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THE NEW SYSTEM OF FINANCING SCIENCE HORIZON 2020 AS A DEVELOPMENT OPPORTUNITY FOR EUROPEAN AND POLISH SCIENCE

NOWY SYSTEM FINANSOWANIA NAUKI HORYZONT 2020 JAKO SZANSA ROZWOJU EUROPEJSKIEJ I POLSKIEJ NAUKI

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Summary: The author examines how the strategic objectives of Horizon 2020 are an opportunity for Polish science. The program allocates significant resources to specific tasks such as the implementation of innovation and social challenges. Despite relatively low public expenditure on education, Poland is placed in the European Union average. However, in the case of competitions Horizon 2020 bonus criteria are different from the current Polish finance division algorithm. Emphasis was placed on the relationship between science and the labor market, which in Poland is not significant. These funds will mean a true test of the potential of Polish scientific institutions. In this article the author has analyzed the various opinions of scientific environment in terms of opportunities and threats.

Keywords: financing of education, EU funds, new technologies, research and development.

Streszczenie: W artykule autor bada, na ile strategiczne założenia programu Horyzont 2020 są szansą dla polskiej nauki. Program przeznacza znaczące środki na określone zadania, takie jak implementacja innowacji, wyzwania społeczne. Mimo dość niskich wydatków publicznych na edukację, Polska mieści się w średniej Unii Europejskiej. W przypadku konkursów Horyzont 2020 kryteria premiowane są inne od obowiązującego w Polsce algorytmu podziału finansów. Nacisk położony został na związki nauki z biznesem, co w Polsce nie jest jeszcze bardzo powszechne. Środki te oznaczać będą prawdziwy sprawdzian potencjału polskich jednostek naukowych. W artykule autor przeanalizował opinie środowiska naukowego dotyczące tego, w czym jego przedstawiciele upatrują szans, a w czym zagrożeń programu.

Słowa kluczowe: finansowanie nauki, fundusze unijne, nowe technologie, rozwój.

1. Introduction

The multitude of challenges currently faced by the family of European states requires resolute action of a strategic nature. Demographic changes, migration and other threats to sustainable development require ground-breaking solutions.

The whole of the 21st century is a series of intensive developments, supported by scientific research and effectively implemented innovation. This was only possible through the competition between contradictory phenomena, such as autonomy and integration, excellence and efficiency, scientific curiosity and relevance to societal challenges [Mejlgaard, Bloch 2012].

The pace of changes resulting from the application of modern technology clearly indicates that only innovation can be a factor counteracting the negative phenomena and contributing to economic growth. This view is quite common and applies to the most developed countries like the United States, Japan and South Korea. The European Union also takes effective actions to stimulate development based on modern and innovative solutions. This is manifest in the clarification of the guidelines necessary to build an innovative economy capable of competing economically with the strongest players on a global scale.

The new policy of promotion and development of scientific research and innovation "Europe 2020 Innovation Union" envisages the designation of as much as 3 per cent of EU GDP on research and development. It is one of the main tasks to promote cooperation between innovative companies, development and support of creativity or partnership for innovation [Baran 2014].

In a way, the programme Horizon 2020 is a continuation of an earlier initiative for innovation. It is a combination of all the existing programmes which directed streams of EU funds for the purposes related to research and innovative projects.

2. The new financial perspective

The programme Horizon 2020 is the largest ever programme on the implementation of scientific research and innovation financed by the European Union. The period of its implementation is scheduled for 2014-2020. Funds of over EUR 77 billion have been designated to finance innovative research and action [National Contact Point for Research Programmes] (PLN 326.4 billion[1]).

The assumptions of the project are based on three main priorities:

1. Excellent scientific background.
2. A leading industrial position.
3. Societal challenges.

These goals are supported by specific objectives: promotion of excellence and assurance of wider participation, education with the participation of society and for

[1] EUR 1 = PLN 4.2395 according to Table No. 227/A/NBP/2015 of 23rd November 2015.

society and the cooperation of the Joint Research Centre and the European Institute of Innovation and Technology.

It should be noted that funding for research and development in the European Union is not competitive in relation to the achievements of the United States or the Asian countries. EU member states will have to face challenges from the competition and its resources devoted to the development of science and innovation. The ambitions of the European Union, stemming from its cultural and scientific achievements, make it necessary to develop these sectors of the economy which for centuries have contributed to the development and the raising of the living standards of the inhabitants of the continent.

In analysing these issues, K.A. Firlej [2013], points out that in the era of globalization it is innovation that constitutes the competitive advantage of economies. Firlej also stresses that in the case of the European Union, market mechanisms do not fully ensure the transformation of economies towards pro-innovation. At the same time all-EU programmes will help overcome the differences between its member states. Currently, serious differences can be seen in the innovation potential of individual member states.

The leading intention of the programme is to strengthen the EU's position as a world leader in science. To achieve that purpose it will be useful to create attractive conditions for the best scientists and a space for scientific collaboration, but also competitiveness, in Europe.

In order to implement these ambitious plans, the European Research Council (ERC) was established, whose task will be to finance pioneering inventions. The only criteria for obtaining a grant are the excellence and uniqueness of the actions aimed at stimulating innovation. This entity will be subsidised with more than EUR 13 billion.

One of the activities under Horizon 2020 is a programme called "Maria Sklodowska-Curie Actions" (originally called "Marie Curie Actions", later re-named as "Maria Skłodowska-Curie Actions") [Opinie MNiSW 2012], aimed mainly at young researchers. It is supposed to facilitate the careers of young researchers so that they can gain knowledge, also of a practical nature, necessary to develop their talents. An amount of over EUR 6 billion has been designated to these activities.

Attention to the development of European competitiveness and the development of research and innovation in new technologies is a task which will be funded by nearly EUR 2.7 billion. The aim of this action is to promote a proactive attitude and competitiveness in thinking.

Nearly EUR 2.5 billion has been allocated to provide European researchers with access to research equipment, particularly in large-scale research projects.

Horizon 2020 will support new technologies, mainly those of a breakthrough character, which will raise the innovativeness of production technologies, biotechnology, nanotechnology, nanomedicine, with the amount of EUR 13.5 billion. This dynamically developing sector of the European economy is one of the leading employers and employs 31 million people.

Small and medium-sized enterprises, indicated as the main source of employment, are treated with special care. To support their development, competitiveness, as well as training, they will be granted EUR 3.1 billion.

An element of the programme "Access to risk finance" will ensure access to funds for projects of a risky nature. The amount of EUR 2.8 billion will assist in providing access to credits or bank guarantees, mainly for companies with small and medium capitalization.

A great and important area of Horizon 2020 are "Societal Challenges". The European Union has defined seven priority challenges. It has been estimated that investments in these areas will bring real benefits to its citizens [European Commission 2014]:

1. Health, demographic changes and wellbeing. This is an area associated with research aimed at improving the quality of life, broadly defined health care, methods of treatment, but also social care. Funded to the amount of approximately EUR 7.5 billion.

2. Food security, sustainable agriculture and forestry, seas and inland waters research, and bio-economy. The amount of EUR 3.8 billion is to support projects of a pro-ecological character, oriented towards the popularization of sustainable energy sources. The food sector and agriculture play a key role in the development of rural areas, hence the need to support such action.

3. Safe, clean and efficient energy. Energy, as the driving force of any economy is of particular importance for their development. Progress, however, requires more and more energy. Europe's ambitious goal is to gradually become independent of fossil energy sources. The amount of EUR 5.9 billion has been allocated for that purpose.

4. Smart, ecological and integrated transport. Mobility stimulates employment and enables global commerce. The aim should be to make the sector free from liquid fuels. It is also necessary to raise the effectiveness and efficiency of transportation through the elimination of congestion and reduced exhaust emissions. The amount of EUR 6.3 billion has been allocated for that purpose.

5. Action for climate, environment, resource efficiency and raw materials. This bundle of measures is to transform the economy towards a green economy, one that is in harmony with the environment. Waste and water management is an additional challenge. This ambitious action has been subsidized with the amount of EUR 3 billion.

6. Europe in a changing world – inclusive, innovative and reflective societies. Support for scientific research which creates innovations in the field of European heritage, identity, culture, and support for lifelong continuing education for adults is a task which has received EUR 1.3 billion.

7. Safe societies – protection of freedom and security of Europe and its citizens. Providing a secure life for the citizens of the European Union is one of the obvious priorities. New technologies oriented towards protecting our societies are to be

developed within the framework of scientific research. Funding in the amount of EUR 1.7 billion.

Among the opinions on the Horizon 2020 programme critical voices can also be heard, which point to the fact that the idea of the whole project was created in an atmosphere of economic growth in Europe. Therefore the possibility of possible turbulence in the economic development, which is being experienced by the majority of EU member states, was completely ignored [Macilwain 2015].

According to the results of research conducted by the European Association of Public Funding Laboratory, public funds allocated for universities in ten selected EU countries have in fact fallen since 2008 by as much as 10 percent. It is worth noting that in countries particularly exposed to crises, such as Italy, Greece and Hungary, the decline was, respectively, 20 per cent and 40 per cent. Besides, Germany, Norway and Sweden have reduced these expenses by one-fifth.

To properly evaluate the importance of the Horizon 2020 programme and the significance of the funds allocated for its implementation, it should be noted that in 2013 under the European Research Area, Germany and the United Kingdom received EUR 1.1 billion, the Netherlands EUR 560 million, and Poland merely EUR 67 million.

Among other potential threats attention is drawn to the danger of funding research in narrow disciplines. It is essential to take into account factors combining many disciplines and intercultural topics which transcend the barriers or boundaries established by custom [Vrabie, Baetu 2013].

According to some opinions, thanks to the implementation of the programme, European Union citizens will have greater opportunity to participate in the development of science and technology. The commitment of stakeholders will increase the level of the integration of the needs of local environments, their values and expectations, with the ongoing research or inventions. What is important is that the programme's achievements can bring benefits not only for Europeans, but also for stakeholders around the world [Cavas 2015].

3. Financing research and universities

In the national system of higher education universities are supported by budgetary appropriations and revenues achieved independently as a result of research or didactic activity. In 2013 the Ministry of Science and Higher Education provided state universities with PLN 10.66 billion, while private ones received PLN 203.53 million of grants for teaching within the framework of full-time studies [GUS 2014].

Despite attempts to change it, the system of university funding is highly imperfect. Public spending on higher education in 2009 amounted to only 1.1 per cent of GDP. This level, though assessed as too low, falls within the average of 1.13 per cent of GDP for the 27 countries of the European Union in 2006. In the case of Finland and Sweden it is almost 2 per cent, and Denmark exceeds even that level [Jongbloed 2010].

The award of a grant is based on an algorithm whose main variables are factors such as the number of students, academics, conducted research, and entitlements. Less important is the number of employees or students participating in international exchanges. What is important, however, is the quality of academic staff, measured by their titles or scientific degrees. In the case of research it is actually implemented projects, not plans and intentions, that are important. It should be noted that this system puts universities from strong academic centres with large populations, with a steady supply of candidates, in a privileged position [Hońko 2013].

Nevertheless, one cannot ignore the factor of the uncertainty and risk associated with legal or political changes. University management is always associated with some risk, mainly related to the implementation of budgetary assumptions or to the provision of funding for the adopted strategic plans [Szczepaniak 2013].

It can be assumed that the inflow of funds for research and innovation will stimulate the development of science. Currently, Polish science is financed at the level of 66.9 per cent from the state budget, while 16.7 percent comes from private funds, mainly from business entities. European funds constitute 11.1 percent [GUS 2012].

The budgetary appropriations are largely transferred through the National Centre for Research and Development and the National Science Centre, which allocate funds on the basis of competitions. Inevitably, such a system rewards centres with the strongest scientific potential.

Simultaneously the role and the participation of the European funds are clearly growing. While between 2007 and 2013 approximately PLN 4.1 billion was allocated from structural funds in Poland to finance science, the programme Horizon 2020 envisages an increase of the funds to approximately PLN 100 billion. These funds will mean a true test of the potential of Polish scientific institutions because competitions for grants will have a pan-European rather than intrastate character. Addressing this competition will require a truly close cooperation between universities and the business sector. In line with the assumptions of Horizon 2020, it is business partners that will be co-beneficiaries of the resources allocated to science [Nowak, Niewiadomski 2014].

The amount of PLN 14 billion was allocated for the financing of higher education with public funds in 2015. This is 0.75 per cent of GDP. It should also be emphasized that most of this money goes to universities as a basic grant and is allocated according to the statistics and the Ministry of Science and Higher Education, largely because it amounts to up to 70 per cent of the total expenses of universities, to wages understood as labour costs.

Thus, as indicated by the report assessing the algorithm for the funding of public universities which is currently in force, there is a lack of quality criteria and a lack of rewarding quality; the orientation of universities towards the labour market and its needs is weak, and the per-student granting system promotes a mass scale education. In addition, some institutions receive excessive funds while others are under-funded.

At the same time, the growing positive trends of the changes in the funding of Polish science have been highlighted. A scientific category is granted by the Committee for the Evaluation of Research Centres on the basis of actual scientific achievements, e.g. the number of publications in peer-reviewed journals [Fundacja im. Lesława A. Pagi 2015].

Professor A. Giza-Poleszuk, Vice Chancellor of the University of Warsaw, does not agree with the promotion of the 'massification' of higher education. The claim being that "it may be more beneficial to raise money in other ways. Foreigners (…) should be (...) attracted to universities. The algorithm allows us to strive to create elitist education" [Łukaszewska 2015]. Moreover, on the basis of just a fragmentary assessment of the subsidies algorithm, one can conclude that it is research grants that are awarded, while those of an international scope receive double scoring.

Therefore, in the context of the above discussion, it is curious to hear of the result of an analysis by Krakow's Centre for Research on Higher Education at the Jagiellonian University, which clearly states that "currently the impact of higher education on GDP through the implementation of its research function is marginal" [Bugaj et al. 2012]. It should be noted that the report cited above indicates that it is not only the amount of funds allocated for investment in the higher education system that matters, but also the quality of these investment decisions. That assessment covered the region of the Baltic Sea states, thus providing also good models for comparison.

In the discussion on research funding it is difficult to ignore the topic of responsible research and innovation activities. Research should therefore be done transparently and constitute a truly interactive process which involves stakeholders. Establishing the direction of research should be based on social expectations, support sustainable development, and be in line with ethical norms [Schomberg 2011].

Creating responsible innovations must be a different process from creating "ordinary" innovations. Not only must it be characterised by a more practical application, but also by feasibility. Responsible innovations should primarily transcend the limitations of scientists' ambitions and bring about fundamental change [Owen et al. 2012].

An extremely important conclusion of the above mentioned studies is the confirmation of the thesis about the positive impact of higher education on GDP. What is important, in addition to the impact through graduates and their professional and social activity, is the impact of the university as an institution providing services in education and research that matters the most. At the same time, the authors of the studies emphasise, among the intangible profits for the public, the stimulation of further scientific and technological progress and dissemination of new technologies [Owen et al. 2012].

One cannot ignore the important aspect of gender equality in the context of research funded by the European Union. In fact, it turns out that the majority of drug tests are performed on male patients, and the search engine Google Books shows

twice as many male authors. As a result, the European Commission through the Horizon 2020 programme requires applicants that projects include gender based analysis, for example, whether conducted research has different implications for women and men [Schiebinger 2014]. Ignoring such aspects as checking whether the sexes react differently to scientific achievements might amount to missing a serious opportunity. It thus appears that the Horizon 2020 programme brings innovations already in its assumptions.

4. Opinions on the Horizon 2020 programme

Among the emerging opinions on the programme in question that of the President of the Polish Academy of Sciences Professor Michał Kleiber is worth noting. He notes that "(...) the regulations are so detailed (...) that any failure ends in tragedy for potential beneficiaries". It is judged, however, that the programme itself is extremely ambitious, it outlines a feasible, yet difficult, perspective. Therefore it can be a potential opportunity. Kleiber stresses that a big distinguishing feature of the programme is the co-operation with the business community. In fact, only then can one talk about applied research if the results are implemented in practice [Figiel 2014].

EU Commissioner Geoghegan-Quinn has announced that "research and innovation will have their place in the policy of economic growth in the European Union" [Opinie MNiSW 2012], thus emphasizing the importance of the whole project and its importance to the economic system of the Union.

The development of the program has gone through numerous lobbying activities. Thanks to the involvement of the Polish, now former, Minister of Science and Higher Education Professor L. Kolarska-Bobińska, a coalition was created to increase the participation of Polish scientists in the programme. This required a correction of the remuneration system, which had put researchers from Poland and other countries in Central and Eastern Europe at a disadvantage [*Polska tworzy*… 2015].

The Horizon 2020 programme was launched in 2014. It is worth noting that more than 1,800 Polish research teams have submitted more than 400 applications. Of these, 15.8 per cent received funding – a result slightly below the EU average, which was 16.7 per cent [Krasinski 2015]. So there is still a lot of effort to be made to acquire the necessary research funds more effectively.

5. Conclusion

Funding of research and didactic activity is always a complex issue. Science as such is not easily subjected to the criteria of qualitative or quantitative assessment. This also applies to supporting didactic activities. It is difficult to accurately assess the role and impact of higher education on the level of the development of modern societies.

Thus, searching for the perfect model of financing science is in fact striving to achieve excellence. In this context, the Horizon 2020 programme which, in line with the general demands, assumes substantial, additional transfers of funds to the university, fits in unequivocally with the expectations of both the scientific community and societies. For it is the role of the university to empower science, conduct research and educate students.

However the massive funds for research under this programme impose certain limitations. Reference is made to their link with social needs, emphasis is put on relations with stakeholders and the equal treatment of the genders. It is essential to strive to improve the quality of life, also through intercultural projects.

A completely different aspect of the topic under discussion are the social benefits of higher education of citizens. Thus the funds allocated to the operation of universities should not be considered as a subsidy but as an investment. Benefits should be understood as the most quantifiable elements, such as wage increases or increased chances of employment [Bugaj et al. 2012]. It is hard to ignore the non-financial benefits gained by people with higher education. These include not only better physical condition and health, but also greater attention to family health. In addition, people with higher education are less vulnerable to the negative aspects of aging.

The Horizon 2020 programme can bring epochal changes in the research and innovation space within the European Union. It is up to its beneficiaries, i.e. higher education institutions, to develop high-quality applications. The amount of the allocation seems to be so substantial that the funds should be sufficient to finance most projects. Therefore one may expect far-reaching effects on the improvement of the research and innovation competitiveness of the European system of higher education.

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