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## EVALUATION OF THE EFFECT OF STATE SUBSIDIES ON BUSINESS

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**Abstract.** The effect of market regulation tools on business is a complex phenomenon, and the after-effects of such regulation could be both favourable and adverse. The enhancement of the positive effect is a scientific task, which requires a systematic approach. In order to find a solution to this problem, it is necessary: a) to identify the relevant factors; b) to make a coherent evaluation of these factors and their influence on the phenomenon under investigation; c) to establish the optimal form and extent of the SRB (State Regulation of Business) tool required for the achievement of the desired results.

The study analyses aims of economic regulation and business management from the point of view of a state. It also examines the practice in economic research and evaluation of EU Structural Funds in Lithuania and abroad. The research is focused on problems caused by state subsidies for business enterprises as one of the forms of SRB. The research also focuses on possibilities to enhance the effectiveness of business regulation. The main objects of this study are: state subsidies for business enterprises as a form of state intervention in the market, and the possible correlation between the specifications of subsidies and their effect on business.

The evaluation presented in this study proved that EU subsidies had a direct positive influence on the effect of subsidies. The research into the influence of various subsidy criteria on the effect of subsidies revealed that a greater effect results from the rate rather than the size of funding.

**Keywords:** state subsidies, EU financial aid, multicriteria evaluation methods, expert assessments.

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### 1. Introduction

In modern economy, the main market forces are determined by the market itself. Nevertheless, the world practice proved the significance of the state's role in economy, and it is hard to believe that the market could exist without state intervention. There are numerous forms of state intervention in the market, e.g. legal and administrative regula-

tions as well as operational activities in the market (economic activity, subsidies, soft loans, etc.). All of the above-mentioned forms of state intervention have an undoubted influence on the market. The study is mainly focused on direct state subsidies (economic aid) for business enterprises. The tool of the State Regulation of Business (SRB) is a topical issue in Lithuania as well as in other EU member states, as this is exactly the way the major part of economic aid to business from EU Structural Funds is provided. In the period of 2004–2006, the extent of such aid to business in Lithuania alone was approximately LTL 270 million (EUR 78 million), while in 2007–2013, it exceeded LTL 3.9 billion (EUR 1.1 billion).

The analysis of financial subsidies for enterprises, as a form of business regulation, was based on the cases of the EU financial aid to business enterprises. Nevertheless, the presented study is not only relevant to the provision of the EU financial aid as the findings of the study may be taken into consideration when providing state subsidies irrespective of the source of financing.

The issues related to state interventions in the functioning of the market and their effect on business have been of interest to many scientists for a long time; numerous studies have been carried out in this area (Alexe, Tatomir 2012; Munteanu 2012; Vadasan 2012; Jaliu 2012; Gómez-García *et al.* 2012). Evaluation of the management of the EU financial support has been continuing for several decades. Despite the abundance and variety of issues analysed in these studies, subsidy defining criteria – such as their size and rate as well as the influence of these criteria on the effect of subsidies – have not been investigated in a more detailed manner.

The effect of State Regulation of Business (SRB) is a complex and tricky phenomenon influenced by numerous external factors; it is impossible to define or express this phenomenon using a single indicator or criterion. The evaluation is aggravated by the fact that various criteria used to define this phenomenon are unequal in their relevance. Nevertheless, this problem can be resolved employing modern approaches to scientific research, e.g. multicriteria evaluation methods.

The objects of scientific research in the article are: 1) state subsidies for business enterprises as a form of state intervention in the market, and 2) the possible correlation between the criteria that define subsidies and their effect on business. The aim of the research is to define the effect of state subsidies on business. The study is based on findings of the previously published studies on the EU financial aid to business (Ginevičius, Podvezko, Bruzė 2008).

The research methods employed in the present study include complex research methods, multicriteria evaluation methods, comparative analysis, generalisation, synthesis, modelling, analysis of statistic data, representative survey, expert assessment (formal inquiry) and others.

## **2. Practice in Research and evaluation of subsidies from the EU Structural Funds for economy**

The EU funding aimed at implementation of the Cohesion Policy (from the EU Structural Funds and the Cohesion Fund) in 2007–2013 totalled EUR 336 billion, which exceeds one third of the EU budget. At present, the European Commission (EC) has defined the following criteria for the evaluation of structural assistance programmes (Ministry of Finance ..., 2010):

- Relevance: a criterion that provides the basis for assessment of correlation between the objectives defined in the programme, the needs of different focus groups, and the existing socio-economic problems in the region, which are to be solved by an intervention. In order to evaluate the efficiency of the programme, it is necessary to have the objectives of the programme expressed in quantitative indicators that would enable measuring the products, the outcome and the effect of the programme.
- Complementarity: a criterion that provides the basis for assessing the internal (i.e. how compatible are priorities and tools defined in the programme) and the external complementarity (i.e. how compatible is the programme with other programmes and tools).
- Efficiency: a criterion that provides the basis for assessment of the ratio between the financial inputs related to personnel or time consumption on one hand, and the actual or estimated outputs and results of the programme (or a certain part of the programme) on the other.
- Effectiveness: a criterion that provides the basis for assessment of the ratio between the goals and objectives set by the programme (or a certain part of the programme) and the actual results, i.e. the level of achievement. The effectiveness of the programme can be assessed not only once the programme has been implemented, but during its implementation as well (expected effectiveness).
- Impact: a criterion that provides the basis for assessment of direct and indirect (beneficial or damaging) outcomes of the programme. The impact of the programme becomes evident only once implementation of the programme is completed. The impact can be specific and general. The specific impact of the programme is directly linked to implemented activities and is felt by direct beneficiaries within several months following the programme completion. The general impact of the programme is of a long-lasting character; eventually, it manifests on a more extensive microeconomic level and to a broader population.
- Sustainability: a criterion that provides the basis for the assessment of a possible continuity of positive outcomes (results and impact) after completion of the programme (or a certain part of the programme) and termination of funding (in mid-term and long-term). The outcomes of the programme are considered to be sustainable provided they continue once the funding of the programme is terminated. The continuity of the programme and the sustainability of its outcomes depend on various internal and external factors.

The economic theory clearly identifies the usefulness of investments in the infrastructure and human capital, despite the fact that numerous studies with ex-post evaluation of the EU financial aid do not give a uniform answer regarding the significant effect of such aid on economy. Many regions – beneficiaries of the aid – remain relatively poor (Veld 2007). Herve and Holzmann distinguish the main reasons responsible for a significantly smaller actual increase in physical and human capital than might be expected from the optimal use of financial allocation (Herve, Holzmann 1998):

1. Waste of transfers. Due to inadequate administration, the funds could be used to finance investment projects with nil or even negative return on investments.

2. Administrative expenses required for the appropriate use of funds. Extra resources, needed for programming and monitoring of the financial aid, could not be used for building economic capacity.

3. Rent-seeking. Large amounts of financial support prompt players of the private and public sectors to engage in fraudulent behaviour in pursuit of financial support. This leads to investment in inefficient work, i.e. dishonest pursuit of financial support. Competition for financial resources also requires substantial resources, which otherwise could be used for achievement of more effective goals.

4. Diversion of funds to consumption. Positive effect to income has a direct influence on consumption in the private and public sectors. Growing consumption and the probability of an even faster growth in future leads to re-distribution of costs from investment to consumption, which has a negative effect on investments.

This point of view is supported by such researchers as Ederveen, Gorter, Mooij Nahuis (Ederveen, Gorter, Mooij Nahuis 2003). They claim, that although the EU Cohesion Policy is potentially able to stimulate the cohesion of EU regions, such problems as crowding out of investments in the private sector, poor efficiency of fund distribution, or dishonest pursuit of financial support may reduce or totally eliminate its positive effect.

Since the very beginning of the Cohesion Policy, efforts were made to evaluate its effect on the reduction of disparities between EU regions. According to Bachtler and Michie (Bachtler, Michie 1995), first evaluations were not very adequate. The reasons for this outcome can be explained by three factors:

- The required national co-funding aggravates the evaluation of the effect of EU assistance;
- Poor coordination of research within the EC;
- The use of different methodological approaches in the European Community to the evaluation of programmes prior to release of appropriate guidelines.

The systematic evaluation of the Cohesion Policy commenced subsequent to signing of the Single European Act in 1987evaluation. In conformity with the provisions of the Act, the EC started applying the established standards for the evaluation of financial aid: specific and measurable objectives were identified, and certain agreements regarding the evaluation methods were achieved. After the reform of the EU Structural Funds

in 1988, evaluation of the effect of structural tools became compulsory. As per regulations, the ex-ante, on-going and ex-post evaluation of a programme has to be carried out to produce an indication of the effect of the programmes (Hagens, Bekker, Gaaff 1994). According to the estimations of the EC, this resulted in about 300 independent studies in 1992. All studies concluded that assistance of the Cohesion Policy had a substantial effect on the growth in the added value of regions as well as the level of employment. Nevertheless, Bachtler and Michie (1995) referred to such evaluations as very subjective – they identified additional evaluation problems, such as incoherence of evaluation in different countries or regions, and differences in the quality of such studies. The international audit company Ernst & Young (Ernst & Young 1996) have also criticised the studies for incompatible evaluations. In response to critical remarks, the EC introduced even stricter evaluation procedures. Simultaneously, they started a research into evaluation procedures, which employ simulation methods for the evaluation of the macroeconomic effect of the Cohesion Policy (European Commission 1999).

As evaluation of the structural aid is one of the functions of the EU funded programmes, there were more studies and articles published on the topic (Sisäasiainministeriö 1996a, 1996b, 1997; Eskelinen, Kokkonen, Virkkala 1996; Forsström, Mustonen 1996). In 1996, the authors of the study on the financial aid for business, which was carried out in Finland, focused on the five types of effect on business: distortion of competition, safety of supply, social outcomes, impact on technologies, and the environment.

Systematic evaluation of EU funded programmes was also a major part of the EC initiative (in 2000) aiming for sound and efficient management. Apart from the internal management reforms, the sound and efficient management initiative of 2000 was aimed at increased cooperation with the EU member states and improved programme evaluation and monitoring.

The number of available evaluation methods has been growing together with the increasing number of evaluations of the EU Cohesion Policy and Structural Funds. Methods used for evaluation include case studies, the method of computable general equilibrium, and econometric methods (Bradley, Morgenroth, Untiedt 2003). The researcher Beutel (Beutel 2002) used the input–output method in his analysis of the effect on the macroeconomic level (in East Germany and Mazzogiorno Region in Italy), as well as on the national level (in Greece, Ireland, Portugal and Spain). Pellegrini *et al.* used a non-experimental comparison group method, the regression discontinuity design and a novel regional dataset for 1994–2006 to evaluate the impact of the EU Regional Policy on economic growth (Pellegrini, Terrible, Tarola, Muccigrosso, Bussilo 2013); their findings show a positive impact of the EU Regional Policy on economic growth. Another method of regional modelling, based on the income–expenditure model, was offered by Treys (Treys 1993; Fan, Treys, Treys 2000). Other researchers have developed their own evaluation methods for quantification of the effects resulting from the injection of the Structural Funds, e.g. Monrobel *et al.* developed a model, which is considered a neoclassical version of the Walrasian equilibrium, modelling production sectors on perfect competition, full use of production factors and the clearing of all markets

of goods (Monrobel, Camara, Marcos 2013). The main advantage of evaluation methods based on the macroeconomic modelling is the possibility to evaluate the policy effect comparing it to scenarios without intervention (Bradley, Morgenroth, Untiedt 2003).

Some econometric models for evaluation of the Structural Funds are based on the growth of regressions (Ederveen 2002). These methods are used for the analysis of information on regions. De la Fuente and Vives (Fuente, Vives 1995) evaluated the effect of the European Regional Development Fund, as well as other state subsidies for infrastructure and education, on the income level in different EU regions. In their analysis, they used a small simultaneous equation model and the decomposition method. The studies confirmed the success of the EU policy in convergence of the EU regions.

The following models for evaluation of the effect of the EU financial aid are among the most popular ones.

Quest III Model is perceived as a new generation model, widely used by institutions setting the economic policy. The model involves efficient public investments, which enable to evaluate the efficiency effects of investments in infrastructure.

Quest II Model is a global macroeconomic model with a microeconomic basis. The Model enables evaluation of the efficiency effect of investments in infrastructure and human capital.

Hermin Model is one of the most modern multi-equation models offering a possibility to evaluate, among others, the indirect effect of Structural Funds (substitution and other external effects) which, as a rule, cannot be evaluated using the micro method “from down to top”. The Hermin Model is based on the Keynesian theory of a small open economy. It also involves neoclassical side effects and, what is even more important for evaluation of the Structural Funds, the mechanisms of the internal growth. That makes it possible to evaluate the effect of Structural Funds in the long term. The model is suitable for evaluation of both the general efficiency of the programme and to predict the effect of the internal change of microelements to the aggregated macro-effects.

REMI Model of a political survey is a model of the structural economic forecast and political analysis. It is an integrated model, which comprises several types of models, making it easier to comprehend general macroeconomic effects of political decisions. This dynamic model allows for annual forecasts and simulations, as well as the evaluation of certain alternatives in wages, prices and other economic factors.

There were a lot of studies carried out in Lithuania. They aimed to evaluate the financial aid of the EU Structural Funds to Lithuania (including the direct financial aid to business), as well as its effects. The Ministry of Economy of the Republic of Lithuania commenced a research on the Most Effective Forms of Financial Support to Business from the European Union Structural Funds. This study concluded: when determining the conditions for provision of the financial support, the demand – the willingness of companies to increase productivity, to create new work places, to be engaged in the R&D activities and etc. – was clearly underestimated. Because of the existing restrictions, defined in the EU

legal acts pertaining to the maximum size of the financial aid to Lithuania, this kind of support has not turned into a powerful impulse for the commencement of special projects, which could not be financed by credit institutions, despite the fact that they have a great positive effect to the growth of the country's economy (The Most Effective Forms of Financial Support to Business from the European Union Structural Funds 2007).

In December 2008, another Report on the Evaluation of the Handling of Financial Support from the EU Structural Funds during the Programming Period of 2004–2006 was published by the Ministry of Economy. The aims of the report were to evaluate the peculiarities of the handling of the EU structural aid, administered by the Ministry of Economy during the programming period of 2004–2006, to analyse and evaluate the factors having effect on the implementation of projects, and to assess the socioeconomic influence of the provided aid. From the point of view of the financial support, the analysis was restricted to the form of aid (direct/indirect aid) and the type of the beneficiary of the aid (small and medium size companies/big enterprises). The results of the macroeconomic modelling, used in the evaluation report, indicated that in short term, the funds transferred as per provisions of the Single Programming Document (SPD) and administered by the Ministry of Economy during 2004–2006, had the strongest effect on the Lithuania's economy in 2007–2008. The evaluation, based on the accumulative approach, predicts the additional GDP increase by more than LTL 2.2 billion (EUR 0.64 billion) (the calculation is based on the recent price level). The identified increase in added value due to the EU financial aid is nearly 2.4 times greater than the funding received (Report on the Evaluation of the Handling of Financial Support from the EU Structural Funds during the Programming Period of 2004–2006, 2008).

Although the programming period o2007–2013 is not over yet, the primary evaluations of this period have already been made. In the Annual Report on the Implementation of the Operational Programme for the Economic Growth, the information presented relates to the following sections (Report on the Implementation of the Operational Programme for the Economic Growth for 2010, 2011):

- the overall progress in the implementation of the Operational Programme for the Economic Growth expressed in financial and physical indicators. It includes the socioeconomic analysis, synergy with other programmes (the EU Strategy for the Baltic Sea Region, the European Fund for Agricultural Development (EFAD), and others), as well as the use of other financial tools (JEREMIE, JESSICA);

- a detailed description of the progress in the implementation of each priority issue;
- implementation of extensive projects;
- handling of the technical support, provided for the administration of the programme implementation;
- information and publicity activities.

In the end of 2011, there was a study on the Evaluation of Changes in the Sectors of Economy Co-financed by the EU Structural Funds and the Funds within the Jurisdiction of the Ministry of Economy. The Study presented the evaluation of the macroeconomic effect of the actions, financed from the Structural Funds and administered by

the Ministry of Economy, as well as the effect of such actions to the main sectors of economy. Besides, the study investigates the effect of the EU financial aid on the micro level. One more issue addressed in the Study was the effect of the co-financing rate to the process of application for the direct financial aid (Evaluation of Changes in the Sectors of Economy Co-financed by the EU Structural Funds and the Funds within the Jurisdiction of the Ministry of Economy, 2011).

In summary, taking into consideration all of the findings of the above mentioned studies, it can be stated that evaluations of the EU financial support, as well as other research into state regulations of business, are mostly focused on the effect of aid. The evaluations only consider whether the financial aid was provided or not. The above studies do not analyse, how different specifications of the financial aid – such as the size or the rate of co-funding – influence the effect of funding.

Both – state regulation of business and the aid from the Structural Funds (as one of the forms of state regulation of business) – and their effect on business are multipurpose and complex phenomena. A great number of models and their criticism only confirm the fact that a single and universally accepted approach for evaluation of such phenomena simply does not exist. Depending on the questions raised during evaluation, and seeking a greater credibility and accuracy of results, different approaches can be applied.

Due to the fact, that the financial aid is multipurpose and complex, it is impossible to define the subsidies, provided to business enterprises, and their effect on business, if we use just one or two criteria. To have a more detailed evaluation of the phenomenon under consideration, it is necessary to significantly increase the number of descriptive indicators. During the evaluation process, it is also necessary to consider the importance of individual indicators (i.e. the indicators are not of equal significance) (Tamošiūnienė, Šidlauskas, Trumpaitė 2006). It is possible to get a more objective answer to the question on the effect of financial aid on business, when the issue is considered from several aspects rather than just one dominating aspect. In order to identify the conditions, determining the positive influence of the financial aid, and to identify the appropriate volume of such aid, it is essential to distinguish the criteria for the definition of the financial aid as such.

### **3. Methods/theoretical framework**

According to provisions of Lithuanian and the EU legal acts or other documents regulating the financial aid for business, four fields of activity of enterprises were defined as eligible for financial aid: production development, expansion of services, R&D and professional development. Next, the authors researched into the financial aid in the four fields. As the authors used the identical indicators and methods of research, it will be possible to evaluate the rate of funding in the different fields of activity. The results of the evaluation were supplemented with criteria that define subsidies: this will allow identifying the factors of the greatest effect to the phenomenon under investigation.

Beside the basic criteria (such as the size and the rate of the financial aid) defined by legal acts regulating the EU financial aid to Lithuania, several more criteria were entered on the criteria list. On one hand, they expand the basic criteria (e.g. the size of the financial aid expressed in per cent of the annual turnover of the enterprise); on the other hand, they supplement the basic criteria (e.g. the experience of the enterprise in the implementation of similar projects). In this study, seven criteria were selected to define subsidies for enterprises and fifteen criteria – to define the effect of subsidies for enterprises. There were two questionnaire forms compiled, based on the above criteria. One questionnaire form was intended for business enterprises, which received subsidies; the other – for experts working with the EU financial aid.

The findings of the study were processed using the multicriteria evaluation methods. In order to make the evaluation more comprehensive, the authors used two evaluation methods for the analysis of the results: Simple Additive Weighing (SAW) method, which is not very sophisticated, and the TOPSIS method, which is a more profound one (Ginevičius, Podvezko, Bruzgė 2008).

### 3.1. Comparison of results received using various multicriteria evaluation methods

The summarised multicriteria values of aid indication are given in Table 1, below.

**Table 1.** Summarised multicriteria values of aid indicators (Source: Ginevičius, Podvezko, Bruzgė 2008)

Enterprises	Multicriteria Evaluation			
	SAW		TOPSIS	
	Multicriteria value	Place	Multicriteria value	Place
1	0.0404	8	0.320	6
2	0.0447	5	0.261	17–19
3	0.0355	14–15	0.261	17–19
4	0.0348	18	0.274	13
5	0.0280	22	0.270	15–16
6	0.0417	7	0.337	5
7	0.0346	19	0.243	20–21
8	0.0355	14–15	0.270	15–16
9	0.0349	17	0.289	8–9
10	0.0376	11	0.222	22
11	0.0525	4	0.321	4
12	0.0375	12	0.282	11
13	0.0359	13	0.280	12
14	0.0703	3	0.458	3
15	0.0852	1	0.471	2
16	0.0401	9	0.295	7

Continued Table 1

Enterprises	Multicriteria Evaluation			
	SAW		TOPSIS	
	Multicriteria value	Place	Multicriteria value	Place
17	0.0269	23	0.219	23
18	0.0305	20–21	0.284	10
19	0.0251	24	0.212	24
20	0.0387	10	0.289	8–9
21	0.0353	16	0.271	14
22	0,801	2	0.504	1
23	0.0428	6	0.261	17–19
24	0.0305	20–21	0.243	20–21

The summarised multicriteria values of aid effect indication (received using multicriteria methods) are given in Table 2, below.

**Table 2.** Summarised multicriteria values of aid effect indicators (Source: Ginevičius, Podvezko, Bruzė 2008)

Enterprises	Multicriteria Evaluation			
	SAW		TOPSIS	
	Multicriteria value	Place	Multicriteria value	Place
1	0.0349	17	0.309	17
2	0.0462	10	0.375	12
3	0.0446	11	0.379	11
4	0.0379	16	0.343	15
5	0.0247	19	0.204	21
6	0.0410	13	0.357	14
7	0.0503	7–8	0.425	7
8	0.0891	1	0.567	1
9	0.0406	14	0.387	10
10	0.0330	15	0.315	16
11	0.0598	3–5	0.458	3–5
12	0.0598	3–5	0.458	3–5
13	0.0598	3–5	0.458	3–5
14	0.0162	23	0.138	23
15	0.0185	22	0.148	22
16	0.0540	6	0.443	6
17	0.0128	24	0.091	24
18	0.0445	12	0.371	13
19	0.0241	20	0.232	19
20	0.0276	18	0.247	18

Continued Table 2

Enterprises	Multicriteria Evaluation			
	SAW		TOPSIS	
	Multicriteria value	Place	Multicriteria value	Place
21	0.0503	7–8	0.412	8
22	0.0604	2	0.473	2
23	0.0469	9	0.401	9
24	0.0229	21	0.224	20

In order to compare the results received using different multicriteria methods, a correlation analysis was made and the places of enterprises compared. The results of the analysis are given in Table 3 and Table 4, below.

**Table 3.** Comparison of the results of the multicriteria evaluation (correlation) (Source: created by the authors)

Comparative Methods	First Group Indicators	Second Group Indicators
	Coefficient of Determination Value	Coefficient of Determination Value
SAW and TOPSIS	0.86	0.94

**Table 4.** Comparison of the results of the multicriteria evaluation (places) (Source: created by the authors)

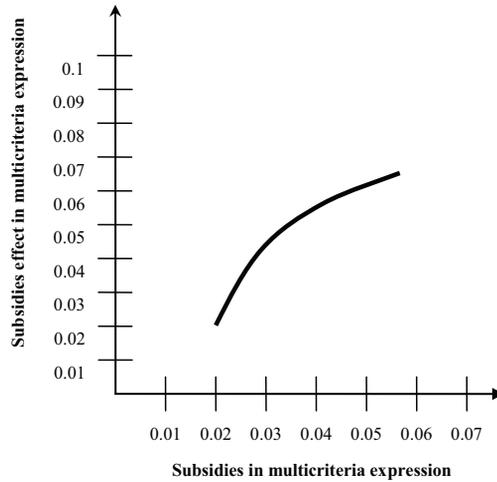
First Group Indicators		Second Group Indicators	
Place of Enterprise SAW method	Place of Enterprise TOPSIS method	Place of Enterprise SAW method	Place of Enterprise TOPSIS method
1	2	1	1
2	1	2	2
3	3	3–5	3–5

As it can be seen from the above, the results received applying both methods are very much alike.

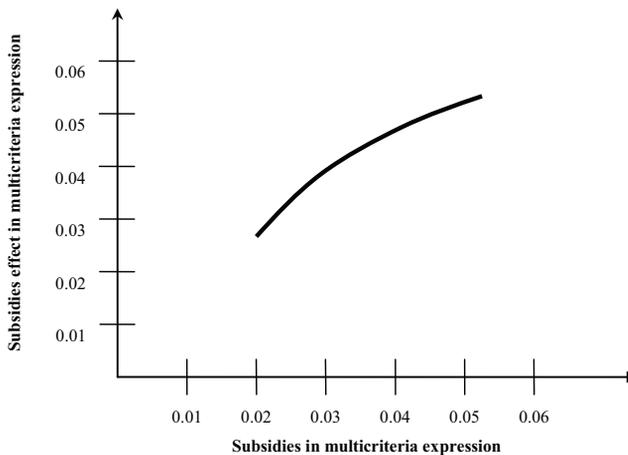
### 3.2. Analysis of the correlation between subsidies received and their effect on business

The values received during multicriteria evaluation were used for further analysis of subsidies and their effect on business.

Multicriteria values defining subsidies and their effect on business that were estimated using different evaluation methods, were grouped and are presented in the graphs below.



**Fig. 1.** Effect of subsidies effect on companies, SAW method (coefficient of determination – 0.38) (Source: created by the authors)



**Fig. 2.** Effect of subsidies effect on companies, TOPSIS method (coefficient of determination – 0.23) (Source: created by the authors)

The strength of correlation indicates the interdependence between the subsidies and their effect on business. Evaluations presented in Figs. 1 and 2, which were made using different methods, as well as the estimated coefficients of determination, allow assuming that the provided subsidies had a direct positive influence on the effect of aid on

enterprises. As the aim of this part of the study was to establish the correlation between subsidies and their effect, the biggest and the smallest values of the derivative multicriteria indicators were not calculated.

It is important to note that the derivative indicators of the projects, aimed at the development of services, differ essentially from general tendencies in subsidies and their effect. It can be concluded that the character of the subsidies, provided within the project framework, has no significant influence on the effect of aid. The effect of aid on enterprises, as compared to other aid recipients, is also the smallest. Due to this reason and in order to understand the connection between the character of the subsidies and their effect, data of the project aimed at the development of services will not be used for further analysis.

Looking into the influence of different subsidy criteria on the effect of subsidies on business, it was determined that it is the rate (the share of aid in the overall project value) rather than the size of subsidies, which has a stronger effect, i.e. the higher the rate, the stronger the effect.

When evaluating the co-funding of a project with borrowed or own resources, experts believe that the latter factor is more important. A higher rate of subsidies has a direct effect on the share of co-financing of enterprises with their own resources, i.e. it reduces the share; thus in terms of project co-funding, in order to expect better results from subsidies, the priority should be given to the increase in the share of the EU financial aid rather than that of an enterprise.

### **3.3. Analysis of correlation of individual criteria defining subsidies and their effect on business**

The correlation established between the subsidies and their effect on business is examined further. A correlation analysis was made to establish the influence of individual criteria defining subsidies on the effect of aid. The analysis provided the values of individual factors, used to define the aid for business, and the values of the effect of multicriteria subsidies on business (see the tables above). When estimating the correlation coefficients, the values that significantly differed from the majority were not used.

The findings of the correlation analysis, when subsidies are not grouped according to different fields of aid are given in Table 5, below.

The findings of the analysis suggest that the strongest correlation between the effect of aid and individual criteria of aid was established in the case of Criterion 6: the readiness of the enterprise for project implementation. In the cases of other criteria, the correlation was not so strong.

**Table 5.** Evaluation of correlation of multicriteria values of the aid and aid effect  
(Source: created by the authors)

Multicriteria value of aid		Value of correlation coefficient	
No.	Criteria	Aid effect SAW method	Aid effect TOPSIS method
1.	Co-funding rate (EU and state budget resources) (the aid share in proportion to the project value).	-0.30	-0.39
2.	Size of aid (EU and state budget resources).	0.05	0.06
3.	Size of aid (EU and state budget resources, in proportion to the annual turnover of the enterprise).	-0.24	-0.30
4.	Size of funding from the enterprise budget (in proportion to the project value).	0.13	0.19
5.	Size of funding from borrowed resources (if used) (in proportion to the project value).	0.10	0.13
6.	The readiness of the enterprise for the project implementation (human resources, document handling, e.g. availability of technical project, etc.)	0.59	0.59
7.	Experience of the enterprise in similar project implementation.	0.35	0.31

A separate correlation analysis was made to evaluate the strength of the correlation in various fields of aid. Because of a greater sample, the analysis was restricted to fields of professional development and production development. The results are given in Tables 6 and 7, below.

In terms of subsidies for professional development, the correlation analysis presented a very strong correlation in the case of Criterion 2. In cases of Criterion 6 and Criterion 7, the correlation was also significantly strong (the value of the correlation coefficient varied from 0.74 to 0.78). In case of other criteria, the correlation was not as strong.

**Table 6.** Evaluation of correlation of multicriteria values of subsidies and the effect of subsidies; subsidies for professional development (Source: created by the authors)

Multicriteria value of aid		Value of correlation coefficient	
No.	Criteria	Aid effect SAW method	Aid effect TOPSIS method
1.	Co-funding rate (EU and state budget resources) (the aid share in proportion to the project value).	-0.45	-0.42
2.	Size of aid (EU and state budget resources).	-0.90	-0.93
3.	Size of aid (EU and state budget resources, in proportion to the annual turnover of the enterprise).	0.03	0.09
4.	Size of funding from the enterprise budget (in proportion to the project value).	0.45	0.42
5.	Size of funding from borrowed resources (if used) (in proportion to the project value).	n/a	n/a
6.	The readiness of the enterprise for the project implementation (human resources, document handling, e.g. availability of technical project, etc.)	0.74	0.78
7.	Experience of the enterprise in similar project implementation.	0.78	0.84

No strong correlation was established in terms of production development. Consequently, it can be assumed that among the factors investigated, the ones with significant influence on the effect of aid were not distinguished.

**Table 7.** Evaluation of correlation of multicriteria values of subsidies and the effect of subsidies; subsidies for production development (Source: created by the authors)

Multicriteria value of aid		Value of correlation coefficient	
No.	Criteria	Aid effect SAW method	Aid effect TOPSIS method
1.	Co-funding rate (EU and state budget resources) (the aid share in proportion to the project value).	0.36	0.33
2.	Size of aid (EU and state budget resources).	0.21	0.10
3.	Size of aid (EU and state budget resources, in proportion to the annual turnover of the enterprise).	0.20	0.12
4.	Size of funding from the enterprise budget (in proportion to the project value).	-0.31	-0.26
5.	Size of funding from borrowed resources (if used) (in proportion to the project value).	0.20	0.13

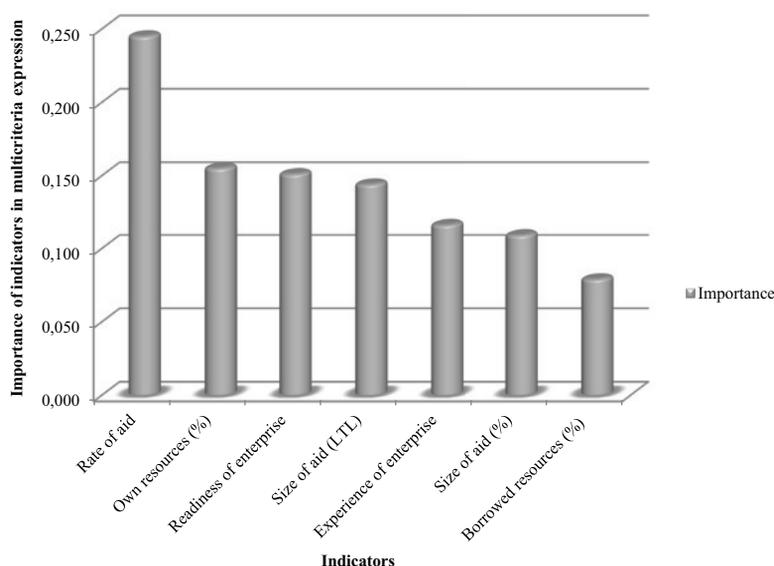
*Continued Table 7*

6.	The readiness of the enterprise for the project implementation (human resources, document handling, e.g. availability of technical project, etc.)	0.18	0.20
7.	Experience of the enterprise in similar project implementation.	0.29	0.25

The values of the assessed correlation coefficients allow concluding that the factors, which were used to define state subsidies, were not the only ones influencing the effect of the EU aid on enterprises. Possibly, such hard-to-assess factors as a specific situation in the market, in which enterprises are operating, the level of qualification of contractors implementing the project, the level of qualifications of the personnel of institutions in charge of project administration, the interest of company employees in implementation of the project, and some other factors have their effect on the outcome of the project.

### 3.4. Analysis on the influence of the rate of co-funding on the effect of assistance on business

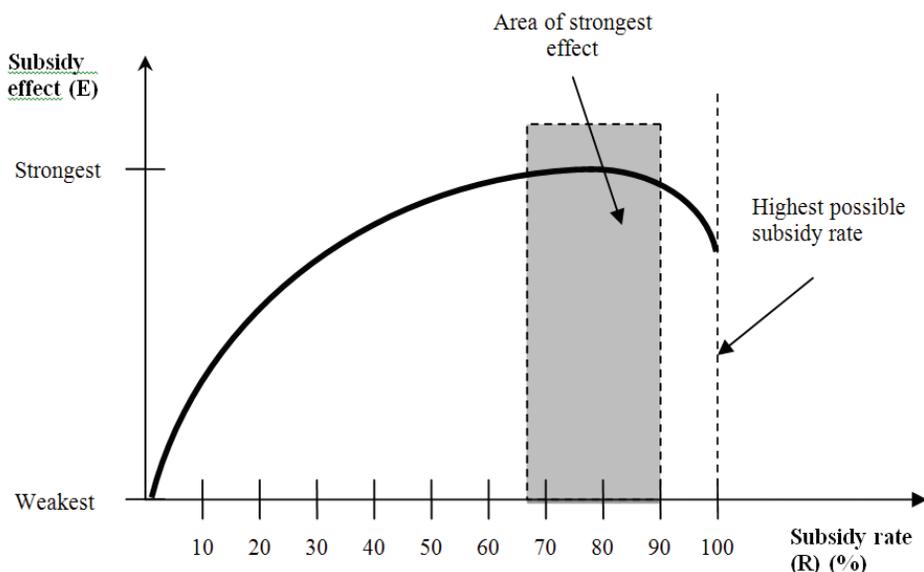
The results of the expert survey can also be used to estimate the influence of individual factors defining the effect of aid on business. The influence of the most important factors on the effect of aid on business, as established by the expert evaluation, should be the strongest. The influence of expert values on the effect of aid is described in Fig. 3, below.



**Fig. 3.** Expert values on the importance of state subsidy indicators  
(Source: created by the authors)

As Fig. 3 provides, according to experts, the most important indicator of the greatest influence on the effect of aid on business is the rate of co-funding. The latter indicator and its influence will be analysed in detail.

As the rate of co-funding indicates the share of the project funded with subsidies, the logical assumption is made: a higher rate of co-funding has a stronger effect of aid on business. Enterprises will be motivated to implement projects if the share of funding is greater. This theoretical correlation is shown in Fig. 4 below.

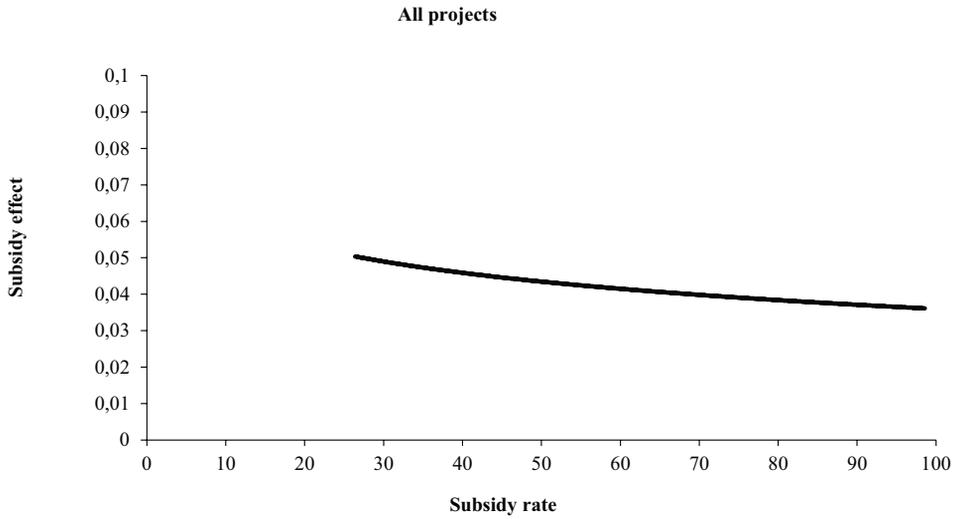


**Fig. 4.** Theoretical correlation between the rate and effect of subsidies  
(Source: created by the authors)

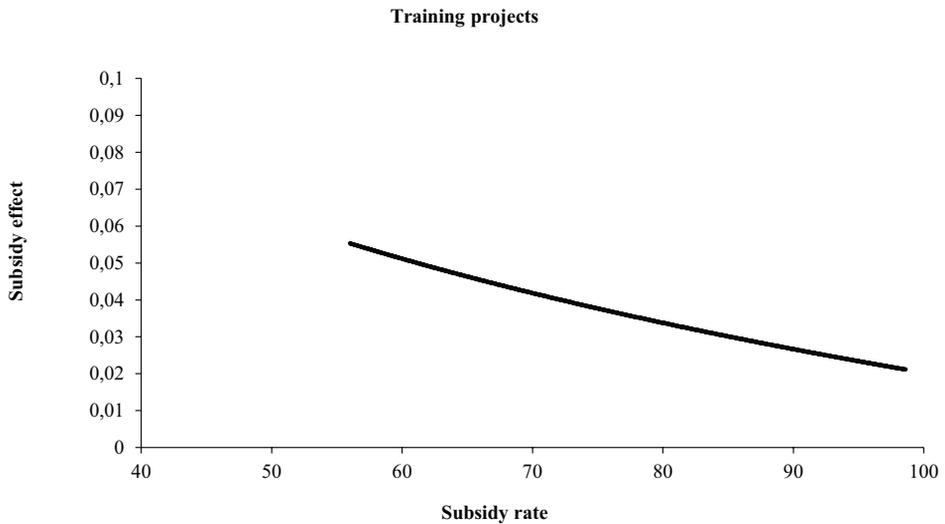
It should be noted that, when the rate of aid is 90% and higher, its predicted effectiveness should be decreasing. Simultaneously, the share of the company resources, that should rationalise the use of aid, is getting relatively small. This fact may predetermine the ineffective use of aid and, at the same time, the decrease of the effect of on business.

Now, the designed theoretical model will be compared with the results of the empirical research. The correlation between the rate of aid and its effect, which was evaluated in the study, is given in Figs. 5–7, below.

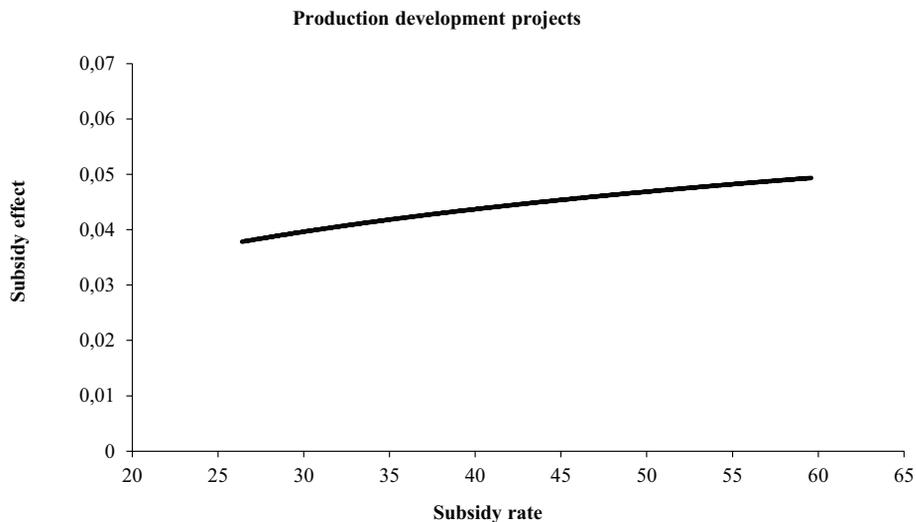
As results of the research carried out using the multicriteria methods basically do not differ, only the results received by SAW method are provided. Because of a small sample, the R&D projects were not evaluated.



**Fig. 5.** Rate and effect of subsidies (SAW method) (coefficient of determination – 0.16)  
(Source: created by the authors)

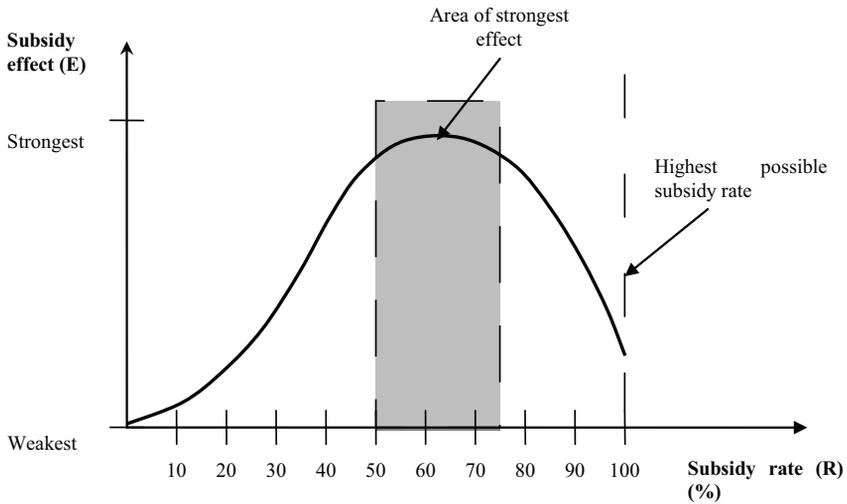


**Fig. 6.** Rate and effect of subsidies in the field of professional development (SAW method)  
(coefficient of determination – 0.99) (Source: created by the authors)



**Fig. 7.** Rate and effect of subsidies in the field of production development (SAW method) (coefficient of determination – 0.13) (Source: created by the authors)

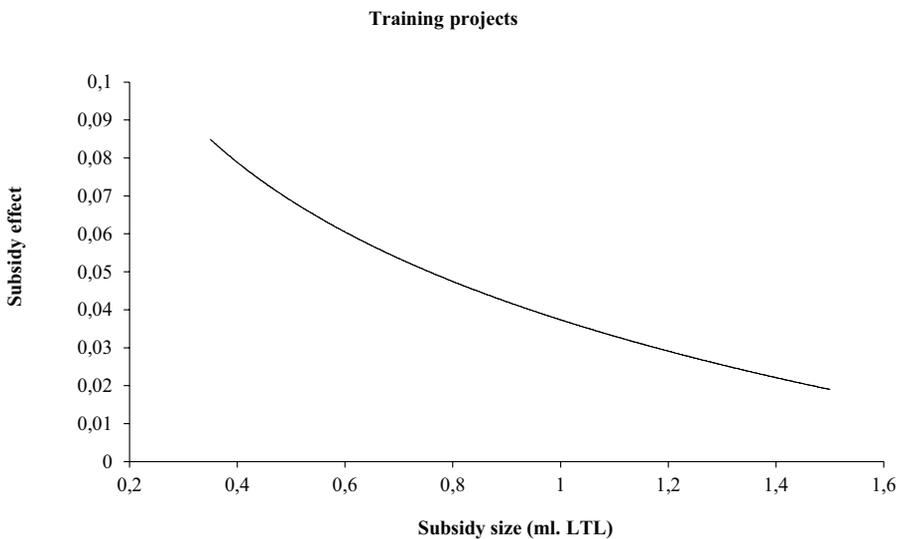
As Figures 5–7 provide, the results, received during the empirical research into the subsidy rate and its influence on the effect on business, differ substantially from the predicted ones. The results closest to the theoretical model were received in the case of production development projects. This allows assuming, that in the area of the relatively low rate (40–60%), the growing subsidy rate has a positive effect on the readiness or non-readiness of enterprises for project implementation, and also on the effect of subsidies on enterprises. In the case of professional development projects, where the subsidy rate is higher (60–100%), the growth of the subsidy rate had no positive influence on the effect of subsidies. In this area, the effect of the growth of the subsidy rate was reverse – the effect of subsidies on business was decreasing. This leads to the assumption that the growing subsidy rate and the respectively decreasing size of the cofunding of an enterprise within the framework of the project determined the ineffective use of aid – a greater aid did not have an incentive effect (as was originally aimed for by the subsidy provider), but rather caused an even greater waste of funds. Taking into consideration the above-mentioned results of the research, the revised theoretical model can be presented in Fig. 4. When the subsidy rate is low (0–30%), the subsidy effect is minimal, as enterprises do not have an external incentive to implement the project (Fig. 8). When the subsidy rate is over 30%, enterprises become more and more interested in project implementation. According to the findings of the study, the strongest effect on enterprises should be achieved once the subsidy rate is 50–70%. The further increase of the rate of subsidies has a reverse effect – ineffective use of funding, which leads to the weakened overall effect of aid.



**Fig. 8.** Revised theoretical correlation between the rate and effect of subsidies  
(Source: created by the authors)

### 3.5. Analysis of the absolute size of subsidies and their influence on the effect of subsidies

The correlation between the size of subsidy and its effect on business (expressed by multicriteria) is presented in Fig. 9, below. As results received using different multicriteria methods practically do not differ, the results below are received using the SAW method only.



**Fig. 9.** Size of subsidy and aid effect in the field of professional development (SAW method) (coefficient of determination – 0.81) (Source: created by the authors)

The influence of subsidy size on the aid effect on business can be estimated only in the field of professional development. The correlation between the size of subsidy and the aid effect on business in the field of production development has not been established: the size of the aid for production development has no significant influence to the effect of a project.

In the field of professional development, the reverse tendency can be observed, namely, a greater size of aid determines its weaker effect. It can only be explained in one way: when vast resources are allocated to professional development, the funding share for the staff training gets too big as work efficiency of employees decreases because of busy training schedules; besides, new knowledge or competences take time to be acquired. Besides, large projects require greater labour expenses in terms of administration rather than smaller projects.

The opinion that non-provision of aid for such projects would have no effect on business allows concluding that the strongest effect can be achieved providing training projects with small-sized aid as the effect decreases with the growing size of subsidies. The growing size of subsidies in the field of production development does not result in the increase of aid effect.

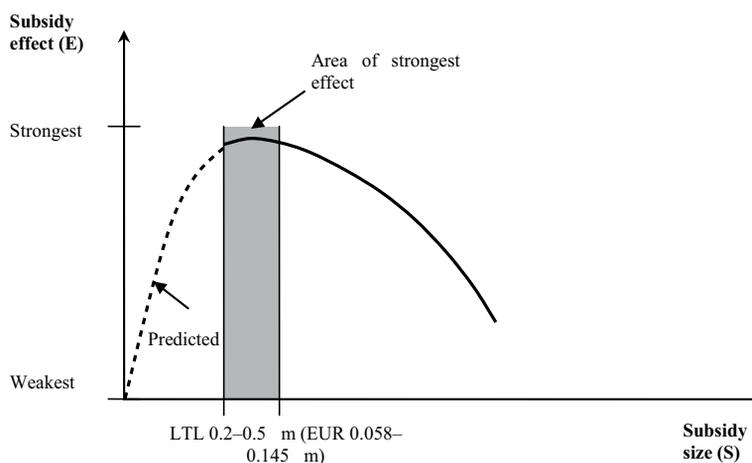
### **3.6. Recommendations regarding the form of state subsidies**

State should intervene in the market only when the market is unable to resolve problems independently or the self-regulation would take too long. The present research focused on state subsidies in the form of the EU Structural Funds. The aim of the study was to establish correlations between such aid-defining criteria as size, rate and etc. and their effect on business (i.e. work efficiency, productivity and etc.).

Findings of the study suggest a general tendency: growing values of indicators that define the total value of a certain form of a subsidy, resulted in the growth of the positive effect of the subsidy, i.e. the more significant the state intervention was, the stronger effect it had. The expert evaluation established that the most important (significant) indicator to describe the form of a subsidy is the subsidy rate. Consequently, this factor has the greatest influence on the effect of a subsidy. As the empirical research suggests, the greatest effect of a subsidy can be achieved when the subsidy rate is 50–70% (Fig. 9). This conclusion was confirmed by the data related to the 2008–2012 calls for proposals for grant applicants (i.e. enterprises) to receive the external funding from the EU budget. The total amount of the EU funding with the subsidy rate over 50% (e.g., for staff training), applied-for by grant applicants, was three times higher than the amount of the planned aid, as the number of applications for the EU aid with such subsidy rate was very high. In terms of EU subsidies with a lower subsidy rate (30–40%) (e.g., for production development), the total sum of the subsidies applied-for did not even amount to the sum of the originally planned allocations. This conclusion is very relevant, when subsidies for enterprises serve as an incentive to carry out certain activities (e.g. pay more attention to qualification of employees, invest in R&D and etc.). In consideration

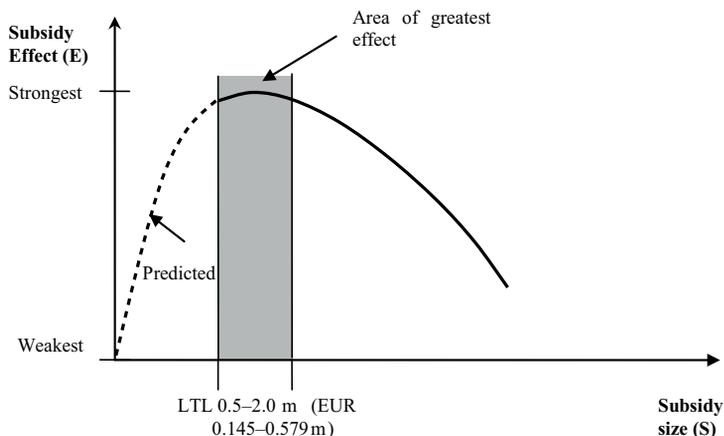
of the said above, the recommended rate of subsidies, in pursuance of incentive effect, should be approximately 50–70%.

The results of the expert evaluation suggest that the absolute size of aid is yet another most important criterion that defines the form of aid. After a detailed analysis of the size of aid and its influence on the subsidy effect, a reverse correlation between the size of aid and its effect has been established in the field of subsidies for professional development (Fig. 10).



**Fig. 10.** Correlation between the size and effect of subsidies in the field of professional development (Source: created by the authors)

No correlation between the absolute size of subsidies and their effect on business was established by the analysis of subsidies for production development. This can be explained by a small sample and the variety in the size of projects on one hand, and the fact that the most successful projects are not necessarily the most expensive ones, on the other. A weak influence of the absolute size of subsidies on their effect also related to the fact that a project subsidy of a big size but at low rate (allocated for funding of a small proportion of the project) results in various bureaucratic obligations for an enterprise, such as procurement conditions, restriction of project amendments, restrictions of collateral, etc., which in case of the EU aid not only involves the allocated funding but also the entire project. Thus, an enterprise with a relatively small subsidy (within the context of the entire project) loses the required flexibility which, in its turn, makes the subsidy less appealing to the enterprise and, at the same time, results in a weaker incentive and overall effect of the subsidy on business. With regard to the above, it can be concluded that the subsidy size as such does not have a significant influence on the effect of a subsidy on business (especially the incentive effect), and the growth in the size of a subsidy leads to the decrease of its effect on subsidies, i.e. – with growing expenditures, their effect remains unchanged (Fig. 11).



**Fig. 11.** Correlation between the size and effect of subsidies in the field of production development (Source: created by the authors)

With the view of research limitations (the heads of enterprises were asked to indicate the size of aid within the pre-set limits). It can be stated that the subsidies from LTL 200,000 (EUR 58,000) to LTL 500,000 (EUR 145,000) have the strongest subsidy effect in the field of professional development (Fig. 10), while in the field of production development, the subsidy size, from LTL 0.5 million (EUR 0.145 million) to LTL 2 million (EUR 0.579 million) has the strongest effect (Fig. 11).

The evaluation of the absolute subsidy size and its effect on business identified a certain tendency: the growing subsidy in the field of professional development results in decreased subsidy effect. Therefore, when composing the regulations for subsidising professional development and in order to have the strongest subsidy effect on business, the size of subsidies for enterprises should be limited to LTL 500,000 (EUR 579,000) per enterprise.

The differentiation of subsidies in the field of production development, due to a weak effect of the absolute size of subsidies, should be based on the size of the company. In any case, the subsidy size per enterprise should not exceed LTL 2 million (EUR 0.579 million). The research findings of the suggest that the absolute size of subsidies would determine a weaker effect and, herewith, would cause greater imperfections of the market, smaller subsidies for enterprises would mean a reduced movement of capital and smaller concentration of capital in the given enterprises.

Despite the fact that the effect of subsidies on big enterprises has not been investigated separately, provision of subsidies for large economic entities is not recommended due to the probability of a weak incentive effect. Such subsidies can be justified only in exceptional cases.

Though the EU aid for enterprises served as the basis for the given research into subsidies, the findings of the research also offer tools, which could be applied in order to increase other state regulations of business. The same principals and recommended sizes of subsidies can be applied to subsidies irrespective of the source of funding (state budget, the EU aid, allocations from other funds), as well as other forms of state regulation of business, such as tax exemption, more favourable interest rate and etc. It is the amount of own resources, which an enterprise is required to use for co-funding rather than the absolute size of subsidies, that motivates enterprises to carry out certain activities promoted by the state. E.g., when the state takes a decision to support investments of an enterprise in a certain field by providing resources for financing of interest payments, the findings of the study confirm, that the stronger effect would be achieved by a smaller-sized aid that covers a greater part or even 100% of the interest due, rather than the bigger size of aid with a very small part of subsidies for covering interest payments.

#### **4. Conclusions**

Comparison of the results received using different multicriteria evaluation methods revealed that the most similar results were received using the SAW and TOPSIS methods. This is confirmed by the correlation coefficients of compared results. The evaluations made and the determination coefficients established using different methods, allow concluding that the provided subsidies had a direct positive influence on the effect of subsidies on business.

Investigation of the influence of different subsidy criteria on their effect on business enabled establishing that the rate of subsidies rather than the absolute size had a greater subsidy effect. The strongest subsidy effect is achieved, when the subsidy rate is 50–70%.

According to the expert evaluation, another most important criterion for defining the form of aid is the absolute size of aid. The analysis of the size of aid and its influence on the aid effect on business indicated a reverse correlation between the size of aid and its influence on the effect on business in the field of professional development. And in the field of production development, the absolute size of subsidies had no significant influence on the subsidy effect. With regard to the above, it can be concluded that the size of aid of itself does not have a significant influence on the aid effect on business (especially to the incentive effect), and the increase of subsidies leads to the decrease in their effect, i.e. the subsidy effect on business remains unchanged when expenditures are growing. The strongest established subsidy effect in the field of professional development was achieved, when the size of subsidy was between LTL 200,000 (EUR 0.145 million) and LTL 500,000 (EUR 0.579 million). In the field of production development, the strongest effect was achieved, when the subsidy size varied from LTL 0.5 million (EUR 0.145 million) to LTL 2.0 million (EUR 0.579 million). When composing regulations for aid provision in the field of professional development and in pursuance of the strongest subsidy effect on business, the size of subsidies to enterprises should be limited to LTL

500,000 (EUR 145,000) per enterprise. In the field of production development, the size of subsidies should be differentiated, depending on the size of an enterprise. The size of aid per enterprise should not exceed LTL 2.0 million (EUR 0.579 million).

The expert evaluation discussed in this study established that the rate of aid is the most important (significant) criterion that specifies the form of aid. This finding only confirms the conclusion that the rate of subsidies is the factor that has the greatest influence on the effect of aid on business.

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