

IMPACT OF EU FUNDS ON THE EFFECTIVENESS OF INNOVATIONS IMPLEMENTED IN THE SME SECTOR IN POLAND

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ABSTRACT

The importance of innovation is reflected in EU policies which provide large funds for member states on the development of innovation. Despite the large interventions innovativeness of the Polish economy is relatively low. This situation is particularly evident in relation to the SME sector companies. This dichotomy is an important subject of research in the field of economy the SME sector, and the applications can make a significant contribution to the strategy of building aid policy in the field of innovation financing.

The purpose of this article is to analyze the efficiency of the use of EU funds for the development of innovation in the Polish SME sector. The author puts the research hypothesis: (H1): *allocation of EU funds does not affect significantly the efficiency of innovation activities carried out by Polish SME companies*. In order to verify the hypothesis author conducted to compare the effects of innovative activity of SMEs include the division of the company that benefited from EU funds for the development of innovation and the company that not exploited EU funds. The author used the method of the survey. The study was conducted in the years 2014–2016 on a sample of 400 SME sector. In addition, author conducted a critical analysis of the literature of the subject and has used commonly available statistics.

Introduction

A present-day, commonly accepted economic paradigm holds that innovation is the foremost determinant of development opportunities – both on the macro and microeconomic level. In the macroeconomic perspective, innovation is a significant factor of economic growth, whereas in the microeconomic perspective, innovation directly affects the competitiveness of economic entities (Farinha, Ferreira, Gouveia, 2016; Carayannis, Grigoroudis,

2014). After a thorough review of academic literature it can be also stated that the role of innovation is particularly emphasized in case of small and medium-sized companies, which reflects the SME sector's significance for today's economy: SME generate over 60% of new employments, SME enable transformation of the industry from traditional production forms to advanced technologies (Dibrell, Davis, Craig, 2008, pp. 203–218), SME of the sector significantly contribute to the development of the global market (Salvato, Lassini, Wiklund, 2007, pp. 282–305), SME play a key role in the development of innovations aiming at the increase of the competitiveness (Low, Chapman, 2007, pp. 878–891).

In the European Union innovation is treated as a *sine qua non* condition for ensuring dynamic growth of the entire Union and its competitiveness in relation to other developed global economies. The EU policy and strategy with regard to the objectives, priorities and support areas of innovation in member states is expressed in EU's official documents and vastly commented on in academic literature (Janger, Schubert, Andries, Rammer, Hoskens, 2016, pp. 30–42; Camagni, Capello, 2013). Authors unequivocally point to the fact that support for the innovation of the SME sector occupies a special place in the EU policy, especially in relation to less developed member states (Radas, Božić 2009, pp. 438–450). Ensuring the continuity of innovative processes requires the control of the development of knowledge and its applications at various levels. (Budziewicz-Guźlecka, 2014, pp. 12).

Poland is one of the largest beneficiaries of the EU funds. Present EU financial support for innovation development in Poland (for the years 2014–2020) is realized through: Smart Growth Operational Programme (with allocation for Poland amounting to 8.6 bn euro), and 16 Regional Operational Programmes dedicated to individual provinces (priority axes supporting the creation of innovation and smart regional specialization, allocation of EU funds of 31.3 bn euro)¹.

Despite this huge financial support, compared to other member states, the level of innovation of Polish economy is still relatively low. In the latest European Innovation Scoreboard Poland ranked 23rd among 28 countries surveyed (Hollander, Es-Sadki, Kanerva, 2016). As it comes to the SII index (Summary Innovation Index) which is a measure of a country's overall innovative performance, Poland's score of 0.2917 placed it among the so-called moderate innovator countries. Poland was followed by Romania (0.1796), Bulgaria (0.2415), Croatia (0.2814), Latvia (0.2814) and Lithuania (0.2821). The below the average level of innovation of Polish economy has also been confirmed by other research conducted by national, European and global institutions including the Polish Central Statistical Office, EuroStat and the World Bank.

The reason for the continuing low innovation of Polish economy in spite of huge innovation funding is undoubtedly an issue that urgently calls for research and explanation.

Measurement of innovation efficiency based on indicator methods. Literature review and theoretical background

In academic literature, efficiency is usually defined as a result of activities undertaken, and described in terms of actual output relative to input, or results relative to resources used (Stoner, Wankel, 1986, pp. 29–30). Efficiency as an economic category is supported by a range of complex theories. A clear, concise and precise overview of present-day comparative efficiency assessment methods can be found, among others, in the works by V. Sarafidis (2002).

¹ www.poig.gov.pl (15.02.2018).

Meanwhile though, upon a thorough literature review the Author concluded that the issue of analysis and assessment of innovation efficiency is relatively rarely tackled (Geroski, Machin, Reenen, 1993, pp. 198–211; Rosebusch, Brinckmann, Bausch, 2010; Sawang, Unsworth, Sorbello, 2012, pp. 110–125). Academics who explore the issue of innovation efficiency focus on formulating definitions of innovation efficiency, and apply standard efficiency measures, which usually capture measurable characteristics of innovation (West, Bogers, 2014; Bijanska, 2011). Such approach can yield certain results in case of individual innovation ventures, however it seems unsatisfactory when aiming at a comprehensive evaluation of innovation efficiency of a company, or entire economic sector(s).

As it transpires from existing subject literature (Foreman-Peck, 2013, pp. 55–70), innovation activities are assessed with the use of the same methods which are used to assess investment projects – commonly used static and dynamic investment project evaluation methods. And so, a wide range of innovation forms is narrowed down to a technology, product or process, that is forms that can be assessed with financial measures – whilst in case of the effects of innovation implementation, a many effects are not financial in nature, or else, are not measurable at all. The issue arises when, for example, one is supposed to assess value innovation or even organizational innovation, when it is difficult to determine or measure expected rate of return or anticipated market success generated by implementation of innovation due to the complexity and multidimensionality of its effects and costs.

Synthetic and comprehensive review of theories of economic efficiency, including an evaluation of their applicability for the assessment of innovation efficiency, was presented by M. Kotsemir (2013). Moreover, in principle, innovation efficiency evaluation based on available European statistics does not provide specific information on the activities of companies from the SME sector (Hollanders, Esser, 2007).

For the sake of clarity of the research subject, the Author adopts in this paper a definition of innovation efficiency (innovation activity efficiency) formulated by S. Sawang, K. Unsworth and T. Sorbello: innovation efficiency is the overall result of benefits stemming from implementation of given innovation (Sawang et al., 2012).

Upon analysis of reference literature and practical aspects of innovation efficiency evaluation, the following group of indicators appears to be a sound proposal:

- return on innovation investment (ROI2),
- percent share in the profit from sale of innovation in total company profit.

The above indicators explicitly illustrate and, in consequence, evaluate the efficiency of innovation activities and allow to directly assess the innovation effects (profits) ratio to costs incurred.

ROI2 (Return on Innovation Investment) is an indicator widely used in subject literature to evaluate efficiency of innovation. It is calculated by comparing total profits of new product or service sales with total expenditure on investment over certain time. The idea to apply the ROI2 indicator to evaluate innovation efficiency and its application methodology were developed by, among others, A. Kandybina (2014), P. Drake (Drake, Miles, Sakkab, Jonash, 2006, pp. 32–41); A. Kandybina and M. Kihn (2004).

Return on innovation investment can be calculated in several way. The most common and useful way is (Marr, 2012): $ROI2 = [(Net\ profit\ from\ new\ products\ and\ services) - (Innovation\ costs\ for\ these\ products\ and\ services)] / (Innovation\ costs\ for\ these\ products\ and\ services)$.

Although the ROI2 indicator is very useful in evaluating the efficiency of specific innovation projects, its application to entire economic sectors and branches of industry is debatable (precise identification of stream of revenues and outlays on innovation), and the evaluation and interpretation of results additionally requires the

researcher to define reference values (or expected values). This stems from the fact that innovation efficiency correlates very strongly with company size, economic sector, type of business activity, and also the kind of given innovation initiative. For example, large production enterprises usually have a substantially higher ROI2 than small service providers.

Method, used sample and research limitations

The main objective of this paper is to answer the question: Does the allocation of EU funds affect the efficiency of innovation activities carried out by Polish SME companies? Relatively low innovation of Polish economy on the one hand, and on the other, consumption of EU funds allocated to innovation, raise doubts as to the efficiency of using European aid measures to boost innovation.

In an attempt to answer the puzzle, the Author has propounded the following hypothesis (H1): *allocation of EU funds does not affect significantly the efficiency of innovation activities carried out by Polish SME companies.*

A comparative method was applied in the research – two groups of companies were extracted from the research sample: one composed of companies which used EU funds in their innovation initiatives, and one grouping companies which did not avail themselves of EU funds (grouping by feature selection). Innovation activity was defined as implementation (diffusion or absorption) of any innovation meeting the criteria of Oslo Manual by the company.

The research sample consisted of 400 SME firms registered in Poland, and operating for minimum 5 years. The companies were purposefully selected with regard to company size (according to the commonly applied classification by size of employment in the research year, i.e. micro, small and medium-sized companies), and primary business activity stipulated in PKD (Polish Classification of Activities, i.e. industrial/ production companies and service companies). This targeted selection was meant to ensure that research is conducted on a sample reflecting statistical composition of Polish SME sector (in accordance with the sectoral data published by Polish Central Statistical Office). However, it must be underlined that the research sample is not representative. A detailed structure of the research sample is provided in Table 1.

Table 1. Research sample structure

Type of company	Number of companies	Number of companies due to the source of financing innovation		The sum of innovations implemented in the period	
		without EU funds	UE funds	without EU funds	UE funds
Mikro	303	179	124	398	265
Production	151	89	62	184	135
Service	152	90	62	214	130
Small	66	32	34	50	66
Production	33	14	19	24	34
Service	33	18	15	26	32
Medium-Size	31	17	14	43	27
Production	14	7	7	18	15
Service	17	10	7	25	12
Total	400	228	172	491	358

Source: own elaboration based on research data.

Empirical data were collected by way of an online questionnaire containing 34 questions. Respondents, that is entrepreneurs, provided basic company data and detailed data regarding innovation initiatives carried out in the surveyed period, i.e.: the number of implemented innovations, type of innovation, overall innovation expenditure, and innovation financing sources (using EU funds or not). Respondents provided additional information, including: expected rate of return on innovation, and competence with regard to evaluation of one's own innovation efficiency. The questionnaire survey was conducted over the period 2014–2016.

Based on the data gathered, the Author computed the ROI2 indicator for all companies surveyed – with the assumption that the accumulated profit/expense streams for each of the companies surveyed was attained (documented) for at least one year. The results were subjected to descriptive statistical analysis, normality of distribution was checked, and non-parametric statistical tests were conducted (U-Mann-Whitney test and Kolmogorov-Smirnov test) to determine whether differences between datasets are significant (Hollander, Wolfe 2014).

Results and discussion

Firstly, the Author divided the research sample into two groups:

1. Companies which used EU funds in their innovation initiatives – the group consisted of 172 firms that implemented the total of 358 innovations in the study period. Average share of EU funding was 62% (micro 61%, small 65%, medium-sized companies 62%, respectively).
2. Companies which did not use EU funds – the group consisted of 228 firms that implemented the total of 491 innovations in the study period.

Next, the Author computed the ROI2 indicator for the study groups, and compared the indicator with the quoted expected values. Due to the limited scope of this paper, the Author presents only the aggregated cross-section mean value of ROI2 for the following data measures: Company size/Type of business activity, grouped by Innovation funding source. Averaged results are presented in Table 2.

Table 2. ROI2 indicator for the research sample (%)

Type of company	Average ROI2	Average expected ROI2	Without EU funds		UE funds	
			Average ROI2	Expected ROI2	Average ROI2	Expected ROI2
Micro	8.98	16.19	9.95	15.04	7.58	17.85
Production	8.54	17.76	9.82	16.40	6.69	19.71
Service	9.42	14.63	10.08	13.69	8.46	16.00
Small	9.50	17.48	9.22	14.59	9.76	20.21
Production	10.12	16.88	8.86	13.93	11.05	19.05
Service	8.88	18.09	9.50	15.11	8.13	21.67
Medium-Size	18.03	16.23	20.35	15.00	15.21	17.71
Production	17.14	14.29	20.00	15.00	14.29	13.57
Service	18.76	17.82	20.60	15.00	16.14	21.86
Average	9.77	16.41	10.62	14.97	8.63	18.31

Source: own elaboration based on research data.

For companies which did not use EU funds to finance their innovation initiatives ROI2 had the average value of 10.62%. The expected ROI2 value for this group was 14.97%. Average value of ROI2 of companies which benefited from EU funding was 7.87%, and the expected value was 18.31%.

Considering the size of surveyed companies, it should be noted that better results and higher efficiency was shown by micro (9.95%) and medium-size (20.35%) companies not supported by the EU funds, as well as small (9.76%) companies using EU funds in their innovation ventures. The difference is particularly noticeable in the group of medium-sized companies (difference of 5.14%).

Considering the type of business activity in the group of firms that did not use EU funds, average ROI2 for production companies was 10.35%, whereas for service providing companies it was 10.88%, thus they showed better innovation efficiency than the group of firms benefiting from EU funding (the difference was respectively: 2.11% for production companies, and 1.84% for service companies).

To recapitulate, the reported results allow to conclude that companies whose innovation projects are co-funded by the EU yield a statistically lower average rate of return (lower innovation efficiency) – the difference was 1.99%, and thus the results tentatively confirm the hypothesis made. The hypothesis can be fully verified after answering the question: Is the difference obtained statistically significant?

In order to answer this question and confirm the statistical significance of differences between results for the data sets, the Author performed the U-Mann-Whitney non-parametric test (selected after the normality of distribution of ROI2 was checked for the study groups). The results obtained indicate that the difference between mean ROI2 for both study groups is not statistically significant – with the p value of $p = 0.114451$ (higher than $p = 0.05$ which denotes standard statistical significance in economic sciences). This result fully supports the hypothesis perpetrated.

Conclusions

The results confirm the hypothesis (H1) made by the Author: the consumption of EU funds does not affect significantly the efficiency of innovation activities carried out by Polish SME companies. What is more, it can be ascertained that the employment of EU funds to finance innovation activities exacerbates the effects of innovation initiatives (average result down by 1.99%). Such a situation gives rise to a question – Why companies that benefit from EU funds have achieved worse results in the study?

An exhaustive answer to this question would require thorough research to correlate the results obtained with particular company's attributes and determinants of innovation processes, such as e.g. innovation planning, R&D collaboration, innovation implementation or enterprise innovation culture. For example, interesting information is provided by correlation of the company's length of existence with effects of its innovation activities (the Author, based on a preliminary analysis, assumes that companies with longer experience on the market achieve higher efficiency).

Another, frequently evoked explanation for these findings is the thesis about the so-called „easy money” resulting from wide and relatively easy access to EU funds. Entrepreneurs use EU funds “as a by-product”, “by the way”, so to speak, which means that they carry out innovation projects in an unprofessional and unplanned manner. The lack of capability to evaluate the efficiency of one's own innovation initiatives displayed by the entire study group confirms this hypothesis – only 23% of the study companies analyzed their efficiency, and as much as 56% admitted to having no competence whatsoever in this respect (this can be understood in case of micro firms, yet in

case of small and medium-sized companies lack of evaluation capacity is unacceptable). Such limitations result in an inability to effectively monitor innovation processes and, in consequence, inability to achieve expected benefits from implementation of innovation.

The results obtained in such a way can help formulate a development strategy for national innovation policy at the macroeconomic level. Moreover, the research findings provide reference values for innovation efficiency indicators for given groups of companies which can serve as basis for the development of recommendations on the monitoring and evaluation of efficiency of innovation initiatives.

From the academic perspective, it would be most interesting to broaden the research scope and include other EU states – results of such an extended research may serve as a benchmark of the efficiency of innovation policy in individual EU member states.

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