

THE ROLE OF FRAMEWORK PROGRAMMES IN COMMERCIALISATION AND INNOVATION GROWTH SHOWN THROUGH RESEARCH RESULTS – EVALUATION RESEARCH OF THE POLISH EFFECTS

Marta Magdalena Rószkiewicz

Barbara Warzybok

The National Information Processing Institute

Laboratory of Statistical Analysis and Evaluation

Abstract

The article presents the results of evaluation research whose aim was the assessment of the effects of completed projects implemented by Polish research departments within the European Union Framework Programmes. This evaluation is the first attempt at a comprehensive analysis of the effects of Polish projects backed by this type of financial support. The research was conducted on the basis of three evaluation structuring criteria: effectiveness, utility and sustainability. The analysis considers three consecutive Framework Programmes which enable the assessment of participation effects and evolution of experiences of Polish beneficiaries over time. The results of the research was juxtaposed with the results of similar evaluation research in other countries, which increased the objectivity of the conclusions. The research pointed to the high effectiveness of achieving strategic goals at institutional level and the career development of individual scientists, as well as low effectiveness in economic output, meaning the impact on innovation is low. Such results are not only a features of Polish participation in framework programmes, but they also correspond to international research which highlights the implementation of other non-innovation geared research objectives.

Key words: European Framework Programmes, commercialisation, innovation growth

Introduction

The EU Framework Programmes is the largest venture of financing scientific development in Europe, including the creation of new knowledge, new technologies, new products and processes and the implementation of innovations for existing solutions. The aim of the Framework Programmes is

to encourage competitiveness and innovation⁶⁴ in European economies and their effects should improve on the existing knowledge in the strategic areas of development.

Framework Programmes are an important tool to implement scientific and innovation⁶⁵ policy geared towards the creation of a smart and balanced economy which encourages social inclusion [the European Commission, 2010]. The growth of European innovation is intended to create a knowledge base and innovation product support through facilitating access to funding for innovation companies as well as creating a common innovations market, promotion of cooperation and utilisation of European creative potential⁶⁶. Amongst others, this instrument targets the creation of favourable conditions for scientists, ensuring access to modern research infrastructure and, most of all, support and strengthening of the cooperation network between science and business sectors. The objective of these activities is to support and accumulate human resources in Europe as well as to stimulate private investment in innovation research, particularly in strategic areas for economic development. The assumptions of the innovation growth policy of European economies correspond with the Union's ambition to bridge the technological gap which separates it from the most technologically advanced countries (such as: USA, Japan, South Korea). Moreover, scientific knowledge and innovations produced within the programmes are to contribute to solutions for the most crucial social challenges.

The effective management of such a large research programme requires in-depth knowledge of the results and the scale of impact, as well as continual adjustment of this mechanism to the dynamic socio-economic climate. One of the tools of such an intervention's impact is evaluation research which offers wide ranging subject analysis of the policy instruments e.g. evaluation assessing the funding mechanisms, implementation process, procedures and the assessment of the true effects of intervention [Olejniczak et al., 2008].

An investment as large as the Framework Programmes - such as the forthcoming Horizon 2020 strategy – relies on the valuable conclusive information from beneficiaries' experiences. The European Commission

⁶⁴ Understood by the European Commission as the ability to implement innovations (new or improved products – goods and services; new processes, organisational and marketing changes) (OECD, 2005).

⁶⁵ Determined by, among others, the objectives of the Europe 2020 strategy.

⁶⁶ Contained in the leading initiative of the Europe 2020 strategy – Innovation Union (the European Commission, 2010).

runs systematic operations whose objective is the assessment of this instrument's effectiveness. The countries which take part in the programmes (e.g. Great Britain, Norway, Denmark, Ireland) undertake independent assessment of the effects of this venture through analysis of project results and their impact on the objectives and thematic areas, implemented both within European and national scientific and innovation policies.

In Poland however, there is a shortage of research devoted to project results, in particular on the utilisation of the effects produced by the Polish research teams. Reports and databases on the Framework projects provide knowledge on technical parameters and project task records. There is a shortfall on information on the project results and their impact on the beneficiary's environment and potential as well as economic advantages achieved. Access to the information seems vital from the point of view of Polish participants and the impact on the socio-economic climate in Poland.

There is a cognitive gap on the subjective experiences of the programme's beneficiaries and the possibility to assess the project's results was the main reason the research was conducted among the Polish project's participants. The research was of an evaluation nature⁶⁷. The aim of the research whose results are presented in this paper was the assessment of the true effects of the project, with the Polish research teams' participation filtered through three evaluation criteria: effectiveness, utility and sustainability. These criteria enabled multifaceted analysis of the Polish research teams' participation impact on the creation of a knowledge base and the growth of the innovation of economy (from the viewpoint of the science sector).

Framework Programmes and innovation – empirical research

The research was conducted by applying various research methods based on triangulation rule [Babbie, 2008]⁶⁸. The research used computer-assisted telephone interviewing (CATI) through a questionnaire and also in-depth interviews with beneficiaries and public institution representatives. In addition, the research was extended by the conclusions from the three cases analysed which involved public institution representatives who were actively engaged in the implementation of Framework projects. The final stage of the

⁶⁷ Evaluation is defined as a systematic socio-economic research method providing information on the quality and value of public service activities (Patton, 2008; Rossi et al., 1999; Weiss, 1998)

⁶⁸ The triangulation method recommends application of varied research methods.

research saw a panel of experts whose aim was the analysis of the evaluation conclusions.

The empirical research (statistical analysis, evaluation research, case study analyses) accentuates the role Framework Programmes play in the development of the knowledge base in Europe and value added generated in the area of science. This is further justified by the expanding budgets of consecutive programmes⁶⁹. Despite the magnitude of this research tool for the development of science, its impact on innovation is still regarded as insufficient. This phenomenon is linked to the *European Paradox* which claims substantial scientific advancement in Europe, however accompanied by low innovation growth. In practice, it signifies that European research programmes contribute to the success of scientific research departments but do not contribute significantly to innovation advancement. The European Paradox⁷⁰ stems from the fact that despite R&D being a drive for innovation, the interdependence between these two is not always direct. The commercialisation of R&D research is a complex process which depends on many factors on the micro level (project management) and on the macro level (market conditions, demand for a particular innovation).

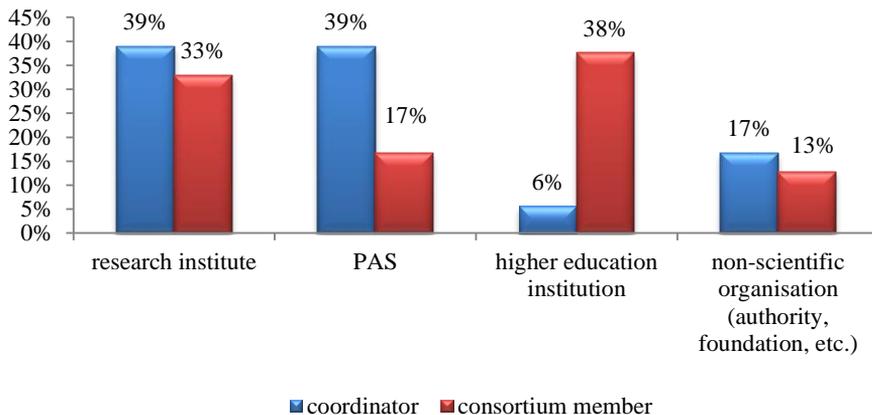
Looking into the reasons for the lower than expected innovation effects of Framework Programmes, it is worth paying attention to the fact that Framework Programmes are dominated by the ‘*technology-push*’ model based approach. This means that beneficiaries focus mainly on the research aspect rather than the practical applications of the research results. The projects are geared towards the creation of technological solutions at an early stage of development for which it is hard to determine a potential market application. The model geared towards market demands (‘*market-pull*’) is applied less frequently. However, the consecutive Framework Programmes are adjusted to the dynamic changes in the innovation creation process and more often consider so called demand models (7th Framework Programme, Horizon 2020) [Arnold, 2011].

⁶⁹ In the 5th Framework Programme 14.89 billion Euros was designated for the implementation of the projects, the 6th received 17.88 billion and the 7th 52.5 billion. The budget of the forthcoming Eighth programme (Horizon 2020) stands at 80 billion Euros.

⁷⁰ A critical approach towards Framework Programmes is expressed by Dosi, Llerena and Labini (Dosi et al., 2006). They deny the existence of the European Paradox pointing to the flaws of European knowledge at the level of scientific research and their commercial application. The validity of precompetitive research is questioned as being a mere excuse for gaining funding from the public purse for marginal areas rather than through self-financing sources, stressing the fact that it does not solve the problem of European innovation.

Moreover, the research conducted within Framework Programmes are defined as *precompetitive*, which means that such research focuses on the development of science and its applicable nature, however its aim is not the implementation of the development of particular products or processes [Fischer et al., 2009].

The survey encompassed 300 Polish beneficiaries including coordinators (6%) and participants (94%) of multinational consortiums. These individuals implemented research projects (development research, scientific research), infrastructure projects (laboratory supplies, equipment purchase, etc) and the projects supporting science institutions in their research. Among the coordinators, the most numerous group was constituted by research institutes and the Polish Academy of Sciences (PAS) institutes (39% each), these consortium members represented mainly higher education institutions and research institutes (Graph 1).



Graph 1. Distribution of the research sample according to the type of institution and its role in the project

Source: Own work based on OPI (Information Processing Institute) research results.

The research covered the majority of the beneficiaries of the 6th Framework Programme (62%), but due to the smaller data, the beneficiaries of the 5th and 7th Framework Programmes complemented the sample (19%

each)⁷¹. The data utilised in the research came from E-CORDA⁷² database, which collects the main information on Framework Programme funding and the beneficiaries⁷³.

Motivation to undertake project operations

The main motivation to participate in the framework programmes for Polish beneficiaries is the opportunity to obtain funding for research. The motivation of scientific development was also considered, stressing the importance of scientific networks for access to state of the art knowledge. The research results point to the fact that these institutions are frequently recommended as members for new consortiums through their track record of cooperation. Access to scientific networks was mentioned as the main non-monetary motivation for programme participation (every second coordinator and as many as 78% of consortium members stressed the importance of this factor). The research also confirmed the lack of a strategy of Polish institutions in the area of activity in Framework Programmes, though the high prestige of participation was appreciated throughout. Polish research confirms a number of European studies, which, similar to the main objective of international teams participation in Framework Programmes, point to the access to complementary knowledge and international qualifications through the network of scientific and business contacts⁷⁴, searching for technological solutions in new fields and the possibility of development in the area of the beneficiaries' specialisations, through implementation of research gained knowledge in these fields [Fischer et al., 2009]. The international participants also considered as a motivator research funding.

Commercialization of the research results implemented by Polish teams was rarely mentioned as the motivation drive in project participation. The demands of private investors for project results was only expressed by 20% of beneficiaries as the reason for undertaking research within the project. This also follows international studies [Astrom et al., 2012]

⁷¹ The evaluation research dealt with the three projects implemented within the 5th, 6th and 7th Framework Programmes (projects completed by 30th June 2012).

⁷² Access to the data courtesy of the National Contact Point NCP EU.

⁷³ E-CORDA database collects data on the technical parameters of the project, they do not include information on their effects. SEZAM is an attempt to create a database on the projects' results. However, it includes only the data on the projects of the 7th Framework Programmes in the area of ICT technology.

⁷⁴ This effect was also regarded as significant by the beneficiaries of the countries which, as a result of many years' experience with Framework Programmes, built extensive international networking (Danish Agency for Science, Technology and Innovation, 2010; Godo et al., 2009; Simmonds P. et al 2010).

confirming that the motivation of scientific institutions (and surprisingly also companies⁷⁵) does not stem from the need to generate results of practical application. Similarly rare is the intention of the teams to implement project results (the significance of this varied greatly among the respondents). However, in the case of beneficiaries whose motivation was the commercial application of the project results, this objective was often achieved. Moreover, the research conclusions point out that despite the fact that the commercial implementation of the results was not the main objective of the conducted research, still the influence of the programmes on innovation was recorded. This conclusion stemmed from the fact that the majority of the teams indicated the achievement of at least one result linked to technology commercialisation [Fischer et al., 2009].

In the case of Polish beneficiaries whose participation in Framework Programmes resulted from the need of private recipients for the project's results, 23% of the beneficiaries confirmed the lack of results in the area of practical applications. 54% of the beneficiaries pointed to partial results, whereas significant results in this area were confirmed by 23%⁷⁶.

Assessment of Framework Programme effectiveness

The application of the criterion of effectiveness of Framework Programmes allowed to assess the level of the implementation of the project's objectives, the effectiveness of utilised methods in order to achieve the desired results, the effectiveness of institutions and the impact of external factors on the final achievements of all the operations. The evaluation research [ETAN Expert Working Group, 1999] divides the results of Framework projects into three groups:

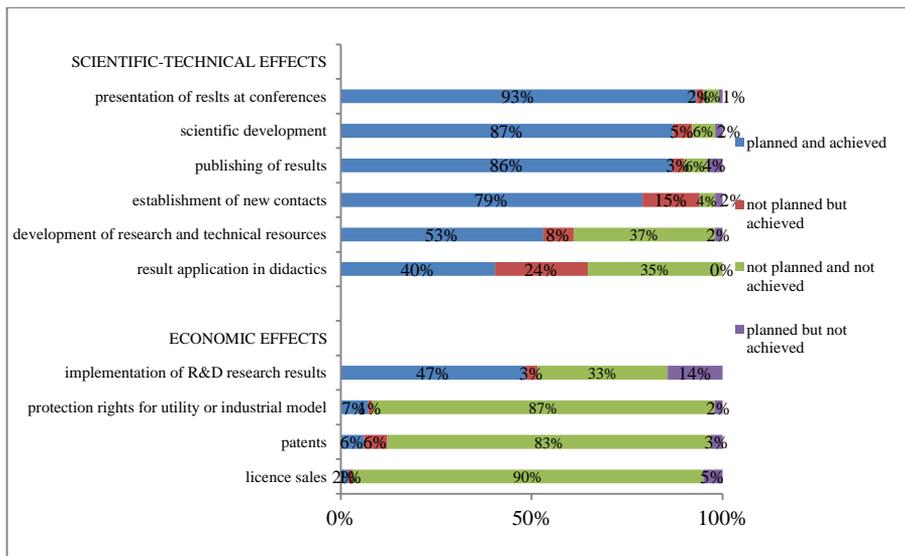
- scientific-technological effects
- economic effects
- social effects

Such a division allows to place the effects achieved by the Polish beneficiaries in the group of scientific-technological effects (which

⁷⁵ On the basis of the research results, companies do not treat Framework Programmes as a result development tool which can be immediately commercialised. Among the main reasons for participation in Framework Programmes they point to the access to scientific knowledge, skill developments, the opportunity to sustain operations at the current level of knowledge on created technologies and access to knowledge on new technologies (Fischer et al., 2009).

⁷⁶ The results in the area of practical applications in the research include: patents, protection rights both industrial and utility model, licence sales and project effect implementation. Partial occurrence of the results means that one effect from the group was achieved; significant occurrence signifies that at least two effects from the group were achieved.

is proved by not only the index of effect achievement, but also by the level of their planning). Low effectiveness characterises the projects with Polish participations in the area of an economic effects (Graph 2). The social effects were not looked into by the research (though the application of the results in didactics may be regarded as a social effect).



Graph 2. The assessment of project result effectiveness (frequency)

Source: Own work based on OPI research results.

Analysis of the data obtained pointed to the particular significance, in the beneficiaries' view, of two factors of Framework project participation. Firstly, networking was regarded as the key and most desired effect. New contacts established within the consortiums are mainly foreign contacts, the majority being scientific ones (97% of institutions which gained new contacts labelled them so), more rarely business contact (29%). Secondly, the development of individual scientific careers can be regarded as a complementary effect of Framework project implementation. These effects contributed to the rise of an institution's standing in the national evaluation system of scientific entities. Within the research that received Framework Programme funding, a number of scientific publications appeared, the participants often presented the results of their research at scientific conferences. The research also pointed out that the factor of career development possibility in its international aspect within Framework

projects increased the attractiveness of an institution as a workplace. Participation in Framework Programmes was also used to stimulate an institution's standing in the scientific world.

The frequency of results of a scientific nature (institution's scientific development and the scientists involved in the project) proves that Polish beneficiaries are focused on a project's objective achievement not linked directly with innovation growth. The effectiveness of Polish participation in the programmes was not recorded in the area of project result implementation. In comparison to other results, implementation was most frequently indicated as planned but not achieved (14% indications). If the implementations were applied, then in research institutes they finalised a project twice as often as in PAS institutes and higher education institutions, which stems from the main areas of activities of these institutions, a result of the law requiring research institutes to gear the results towards practical applications ⁷⁷. The lower effectiveness of projects in the area of obtaining and managing intellectual copyrights was confirmed. In comparison to other results, acquisition of a patent and protection rights as well as licence sales were mentioned less often among the achieved results. Moreover, these results were not planned. Protection tools created a friendly environment for investment in R&D and for the commercial application of scientific research results. Therefore, the protection of research results is vital for innovation growth, and the low result achievements points to the low effectiveness of Framework projects in this area.

The presented results correspond to international assessment research. Assessment research among Framework beneficiaries in other countries confirms the low effectiveness of beneficiaries in areas directly linked to commercialisation of results or protection of intellectual property of achieved solutions. The respondents were in unison in confirming the lesser significance of these results and more frequently achieved a level below the expected rate, in comparison to the scientific and technological effects [Danish Agency for Science, Technology and Innovation, 2010; Godo et al., 2009; Simmonds et al., 2010; Technopolis Group, 2009].

The international data indicates the highest effectiveness of the Framework projects in a range of areas, though these referred mainly to scientific institutions and their employees' development. Scientific and technological results, such as participation in scientific conferences, determining of new research methods and techniques, or scientific publications were implemented beyond project participant expectations

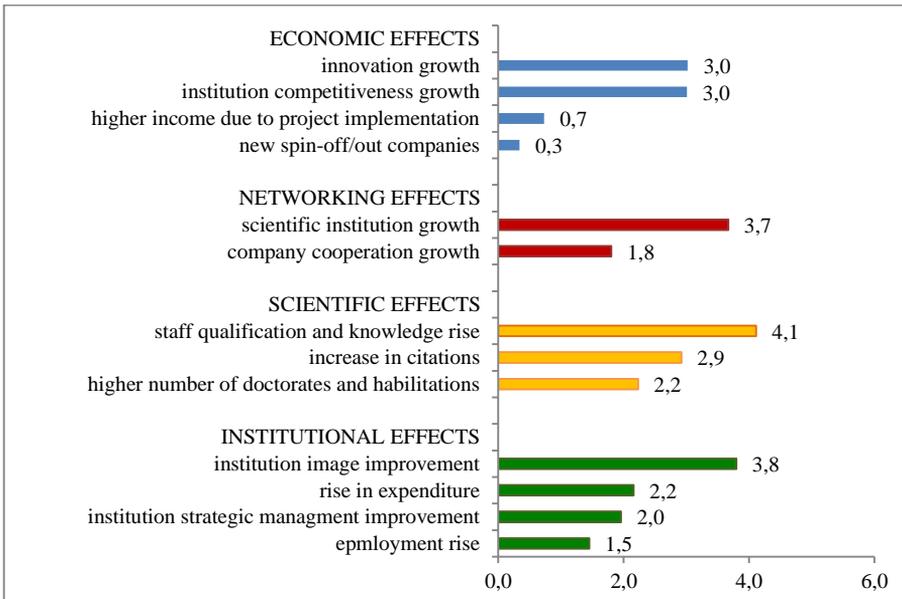
⁷⁷ The Law of 30th April 2010 on Research Institutes Dz. U. Nr. 96 Poz. 618.

[Danish Agency for Science, Technology and Innovation, 2010; Simmonds et al., 2010; Technopolis Group, 2009].

Assessment of Framework project utility

The criterion of utility allowed to assess the true effects of the projects, both planned and unplanned (called side effects), referring to the current, observable situation. The criterion enables the measurement of the effects on, among others, innovation.

Graph 3 presents the classification of the Polish participation in Framework projects used in other evaluation studies [State Secretariat for Education and Research, 2009]. The project’s impact was measured in four aspects: economic effects (influence on the economy and employment level), networking effects (influence on scientific cooperation within a network), scientific effects (influence on the creation of new knowledge and improvement in qualifications) and institutional effects (influence on creating support conditions for scientific and development activities).



Graph 3. Assessment of the utility of project effects (average respondent score)

scale: 0=lack of impact, 5= very high impact

Source: Own work based on OPI research results.

The highest utility effect of the Framework projects was recorded in the area of rising qualifications and knowledge of personnel, scientific effects also scored above average. The beneficiaries admitted that participation in the project improved institution image, rarely though contributing to a rise in employment.

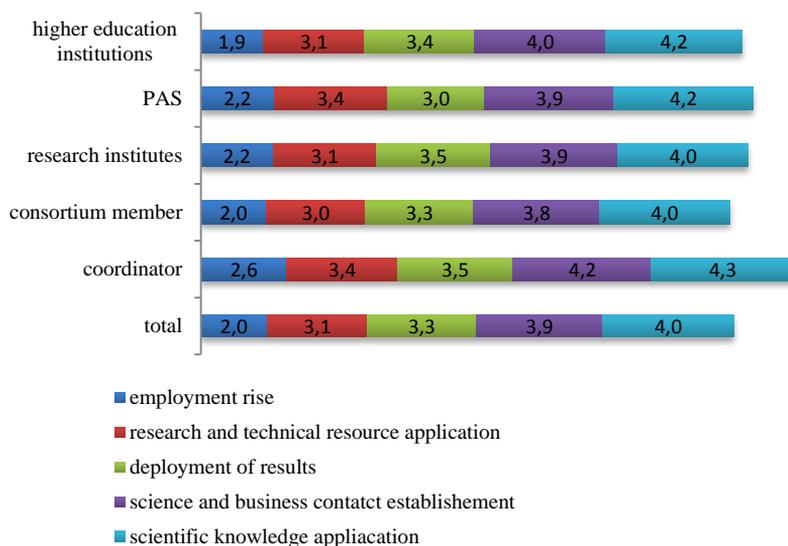
The high assessment of project utility in the area of networking effect corresponded to project effectiveness in the area of networking. Consequently, the projects contributed to an increase in beneficiaries' cooperation with other scientific institutions. The networking effects also play an important role in the institution's standing in the international arena. Participants of the in-depth research pointed to the significance of such scientific contacts (achieved thanks to Framework projects) for further international scientific ventures. Cooperation with companies was mainly established by those institutions whose operations and research included research geared towards commercial recipients (research institutes). The value of utility measurements of the economic effects varied. The beneficiaries confirmed the project's impact on institution innovation and competitiveness growth, however there was a lack of impact stemming from commercialisation of the research results (implementations and new spin-off/out companies). Moreover, the respondents admitted that the profitability of implementations was low. Among the beneficiaries who implemented new solutions, as many as 72% confirmed a lack of extra income from the effect⁷⁸. The opportunity to implement results was regarded by 39% of the beneficiaries as a significant project effect, so contributing to the development of the economy's innovation was not considered significant.

It is worth noting that the utility index values describing the assessment of the project's impact in the given areas increased along with consecutive programmes. Such dependency was recorded for all the analysed effect groups. It signifies the accelerating tendency of Framework project impact, not only in the field of scientific development, but also in the area of innovations.

In order to complement the analysis on the effectiveness and utility of the Framework projects, one must also evaluate their sustainability. The key element of this criterion is the assessment of the continuity of the effects determined by, among others, the time span of the results impact and the aim of their further applications.

⁷⁸ The research participants also pointed to the rare opportunity of consultations on the implementation of project effects with potential recipients.

Among the most sustainable results the respondents pointed most frequently to the application of scientific knowledge and establishment of new scientific and business contacts (see Graph 4). Although the impact of these effects on innovation is perceived as less significant, still they remain the most quoted reason for project participation and are treated as achieved as expected. On the other hand, the results from the group with a higher impact on innovation (practical application of the effects) were assessed in the evaluation study as less sustainable.



Graph 4. Assessment of sustainability of project results

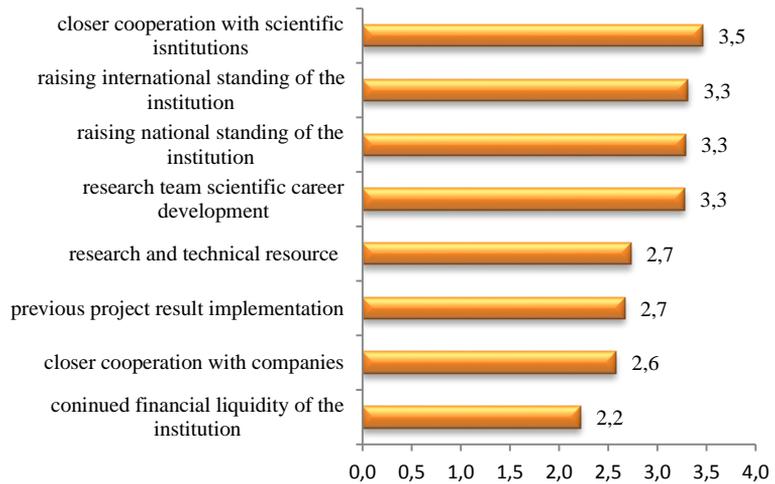
Assessment measure: average of long-term project effects score. Scale: 1=dominance of short-term effects, 5=dominance of long-term effects.

Source: Own work based on OPI research results.

Analysis of the evaluation research results indicates that the higher the research institution's standing in the consortium, the more frequent the long-term application of the effects after the completion of the project. The research also shows that along with the consecutive Framework Programmes, the assessment of effect sustainability increases.

The effects of Framework projects are applied in other (consecutive) scientific institution operations. Most of all, such applications were recorded during further scientific and development work having the

potential to be implemented or commercialised, and also in the form of publications or scientific conference participation (focus on scientific development and scientific career among research institution employees). It is pointed out most frequently that the main objective is close cooperation with other research institutions, raising of national and international standing and research team scientific career development (Graph 5). Closer cooperation with companies and commercialisation (having a direct impact on innovation growth) were rarely indicated as the objective of the continued activities.



Graph 5. Objective of continued activities

Assessment measure: average score of operations stemming from continuation of project activities. Scale: 1=definitely not; 2= probably not; 3= probably yes; 4=definitely yes.

Source: Own work based on OPI research results.

The above results confirm the fact that within the continuity of the Framework project results, practical application was more rarely indicated than the scientific effects, however the objective of continued activities did not refer to factors which impact innovation directly. It also confirms the fact that Framework Programmes raise the level of conducted research, enabling the search for innovation solutions and the possibilities of technological development, however, the assessment of the impact of these effects on innovation requires a more long term time span.

Summary

The presented research is the first attempt to assess the effects of Polish participants in Framework projects and corresponds to evaluation research conducted among beneficiaries in other countries. What is more, the convergence of the results confirms the significance of this tool for participation in scientific networking and achievement of scientific and technological effects, however it points to the low application of the effects in the economic area, in Poland as well as other countries participating in the programmes. The assumptions of Framework Programmes refer to the objectives included in the EU innovation strategies which advocate a raising of conducted research levels, integration of the European scientific field, searching for innovative solutions and new ways of technological developments⁷⁹. Commercialisation of the innovations achieved as a result of a project has never been the major objective of Framework Programmes and is proven by the evaluation studies which confirm that the effects which may impact innovation growth directly are not common according to the research. Such an outcome determines not only participation of the Polish research institutions, but also corresponds to international research, indicating the achievement effects below respondent expectations and the low importance for the consortiums. However assessment of the direct impact of the effects of innovation on the economy requires a more long term time span. The conducted assessment research leads to the following conclusions:

1. The consecutive programmes brought continually better effects. The index of effectiveness, utility and sustainability increased and a clear positive correlation of these measurements with an institution's standing in a consortium (expressed by its role and financial participation in a project) were recorded.
2. The research accentuated the predominance of effects which translate directly into a research team's scientific career development and the rise of an institution's standing, through implementing an institution's objectives. On the other hand, effects that are beneficial for the economy rarely occurred, thus the low assessment of the project's influence on innovations.
3. The effects directly translating into the innovation of the economy were more frequently achieved by research institutes (the utility and sustainability of the effects were also assessed higher by these

⁷⁹ The main objectives for the European Research Area (the European Commission, 2007) is the integration of the scientific world and raising the level of scientific research.

institutions). The higher effectiveness of these institutions is linked to their scientific profile (focused mainly on implementation of ventures of a practical nature). The research results indicate however, that even in the case of these institutions, the applications did not generate financial benefits, moreover their significance, among others, was assessed as low. 4. The continuation of the research commenced within Framework Programmes is a common practice among the beneficiaries. Such practices are in accordance with the European policy on initiative funding, which give long term development prospects and constitute value added on an international scale.

The evaluation research is one of the research methods applied to assess the effects of Framework Programmes. The in-depth understanding of the Framework Programme's impact on the macro economy (including innovation) requires the analysis of this instruments' impact from the viewpoint of individual beneficiaries.

Comprehensive innovation research definitely requires an extension of the analysis to the sector interested in research effect application. This aspect may give rise to later research geared towards assessment of the effects in the business sector. Such knowledge seems to be particularly important in the light of Horizon 2020, which obliges beneficiaries to conduct applicable research and to prepare to implement their results.

Despite the fact that the inclusion of Polish institutions in international research consortia often seems a huge challenge (which is indicated by the consistently low participation statistics), the evaluation research confirmed that the effects achieved by teams correspond to the effects of other European countries participating in these programmes. This justifies the significance of raising Polish participation in this instrument of research funding. Therefore, the understanding of participation mechanisms is significant for the improvement of the existing forms of support and increasing Polish institutions' participation in the forthcoming programmes. The importance of the application effects of the projects in the coming Horizon 2020 strategy demands state intervention to support the cooperation between the science sector and companies. Easier access to scientific research funding for the business sector increases its activity in financing science thus boosting innovation in the Polish economy.

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