.1 | 621.8 | 6558.9 | 29.2 | 58.5 |
| Decommissioning (Direct Research) | 31.7 | 26.0 | 0.1 | 0.0 | 0.0 | 27.6 | 0.0 | 0.0 |
| Ten | 371.5 | 842.3 | 37.6 | 50.3 | 208.8 | 545.6 | 12.2 | 0.0 |
| Galileo | 0.0 | 406.4 | 2.2 | 0.0 | 0.7 | 402.9 | 0.0 | 0.0 |
| Marco Polo | 9.5 | 22.3 | 12.9 | 0.1 | 0.0 | 9.4 | 0.0 | 0.7 |
| Lifetime Learning | 958.8 | 1448.4 | 211.9 | 0.2 | 20.2 | 1216.1 | 20.4 | 40.7 |

Source: Ec.europa.eu (2015).

It is true that scholars representing all groups of Member States are participating in the grants evaluation process, they are also present in the group of advisers to the Chancellor of the Scientific DG, but all this is not sufficient to obtain the needed funds for research, which should be conducted internationally, accelerating the flow of information, results, supporting purchase of scientific equipment and literature. The new Member States in general are too poor to finance the research in old Member States.

We obtain a different vision of Polish participation in the international research financed by the EU funds when we look at the data given by the EU Commission and when we try to analyze data presented in national reports (Table 3).

Table 3. Poland as Compared With EU-28 in Horizon 2020

| Contents | Number of participants in applications | Retained proposals – number of participants | Success indicator (%) | Expected financing in mln € | Number of participant foreseen as coordinators |
|---------------------|--|---|-----------------------|-----------------------------|--|
| EU MS | 92473 | 15485 | 16.75 | 6255.05 | 3570 |
| Poland | 1828 | 289 | 15.81 | 46.81 | 40 |
| Share of Poland (%) | 1.98 | 1.87 | | 0.75 | 1.12 |

Source: KPK PB UE (2015).

Together, all 120 Polish units have signed programmes financing grant agreements within Horizon 2020. This number includes 15 coordinators and 171 participants from Poland. 23 of the total number are small and medium companies. Some of the applicants were using grant support instrument for preparing the project for

submission. The total share of such applications in EU grants was 1.13%, out of which 0.35% was allocated for R&D projects (Statystyki uczestnictwa Polski).

The picture of Polish participation in the EU-financed research is not a very optimistic one, although there are some signs that things are changing for the better. Among them are the growing amounts allocated to Poland. Small success indicator can be explained by (1) limited submission of projects; (2) poor quality of the projects; (3) limited abilities to lobby for the submitted projects; (4) limited influence of national institutions and their representatives within the scientific DG.

Comparing successful submissions from the remaining old and new Member States, it becomes clear that the reasoning in 3rd and 4th point seem to be the answer to the problem. This means that some other solutions in process of allocating grants should be made.

3. What Could Be Seen as Change Stimulating the Engagement in R&D Financing and What Can Be Seen as an Obstacle?

It is very clear that there is a simple dependency between the wealth of a state and the abilities to finance research. When a state represents a group of developed post-industrial economies, more money can be allocated to research; when the economy is changing its branch structure, less funds are allocated to R&D. This seems to be a general law. This finding seems to be a bit trivial, but unfortunately it illustrates the reality. In practice this means that when a country is building its economic potential there is need to understand what type of investment can bring additional money and what type of spending is seen as traditional approach result in from limited understanding of what is really effective and what is simply a continuation of the trends set years ago. Moreover, understanding that things are going in the wrong direction can be solved in different ways, especially under the conditions when a country is effectively building up its potential and is approved to be a successful catching-up economy or an emerging market. Poland is perceived in such way as it was successful with its transformation, which was lately additionally evidenced by its being a “green island” during the 2008+ crisis. In other words: Poland was the only economy in Europe which did not experience a fall of GDP growth into “minus” values (not moving into “red” but keeping the growth rate above zero) during the crisis and one of two OECD economies, which indicated growth in 2008+ crisis. The other one was Australia.

At the same time, it should be clarified that explaining that fact by pointing to a relatively low level of development has a limited explaining power, as economies representing a lower level of development in comparison to Poland had entered into negative growth rates. In other words, their growth rates were below zero, which means that those economies were “in the red”.

Being a “green island” gives strong arguments in different negotiations, including those where additional support for financing research projects can be found. At the same time, the same situation is used to show that nothing should be changed as everything is going in the right direction and changes can only spoil this situation, as changes are always opening a new way into the unknown... This finding moves us to make a simple conclusion: Europe, due to deep structural changes in the world economy, should adjust its intervention policies, shifting from costly, non-effective areas to more profit-oriented ones. Here, profit should be understood in a specific way, as it will be calculated as a return to the budget in the form of different taxes from the turnover of produced goods. There is no doubt that the return is higher in fields which are characterised by a higher added value, this means such services as different types of adds, intellectual property, copyrights, research results, new skills, new inventions of different types, architecture, sculpture, paintings, technologies, ideas, programmes, organisational arrangements, new materials with new, previously unknown characteristics, distribution, etc.

In other words, national money spend on R&D is relatively small. Often the way it is allocated and used can be questioned. It is very difficult to evaluate such allocations, especially when they are spread over different areas and, with relatively low total allocations, do not bring expected results. This is evidenced partially by relatively small numbers of patents registered by Polish researchers and research centres. At the same time, Polish researchers conduct their work in research units of big TNCs and their work is registered as a success of that particular TNC and the country where it is rooted. This is not an attempt to make excuses for the results of Polish research, but to point out a significant and growing problem of disparity between internationalised economy and national statistics and methods to collect reporting data.

This means that there should be a political decision to move money from one area losing its importance in the creation of GDP, creation of jobs and goods supplied to the market in all their phases from production, through transport, warehousing, selling until consumption to areas which started to gain. All the above mentioned mean that priority should be given to those who teach, are engaged in R&D, which could be followed by those who work in the health sector, the sector producing intellectual property, and also to the sector concerned with rest and free time. On top of all the mentioned areas, one should add the development of services and goods which help

to keep the world “green”. Friedman called this allocation of investment as “greening the economy”.

Moving the money within the expenditures of a state and of the EU budget general seems to be important, as in a way, policymakers have their hands tied by the fact that revenues to the budget are limited. Raising the taxes – as practice shows – diminishes revenues in the long run. Printing money – stimulates inflation. Expenditures can grow while the economy grows. A simple rule here is that expenditures should grow at a lower rate than the GDP grows, as most of economies try to reduce their budget deficits. Stimulation of the economy is possible when the incentives and areas in which those incentives are used change. In simple words we can see that in a following way: money allocated in the stimulation of agricultural production has to be slowly reduced, same as support for ineffective state companies of a different type, and it should be allocated into new areas which have more perspectives and are gaining importance. Those areas are shown in the charts presented at the beginning of this article (Schwab, Sala-i-Martin 2014–2015). Without such decision, the applied policies can be compared to a navigational system (GPS) for one state with its roads and highways (fi. for France) used in another one (fi. in Germany) – in other words, it is useless.

Having said that, we can leave this problem aside and move to another one, or even a number of different issues which seem to be problematic and thus limit the effectiveness of the allocated R&D funds and their use. Here, a number of things have to be said. First of them is the applied method of project evaluation at the national level. The message of such evaluation, when it is done by 2–3 reviewers, should be concise and consistent, not contradictive in its contents. In other words, there should be a meeting (it can be a Skype meeting) in which the opinions of the reviewers are amalgamated into a single, uniform assessment. This prevents situations when the project at the same time gets the highest number of points possible and relatively low ones. Consider the situation where one of the evaluators says the project does not bring anything new to the research while the other says that the project is completely new and original. One of the reviewers says that the costs of the project are excessively high, while the other says that they fit the expected workload the project will require. One of the reviewers says that the coordinator of the project has enough experience to do his job in the project, while the other one expresses the opinion that his skills are insufficient and does not justify this opinion with any arguments. I have listed a number of contradictive opinions which I had to deal with while being an evaluator in the Framework Programmes of the EU. In situations like these, such diverged opinions had to be brought closer to one another during meetings, at the same time motivating their authors to formulate their assessments in a more responsible way. At least, within a peer group the reviewers’ opinions lost their anonymous character. In addition,

during the meetings all reviewers learned the arguments of the other members of the team, which often confirmed that everybody's knowledge is limited and we read different sources (articles, reports, documents, books). The meetings always helped us to learn something new, upgrade our knowledge and establish relations with other scientists with specialisations similar to ours. Therefore, to make a long story short, during such meetings it was important to come up with a coherent, unanimous review and not several contradictive remarks.

The second problem is that we spend money in our economy according to the traditional understanding of what is needed. This means that despite being in a post-industrial phase of development we spend much more on agriculture or industry than on research. This finding can bring up a number of arguments in support of such selection of spending priorities. The list can open with:

- ... but we all have to eat;
- ... we need jobs and without that spending we will lose them;
- ... R&D sector is a small sector, look at the numbers of licenses we register, look what a small group of people works in the sector;
- with the population decreasing, we will need fewer and fewer schools and universities, so why should we allocate money into those?

There can be a longer list of such arguments but they all can be refuted by one simple opinion. We are changing, and while thinking about the future we need to allocate money in such a way that will increase our prospective effectiveness. We need to invest into our innovativeness and creativity. The industrial phase of development requires people with high quality knowledge who can understand the tools and machines and can design the process of their production. The post-industrial phase brings about completely new requirements to education. People, educated university graduates, should have the skills of solving problems, inventing solutions, making discoveries, identifying new dimensions, prospects, ideas. This has to be done not always physically, but also in some cases virtually. Education has to develop our imagination. Memorising does not mean that we will be able to meet the challenge of the new phase of development which Poland and other states from the region are heading towards.

All this leads us to specific conclusions concerning what can be done in the Polish scientific policy, which includes teaching and R&D, in order to make it more effective and adjusted to the new requirements.

Demography in a way is helpful here. With the falling birth rate we will have fewer children in schools and at universities. This, on the one hand, brings up the problem of financing, while on the other it brings up the problem of looking for effective solutions. Problem of national finances in this area can be partially solved by openly

competing for students from abroad. Effective solutions mean that a tutor will work with a smaller group of students, so the work can be more effective. Moreover, more schools will use remote teaching and communication with a pupil or student. Tests will also be completed in an online system. All those novelties will not totally eliminate the traditional system of teaching, and the values of different diplomas will also be diversified. The development of the mentioned methods will eliminate the current situation in which a student pretends that he attends the lecture while in reality he goes to work at the time when lectures are held and builds up his CV, while the teacher will stop pretending that he does not notice the absence. Skype and remote teaching will enable the students who work to work and learn using remote infrastructure and those who want to study full time, traditionally, discussing ongoing problems with the professor – will also have that chance. The mentioned two methods do not tell in advance who will be better, the person who works and studies or the one who studies closely cooperating with the tutor. Answering in advance is impossible here, as teachers as well as students are different. We can have a combination of an excellent student and an excellent professor, as well as a bad student and a bad professor. Between these two extreme cases there is a number of other combinations. This means that we can have a number of interesting solutions in this area, promoting a number of talented people.

America has its ARRA (*American Recovery and Reinvestment Act*) from 2009, the limited evidence of correlation between the state's spending and economic growth. Nevertheless, there is evidence that focused state spending can stimulate economy. According to J. Williamson (2008), the state should re-orientate its spending from traditional engagement towards such engagement which in the future will bring returns. This embraces two types of activities. On the one hand, it addresses the problem of taxes and revenues from them within the fiscal policy. On the other hand, it points at some activities which financed today, can bring revenues or reduce spending in the future. In the first group we should mention the development of property taxation as a major revenue source. This is followed by the elimination of tax loopholes, also followed by simplification of tax obligations and aid enforcement. Finally, it is important to see the problem of tax collection in this group.

In the second group it is important to look closer into education and research. The second move here is ascribed to land reforms, which means in practice moving from buying or selling, followed by attempts of nationalising some of them should be replaced by privatisation. The third and final move is micro credit. Originally J. Williamson gave “ten commandments” on how to bring economy into a sustainable path of growth. Those ten pieces of advice were additionally expanded by D. Roderik (2007). It should be underlined that at first Roderick was strongly against the consensus but with as time passed (and he gained new knowledge) he accepted what Williamson

brought about to this solution, and instead of fighting against it, he has expanded Williamson's ten points with his own ten points, which are listed in his book *One Economics, Many Recipes* (Roderik 2007).

Finally, in the context of Poland and the size of transfers from the EU budget which finance the scientific research in Poland, we can see that Poland is the biggest single beneficiary of the EU budget funds. Still, we have to ask a simple question: are those funds allocated accordingly to the Polish national interests? The Polish share in the funding cake is big, but looking at consumption of that cake we can see that it keeps the Polish economy traditionally oriented. Without serious action taken on the Polish side – the country will freeze its dependence on high-tech imports from abroad. This results in the fact that big money transfers are allocated in agriculture, followed by industry, and with relatively little money allocated in education and R&D.

Our priority is to change that allocation structure in favour of education and R&D. Poland has a number of indicators which are above the EU average, as far as PISA tests are concerned. At the same time a number of indicators which show what is happening in sciences are below the EU average. This is the case with General Expenditures on R&D (GERD). There are 16 states which still have a smaller GERD than Poland, but we should compare our potential with those who are in better position, that is the remaining 11 economies. In 2013 the indicator showing the changes in GERD in the EU-27 states illustrated a 0% growth of GERD in Poland, which means neither dynamics nor changes, which means that we have to do with this what we have... Some economies experienced a decrease in the rate of growth of this indicator. These are: UK, Italy, Spain, Finland. Nevertheless, this fall comes from a high level. The group in which spending was lower than in Poland also noted a certain decrease in GERD. Those are the following states: Romania, Estonia, Latvia.

This information shows which area and which states are following the traditional, old pattern of policy, freezing the old structure of the economy. The transfers of funds for R&D financed by the Horizon 2020 are included in that indicator. This means that Poland, as well a number of other states, have limited abilities to finance their own R+D and that they use a relatively big share of the common R&D funding in their financing of this field. Nevertheless, the funds are insufficient to the needs and intervention of the EU level should change that. Such decision would be good for Poland, as well as for the whole EU. This will be the case, especially in the circumstances of sustainable growth. In Poland, the share of the EU GERD is 1.3%, while the share of finances allocated to R&D is 1.1%. In Italy the two mentioned indicators are as follows: 7.1% and 4.7%. Poland is on the 15th position among the EU-28. It is placed before all new Member States, but its economy (GDP) and its number of inhabitants is bigger than in the case of the rest of new Member States. If we look at the indicators of money

allocated to research projects in Horizon 2020 – including the number of researchers engaged in research per 1000 – Poland is on the last position in the EU. The position of Poland looks a little better if we count the allocations per capita for all research and education employment. In such a case Poland is 3rd from the end, surpassing Belgium and Slovenia. Moreover, some other indicators are not favourable for Poland. This is the case of beneficiaries of the research funding counted as share for the EU with use of an indicator for 1 million of inhabitants. Poland is on the last position here. The last indicator which I am going to quote shows Poland as the 3rd state from the end of the list. This indicator shows financing allocated for 1 million of citizens in the submitted projects. Poland is better in this area only than Belgium and Slovenia.

Having said all that, we can draw several conclusions. Science, or should I say scientists in Poland are prepared to guide the economy into sustainable growth based on innovation and creativity. Poland is developing an advanced innovation system. The operation of that system can be illustrated by a number of worldwide competitions in which Polish young scholars or students won (cosmic cart in the US or in Poland, or financial management, stock investing, intelligent plaster, or calcim titanic, etc.). Graduates of Warsaw School of Economics are ranked in Financial Time as second and third best-earning group of young graduates. WSE is the only university from East Central Europe noted on that list. On the other hand, having in mind all the limitations to financing research in Poland, followed by other new Member States, some specific rules in financing R&D from the funds should be applied. In this area specific solutions could embrace the “Polish scientific rebate”, incentives supporting students exchange within Erasmus Mundus to Poland, followed by pointing at Poland as an important partner in international collaborative research and organising competitions in such a way that the shares of winning projects would reflect the scientific potential of a state. This seems to be a must at this point. Otherwise we will find ourselves in a vicious circle: unable to compete, unable to grow, unable to catch up. Our economies will have limited abilities to converge as far as development is concerned. All this can lead us to return to waves of scientific nationalisms, which can be additionally fuelled by the tensions caused by information on Brexit, Grecxit, EMU crisis, and all the solutions which show that states are integrated and talk about the situation when it is consistent with their own national interests, otherwise they seem to forget about internal market and common measures, and they offer preferential conditions to their own institutions and individuals while less preferential ones are offered to others who can cope better competing without such conveniences. Clearly this was the case with the proposal to return the highway duties that were planned in Germany, which were supposed to be returned in the form of reduction of taxes to owners of the cars registered in Germany. The EU Commission gave a negative opinion on that and the project was postponed.

Without protests on the Polish side, where Poles take a big share of transport services in Germany, this law could have been passed and imposed. Similar situation is with minimal wages required on German territory applied to the drivers who are engaged in transport services. The analogy here is clear, although it requires detailed knowledge of the rules of the games played in the EU. The situation is the same concerning sciences.

What we need here is a strong financial push. This can be done with some organisational changes. A number of solutions applied in the DG for sciences is good and well functioning, while the others have to be shaped into specific frames which will make it possible to reduce the disproportions in allocations of funding. This seems to be a must if we want to think seriously about the future of convergence, catching up and fair division of funds. This can result in a leap in innovativeness and creativity.

Conclusions

The article shows that a big challenge for the EU in the nearest future is seen in the changing structure of the expenditures, which has to be followed by understanding of the new conditions which lead towards such decisions. This seems to be a must in the perspective of sustainable growth. The change of structure of the expenditures should be shaped by reduction of expenditures which do not stimulate revenues. This has to be followed by the increase of expenditures on the areas which are seen as generators of revenues to the budget in all the EU Member States. These, among other areas, include teaching, education, research. Following the argumentation: changes in the EU policies regarding financing the R&D should take into account the financing abilities for this specific area by states like Poland, which should result in unambiguous allocation of finances in the form of international intervention measure.

Activity in the area aiming at restructuring expenditures from the EU budget, followed by changes in the Member States' national budgets, should be reinforced through an intervention helping to allocate the R&D money to the new Member States or, considering this in a wider perspective, to all economies attempting to level their development (including the southern old Member States, new Member States and future Member States, states from the neighbouring area).

This seems to be one of the preconditions for overcoming the development gap, which is important to the whole European Community. Decisions in this area can be made regarding the changes planned as follow-ups after signing TTIP.

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