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When Daces Bite Deeper than Sharks – Does the SMEs Public Subsidy Dose Matter?

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Abstract: One of the EU's main priorities is to boost the competitiveness of its member states through subsidies from the European Structural Funds. As SMEs are key elements of competitiveness, their support through various subsidy programmes is important. However, as our research shows, the distribution of funds among SMEs is highly unequal. While some SMEs are very successful in obtaining subsidies, others (especially the smallest ones) are not. Using a robust dataset of Czech companies, we have identified subsidy ‘sharks‘ receiving multiple times more funds, compared to mediocre ‘salmons‘ and lowly supported ‘daces‘. While using counterfactual design with control for a subsidy dose and taking labour productivity as a proxy for competitiveness, we have found out that the subsidy dose really matters. It seems that the higher the dose, the lower the impact on competitiveness. Since, on average, subsidies led to higher competitiveness of beneficiaries, the subsidy daces significantly outpaced sharks. From a policy perspective, limiting support per beneficiary could lead to higher effectiveness of support programmes. This study also highlights the importance of the subsidy dose in evaluation practice and research.

Key words: competitiveness, counterfactual design, subsidy dose, SMEs

JEL Classification: D04, L26, L53

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Introduction

Economic development in market economies is closely linked to competitiveness as a crucial factor for the long-term success of companies and national economies (European Commission, 2022). The role of SMEs is particularly emphasised in this context. A positive correlation between national economic growth and SMEs competitiveness is seen as a key indicator of growth and development (Surya et al., 2021). SMEs play an irreplaceable role in job creation, poverty reduction, economic growth (Gherghina *et al.*, 2020) or innovation (Lewandowska, 2021).

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The European Union is well aware of the importance of SMEs and tries to support them with various financial and non-financial instruments to increase their competitiveness and profitability (European Court of Auditors, 2022). The Europe 2020 strategy emphasises the role of SMEs in the European economy as a driver of employment and economic growth, and the most important element of this strategy is to support them. Not surprisingly, it is mobilising an increasing number of researchers, policymakers, and other stakeholders to discuss how these instruments can be used effectively to maximise the competitiveness of SMEs and maintain sustainable economic growth in their countries. One of the main sources of funding for EU cohesion policy is the European Regional Development Fund (ERDF), which aims to reduce disparities in regional development and improve living conditions in disadvantaged regions. In the 2014–2020 programming period, the EU spent more than €350 billion on cohesion policy, of which the ERDF accounted for around €200 billion. For the 2021–2027 programming period, the EU has earmarked almost €392 billion for cohesion policy, including €313 billion for the ERDF/ESF+. Together with national co-financing, a total of around half a trillion euros will be available to finance projects in the EU countries (European Commission, 2022).

The main objective of these subsidies is to achieve a competitive and sustainable economy based on knowledge and innovation. While competitiveness and sustainability are often perceived as separate or contradictory concepts, they should be perceived as complements with synergies (Jain *et al.*, 2022). In principle, it cannot be claimed that something is uncompetitive if it is sustainable. Competitiveness is a necessary condition for sustainability and sustainable economic growth (Kiseľáková *et al.*, 2019; Cann, 2017, Jain *et al.*, 2022).

However, the term 'competitiveness' itself is quite complex and has numerous different definitions (Lee & Karpova, 2018). Competitiveness refers to the ability of local firms to compete in global markets (added value) and create sufficient jobs (Aiginger, 2013). Sustainability then emphasises the long-term viability of competitiveness, which includes, among other things, the environmental aspects of economic development (European Commission, 2010). Balkyte and Tvaronaviciene (2010) pointed out that the concept of competitiveness is changing and that research should focus more on 'sustainable competitiveness' which takes into account, among other things, globalization, economic dynamism, and social progress.

The EU allocates a considerably large amount of money to SMEs, which requires a detailed and proper evaluation of its effectiveness. A large number of existing studies have dealt with such an evaluation, with very heterogeneous results. While most of the analyses pointed to positive effects, some of them found insignificant or even negative effects. Srhoj *et al.* (2019) found that EU funding had a positive impact on the viability of micro and small enterprises and also on their higher probability of obtaining bank loans, but had no effect on employment and sales growth. Dvouletý and Blažková (2019) and Dvouletý *et al.* (2021) found positive impacts on sales, value-added, and price-cost margin of food firms. Girma *et al.* (2008) observed subsidies in Ireland and found that employment grew faster in supported companies compared to unsupported ones. Similarly, in Estonia, supported enterprises had better sales and labour productivity than unsupported enterprises (Hartšenko & Sauga, 2013). Benkovskis *et al.* (2018) found positive impacts on employment, average wages and turnover. Mole *et al.* (2009) also found positive effects on employment, but not on sales. On the other hand, some studies found no significant results.

Špička (2018) found no significant results on productivity growth and fixed assets to turnover ratio growth in the short-term observation period. Banai *et al.* (2017, 2020) also found no significant impact on labour productivity of SMEs. Capelleras *et al.* (2011) found no positive effects on the employment rate of Spanish supported enterprises, and Čadil *et al.* (2017) observed the value added and labour productivity of supported enterprises and pointed out that R&D support in the private sector had no effect in the short term. Cerqua and Pellegrini (2017) found negative effects on total factor productivity (difference between inputs and outputs) of manufacturing enterprises and negative spillover effects on employment when enterprises located less than one mile from the supported subjects were observed. Cerqua and Pellegrini (2014) found negative effects on labour productivity in lagging regions in Italy. Negative impacts on total factor productivity were also discovered in a study by Bernini *et al.* (2017).

Most studies have used a counterfactual approach, but the conclusions vary widely, so it is evident that there is no consensus on whether EU support really works or not. This is probably due to differences in local subsidy policies, the intensity of support, and the choice of input and output covariates for matching purposes. An official study by the Ministry of Industry and Trade of the Czech Republic (MIT) – Ex post evaluation of the Operational Programme Enterprise and Innovation (OPEI) 2007 - 2013 (MIT, 2018), tried to calculate the real impact of EU subsidies, but its short-term observation resulted in very few statistically significant results. The study recommended that the whole evaluation should be repeated over a longer time horizon. Recent findings made by the European Court of Auditors in a special report assert that 'SMEs have not really benefited from EU action aimed at enhancing their competitiveness. They found that funds stimulate SMEs' willingness to invest, but their impact and effectiveness on competitiveness were rather limited, to the extent that most supported SMEs did simply not derive any real benefit from the EU support.' (ECA, 2022a).

Typical evaluation studies, such as those mentioned above, do not consider the relative size of support (dose). However, from a policy point of view, it is very important to set the support dose appropriately to avoid unintended effects. So far, only several studies have been carried out that reflected the support dose of EU funding. Research from the Italian province of Trento (Cerulli *et al.*, 2020) found positive effects of EU subsidies (intermediate support doses) on employment, labour quality, and growth of intangible assets, but also showed inefficiency of very small and very large projects. French evaluation of a regional research and development subsidy policy pointed to an increase in private research and development spending with large subsidies, but revealed a low impact with small subsidies (Marino *et al.*, 2016). Both studies highlighted the importance of considering the dose of support. Bondonio and Greenbaum (2014) found a positive correlation between the intensity of public support (dose) and employment and employment growth, with these effects increasing with higher doses.

Our paper aims to assess the impact of EU funding on the competitiveness of SMEs in the Czech Republic, focusing on the effect of the subsidy dose. We use the quasi-experimental counterfactual design, a combination of propensity score matching (PSM) with difference-in-difference (DiD), run on subsidy quartiles. Taking the subsidy dose into account contributes to the current research gap in evaluation research and practice, where such studies are very rare, often due to data availability. We also analysed the long-term (2004–2017) effects of support using a unique robust database. This approach provides a more comprehensive understanding of the impact of EU subsidies on SMEs in comparison to contemporary research.

Data and method

Data from the Czech national monitoring system MS2014+ show that ERDF funding has become an interesting opportunity for thousands of Czech SMEs. The Ministry of Industry and Trade (MIT) manages these funds in the Czech Republic and announces specific areas and activities where SMEs can apply for support. The total allocation for the current Operational Programme Enterprise and Innovation for Competitiveness (OPEIC) in 2021 was €223.21 million from the ERDF, and the total eligible expenses reached €4.52 billion from the beginning of the OPEIC until 31 December 2022 (MIT, 2022). As its name suggests, the OPEIC is primarily focused on improving competitiveness.

We focused on the previous operational programme OPEI, which ended in 2013 (some projects remained active until 2015), which allowed us to observe the effects over a longer period. During the entire period, 26,280 applications were received, of which 12,412 were supported, with a total amount of approximately €3.8 billion (CzechInvest, 2022).

To assess the impact of the support on beneficiaries, we have chosen to use a combination of counterfactual impact evaluation methods, propensity score matching (PSM) with difference-in-difference (DiD). This combination is quite common in evaluation practice (Khandker et al 2010).

PSM assigns each subject a score (ranging from 0 to 1) based on their individual characteristics, which allows subjects to be matched from observed groups. Choosing the correct algorithm for matching subjects is also very important. In our case, we have chosen two algorithms to eliminate the possibility of bias in a particular type of matching: the nearest-neighbour matching (1:1) and the Kernel matching (Epanechnikov algorithm). The nearest-neighbour matching pairs subjects in the supported group with subjects in the control group based on the similarity of their propensity score values, while the Kernel's method compares each supported subject with all subjects in the control group to reduce the risk of small representation in common support. DiD is based on observing changes in outcomes over different time periods. When the necessary data of supported and unsupported enterprises are available, the combination of PSM and DiD can reduce the risk of potential bias in the resulting impact estimate. PSM only considers observable characteristics, while DiD can eliminate at least those unobservable characteristics that are constant over time between the groups. This combination is likely to provide the best reduction in bias. Rosenbaum and Rubin (1983) say that eliminating all bias associated with differences in covariates can be achieved by adjusting differences between treated and control subjects in the propensity score. Quasi-experimental methods are very demanding in terms of data size and bring many risks and limitations with them, but they are very popular in evaluating the effectiveness of spending programmes in the EU.

Our pre-intervention (before treatment – bt) time frame is set to the period 2004–2006, two years before the enterprises could apply for subsidies, and two years before the start of the OPEI. Our post-intervention (after treatment – at) time frame is set to the period 2016–2017. Autio and Rannikko (2016) define the short-term horizon as a length of 1–2 years before and after support, which is also recommended as the shortest possible horizon when using counterfactual methods. Caliendo *et al.* (2005) define medium and long-term effects three years after the programme. The long term can be observed in similarly focused evaluations, e.g. Jespersen *et al.* (2008). Our research definitely falls into the long-term category. This time period was chosen based on prior knowledge of non-significance due to short-termism, as seen in the aforementioned ex-post evaluation of OPEI by MIT (2018).

The original raw project data from the MS2014+ monitoring system of the Ministry of Industry and Trade of the Czech Republic contained 5,160 supported (applied and were successful) and 4,120 unsupported (applied and were unsuccessful) enterprises. After standard validation and cleansing, the number of observations was significantly reduced. The final dataset used in this paper consists of a total of 2,303 enterprises (663 unsupported and 1,639 supported). Such a reduction is common (MIT, 2018). The main reasons for this reduction are the unavailability of financial data and ratios for individual enterprises, the mortality of the enterprises observed, extreme and erroneous values in the dataset obtained, the focus on commercial SMEs only, the selection of support programmes aimed solely at strengthening competitiveness, etc. However, it is important to note that the reduced dataset is only partially representative. Using the Kolmogorov-Smirnov test, we found that the final sample had a different distribution in terms of size and age, compared to the original population, which is not surprising as data availability is generally expected to be better for older and larger subjects. However, this does not affect the external validity of our analysis as we used the most robust databases available in the Czech Republic – similar studies have not come close to achieving such numbers.

Our research focuses on the impact of the EU subsidies on competitiveness, so we had to choose a suitable variable to represent such an outcome, although competitiveness does not have a clear definition yet (Fueurer & Chaharbaghi, 1994). Various indicators have been used to measure it, such as key firm costs - depreciation costs (Dvouletý & Blažková, 2019), employment (Cerqua & Pellegrini, 2017), sales (Decramer & Vanormelinegen, 2016), value-added (Srhoj *et al.*, 2019), labour productivity, and profitability indicators (Bernini *et al.*, 2017). Our study focuses primarily on labour productivity growth, which is one of the main indicators of competitiveness, along with sales growth, market share, costs, and profitability. In our case, labour productivity growth was measured as value added per employee. The EU classifies these indicators in the category of operations and market position category if a sample of SME projects is evaluated with direct ERDF financial support to see how their current and potential competitiveness will evolve after the project is completed (ECA, 2022). Focusing on productivity indicators is a fairly common practice in competitiveness studies (Decreamer & Vanormelingen, 2016; Srhoj *et al.*, 2019; Dvouletý & Blažková, 2019; Špička, 2018; Čadil *et al.*, 2017; Brachert *et al.*, 2018). In our research, we excluded profitability indicators, as tangible assets are often only acquired through subsidies.

As mentioned above, correct implementation of matching depends on the assumption of conditional independence (CIA), also known as confoundedness (Lechner, 1999; Rosenbaum & Rubin, 1983). In practice, this means that the researcher must be aware of all variables that influence both the allocation of support and the chosen outcome (Caliendo & Kopeinig, 2008). This assumption is strong and highly dependent on the expertise of the researcher. Since CIA cannot be tested, it is recommended to use deterministic and time-invariant variables, such as age before support, industry, size, etc. (Caliendo & Kopeinig, 2008) for matching purposes. In our research, we selected covariates that meet these criteria and have been used in similar studies by other researchers (Srhoj *et al.*, 2019; Dvouletý *et al.*, 2021; Čadil *et al.*, 2017; Banai *et al.*, 2020).

Based on standard input variables commonly used in counterfactual impact evaluations (CIE) and the availability of data in the Czech Republic, we selected the following enterprise indicators: age, legal form, size, headquarters location, technological complexity, financial indicators (e.g. assets, costs, etc.) and the support intensity/dose. The age of the enterprise was defined as the number of months between its establishment and the beginning of the observed period. We assumed that older firms would be more successful in obtaining support due to their greater knowledge of the market and EU funds. Financial indicators (assets, costs, etc.) were obtained from various available sources and calculated as the average of the pre- and post-intervention values for each enterprise. In some cases, a logarithmic transformation was used to assess the growth of the indicator over time. The support intensity/dose indicator was calculated as the amount of funds received from subsidies divided by the total assets from the pre-intervention period. For unsupported enterprises, the indicator is equal to zero. The higher the indicator, the higher the dose relative to the assets of the observed subject. The remaining indicators were transformed into dummy variables with values of either 0 or 1. Legal form was used to exclude non-business types of enterprises from the data, and enterprises were divided into three groups – private limited companies, public limited companies and others (e.g. unlimited and limited partnerships). Size was used to classify enterprises as micro (0-9), small (10-49), or medium-sized (50-249) based on EU guidelines. The location of the headquarters divided the enterprises into 14 Czech regions, with Prague being the only region above average and not eligible for ESF support. However, enterprises located in Prague can receive support if their projects are realized outside of Prague. Finally, technological complexity was divided into 11 different groups based on the definitions of the Czech Statistical Office, with a more detailed division being necessary due to the large representation of enterprises in the manufacturing sector.

Table 1 shows the mean values of the covariates used, divided into the treated and untreated groups. In this paper, unsupported enterprises are labelled as 'treat=0' and supported enterprises are labelled as 'treat=1'.

Results

Our research went beyond simply examining the impact of EU support by comparing supported and unsupported firms. First, it is important to note that hundreds of Czech enterprises received OPEI support multiple times, some of them even more than 10 times, and some individual projects were larger than many smaller ones, which highlights the significant disparity between the amounts of support given to each enterprise. However, as companies vary in size, we calculated the so-called dose variable, which is the ratio of the subsidy to assets (at the time of support). Although this factor is considered important (Gertler *et al.*, 2016), it is often overlooked in evaluation studies.

Table 1. Covariates – treated/untreated

Variable	Treat = 1	Treat = 0
Age	106.015	98.834
Legal form (a.s.)	0.264	0.262
Legal form (s.r.o.)	0.732	0.732
Legal form (others)	0.004	0.006
Size (micro)	0.004	0.002
Size (small)	0.420	0.517
Size (medium)	0.575	0.481
HQ location (Prague region)	0.074	0.121
HQ location (South Bohemian region)	0.041	0.060
HQ location (South Moravian region)	0.156	0.175
HQ location (Karlovy Vary region)	0.025	0.018
HQ location (Hradec Kralove region)	0.054	0.054
HQ location (Liberec region)	0.038	0.032
HQ location (Moravian-Silesian region)	0.145	0.125
HQ location (Olomouc region)	0.077	0.062
HQ location (Pardubice region)	0.063	0.060
HQ location (Pilsen region)	0.029	0.027
HQ location (Central Bohemian region)	0.073	0.090
HQ location (Usti nad Labem region)	0.050	0.059
HQ location (Vysocina region)	0.060	0.038
HQ location (Zlin region)	0.113	0.078
CZ-NACE – services (High-tech)	0.048	0.044
CZ-NACE– services (High-market)	0.027	0.060
CZ-NACE – services (High-financial)	0.001	0.002
CZ-NACE – services (High-others)	0.010	0.014
CZ-NACE – services (Low-market)	0.124	0.223
CZ-NACE – services (Low-others)	0	0.005
CZ-NACE – services (Others)	0.090	0.155
CZ-NACE – manufacturing industry (High-tech)	0.027	0.020
CZ-NACE – manufacturing industry (Medium High-tech)	0.204	0.131
CZ-NACE – manufacturing industry (Medium Low-tech)	0.340	0.226
CZ-NACE – manufacturing industry (Low-tech)	0.129	0.121
Assets growth before treatment	17.714	17.539

Source: Authors.

In the first step, we analysed the average effect of treatment on the treated (ATET) using the whole group of beneficiaries as the treated. As outlined above, we used the standard propensity score matching based on logistic regression. The results show that older enterprises, enterprises in more technologically demanding service sectors, and the manufacturing industry (the most common applicants) had a higher probability of receiving support. On the other hand, small enterprises and those located in Prague, South Bohemia, Central Bohemia and the Ústí nad Labem region had a lower probability and were less likely to receive support. The full logit can be found in the appendix of this paper. The propensity score was calculated on the basis of the logistic regression results. Elimination of systematic bias is ensured by the overlap (common support) of the observed characteristics (score overlap), which ensures the pairing of subjects in both groups (Gertler *et al.*, 2016, Khandker *et al.*, 2010). As Figure 4 in the Appendix shows, matching effectively reduced the overall bias between both groups (the mean bias dropped by more than 65%).

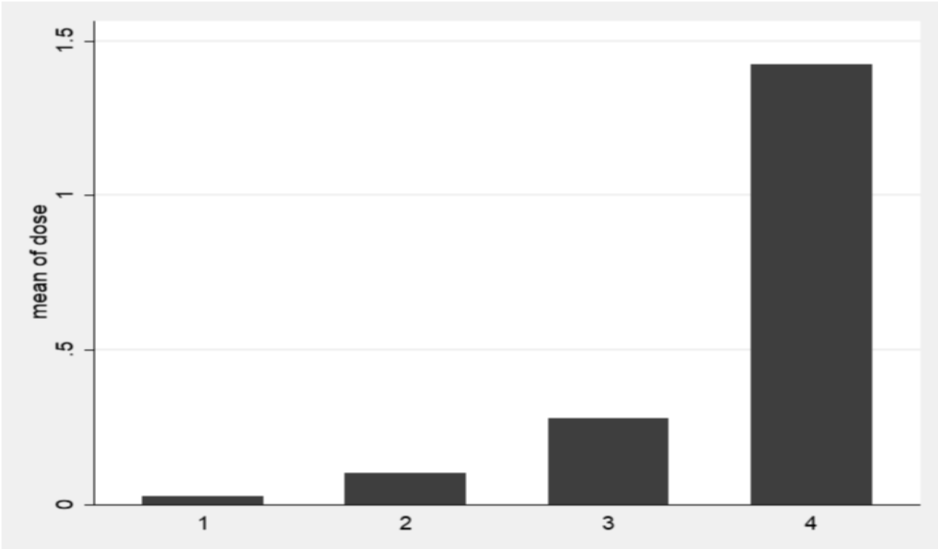
Analysing the whole group of beneficiaries, we found positive effects of subsidies on the output variable, just like many other analyses of European subsidies (Srhoj *et al.*, 2019, Dvouletý & Blažková, 2019; Dvouletý *et al.*, 2021; Bondonio & Greenbaum, 2014; Girma *et al.*, 2008, Benkovkis *et al.*, 2018; Mole *et al.*, 2009). This is also the case for labour productivity as a specific proxy for competitiveness (Hartšenko & Sauga, 2013; Čadil *et al.*, 2017).

For further analysis, we divided the beneficiaries into three groups based on the subsidy dose, which we previously defined as ‘daces’, companies in the first quartile, whose dose size was less than 25% of the sample, the ‘salmons’, companies in the 25–75% quartile, and ‘sharks’ which were companies within the last quartile. We analysed the effect of a higher intensity of support, with a particular focus on whether a higher dose of support leads to higher competitiveness (measured by labour productivity). We also compared the unsupported group with both less and more supported enterprises and found some very interesting conclusions from the OPEI data.

As shown in Figure 1, the distribution of the support is highly unequal, as the most supported subjects received multiple times more relative support. This should be considered when evaluating the impact of the support on competitiveness.

Table 2 shows the results for all four groups after running the counterfactual impact evaluation. The outcome variable, labour productivity, was significant in both matching algorithms (NNM, Kernel) and was considered statistically significant.

Figure 1. Dose distribution



Source: Authors (STATA).

Table 2. Counterfactual impact evaluation results

Variable	Matching technique	coefficient	P > I z I
Labour productivity growth	PSM	0.421	0.000
(**all**: Q1-Q4 dose x unsupported)	Kernel	0.311	0.000
Labour productivity growth	PSM	0.468	0.001
(**daces**: Q1 dose x unsupported)	Kernel	0.445	0.000
Labour productivity growth	PSM	0.439	0.000
(**salmons**: Q2-Q3 dose x unsupported)	Kernel	0.291	0.000
Labour productivity growth	PSM	0.336	0.026
(**sharks**: Q4 dose x unsupported)	Kernel	0.218	0.019

Source: Authors.

The data show that supported enterprises achieved remarkable improvements in labour productivity, with growth rates ranging from 31.1% to 42.1% higher than unsupported enterprises. This alone indicates that EU support plays a crucial role in fostering productivity gains among supported enterprises. To delve deeper into the relationship between the dose of support and productivity growth, the supported enterprises were divided according to the dose of support they received. This analysis revealed a noteworthy pattern: the dose of support seemed to have an influence on the degree of productivity improvement. As mentioned above, the study identified three distinct groups within the supported enterprises: daces, salmons, and sharks. Daces, the least supported group, achieved the most substantial growth in labour productivity – between 44.5% and 46.8% higher compared to unsupported enterprises. This finding was intriguing, as it suggests that a moderate dose of support might lead to the most significant productivity gains. Salmons, who received higher doses of support compared to daces, showed a slightly lower increase in labour productivity, ranging from 29.1% to 43.9% higher than unsupported enterprises. While their growth was still significant, it was not as substantial as that of the daces group. This observation raises the question of whether there could be an optimal level of support beyond which the returns on productivity growth begin to diminish. To explore this further, the study turned its attention to the most supported group of enterprises, the sharks, and compared their productivity growth with unsupported enterprises. Surprisingly, the results showed that the sharks had the lowest growth in labour productivity among all other supported groups. Their increase in labour productivity growth was only between 21.8% and 33.6% higher than that of unsupported enterprises. This finding implies that there might be a point of saturation beyond which additional support does not lead to commensurate improvements in productivity. The correlation between the dose of support and labour productivity growth became evident as the study progressed. As the dose of support increased, labour productivity growth tended to decrease, indicating a negative relationship between the two variables. This insight is crucial for policymakers and organizations involved in distributing EU subsidies, as it suggests that relatively smaller projects may benefit more from the support compared to larger and heavily funded enterprises. The study's results provide valuable evidence for crafting more effective support programs that maximize the impact of EU subsidies on enterprise growth. By recognizing the potential diminishing returns associated with higher support levels, policymakers can allocate resources more strategically to foster substantial productivity improvements. The findings emphasize the importance of tailoring support mechanisms based on the enterprise's size and needs.

Conclusion

Although there are many studies examining the impact of EU subsidies on SMEs, there are still very few that consider the intensity of support, the dose. We have found only four: Cerulli *et al.*, 2020; Marino *et al.*, 2016; Bondonio and Greenbaum, 2014; Ginevičius *et al.*, 2007). Moreover, most of the studies focus on specific programmes and usually on short-term effects. In our paper, we observed the impact of EU subsidies on the competitiveness of SMEs in the Czech Republic in the period 2007–2013. Using a standard counterfactual design – a combination of PSM and DiD, we analysed the entire OPEI programme, focusing on long-term effects and taking the subsidy dose into account.

Our results suggest that the OPEI programme, which focused on increasing the competitiveness of SMEs, was generally successful. Subsidized firms actually achieved higher labour productivity, which has been used as an output variable for competitiveness, than the control group. What is important to note here is that we have been considering long-term effects, rather than short-term ones, which were found to be insignificant in the previous research (MIT 2018). Moreover, we have shown that the subsidy dose is a significant factor if we compare the effectiveness of the support. We may conclude that in the case of the OPEI programme in the Czech Republic, higher doses meant a relatively lower effectiveness of the support. In other words, the subsidy "sharks" that benefited most from the OPEI programme performed worse than the mediocre "salmons" and even worse in comparison to the relatively least subsidized "daces". Using such fish terminology, we may say that daces bite deeper than sharks. Although examining different contexts, several recent studies suggest that the benefits of government grants also decline for firms receiving multiple subsidies (e.g., Lanahan *et al.*, 2022; Lanahan & Armanios, 2018; Lerner, 2010). From the policy point of view, it would be worthwhile to adjust the policy, for example by setting some limits on subsidies. There is also an emerging body of research questioning the entrepreneurial state approach (Audretsch & Fiedler, 2023; Wennberg & Sandström, 2022), with numerous calls for greater public choice considerations in the assessment and discussion of entrepreneurship policy (Gustafsson *et al.*, 2020; Karlson *et al.*, 2021; Lucas *et al.*, 2018; Lucas & Boudreaux, 2020). This study may have implications for these political economy discussions. From a research design perspective, it seems important to take the subsidy dose into account in any similar research or evaluation practice.

Discussion

The findings of this study raise important questions for future research on EU subsidy programmes. In our paper, we have highlighted two main issues – the difference between long-term and short-term effects, and the subsidy dose. While contemporary research and evaluation practice usually deals with short-term effects due to data availability and the necessity to evaluate shortly after the programme's period, it seems that the analysis of long-term effects may yield different results. The OPEI programme in the Czech Republic has already been analysed regarding the short-term effects (MIT 2018) with inconclusive results. However, as we have shown, the long-term effects seem to be significant. Moreover, we have shown that the subsidy dose is very important from the point of view of programme effectiveness. This raises the question of how to design effective policies that consider the dose of support and maximise its impact on competitiveness or other outcomes the subsidy aims at. Of course, the results and recommendations may vary from country to country and from programme to programme. However, neglecting the subsidy dose and focusing only on short-term effects may lead to distorted results and incorrect policy recommendations.

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Appendix

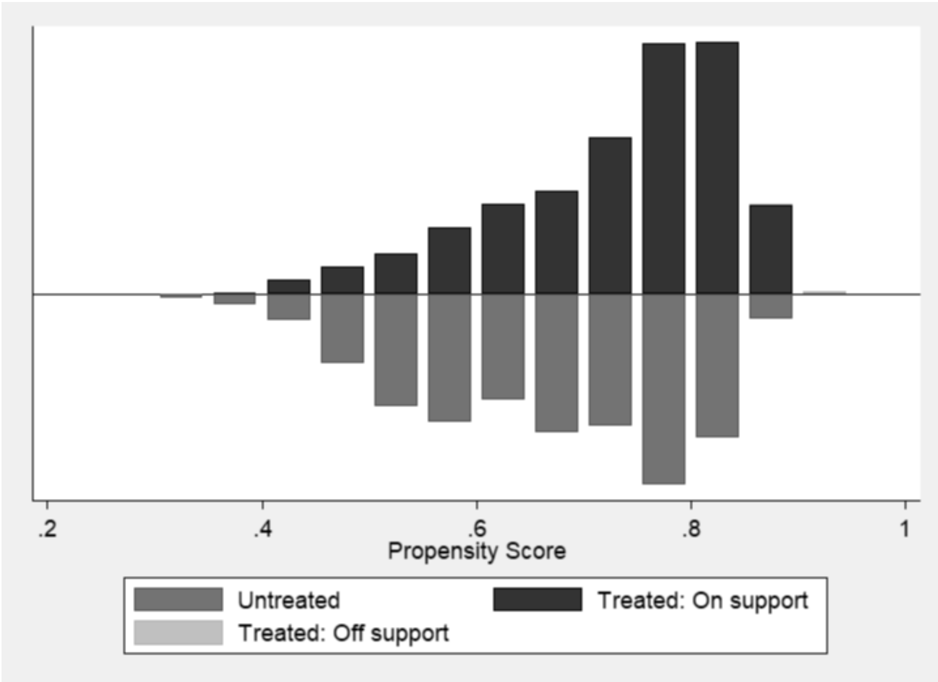
Table 3. Covariates – Logit (2.299 observations)

Variable	Coefficient	Robust Std. Err.	P > I z I
Age	0.003	0.010	0.016
Legal form (a.s.)	0.934	0.683	0.172
Legal form (s.r.o.)	0.901	0.678	0.184
Legal form (others)	0	(omitted*)	
Size (micro)	1.214	1.006	0.228
Size (small)	-0.224	0.118	0.057
Size (medium)	0	(omitted*)	
HQ location (Prague region)	-0.679	0.225	0.003
HQ location (South Bohemian region)	-0.731	0.265	0.006
HQ location (South Moravian region)	-0.325	0.199	0.103
HQ location (Karlovy Vary region)	0.136	0.372	0.715
HQ location (Hradec Kralove region)	-0.368	0.262	0.161
HQ location (Liberec region)	-0.210	0.300	0.483
HQ location (Moravian-Silesian region)	-0.020	0.209	0.923
HQ location (Olomouc region)	-0.066	0.246	0.789
HQ location (Pardubice region)	-0.325	0.250	0.194
HQ location (Pilsen region)	-0.293	0.328	0.371
HQ location (Central Bohemian region)	-0.500	0.234	0.033
HQ location (Usti nad Labem region)	-0.468	0.264	0.076
HQ location (Vysocina region)	0.101	0.283	0.720
HQ location (Zlin region)	0	(omitted*)	
CZ-NACE – services (High-tech)	0.757	0.265	0.004
CZ-NACE– services (High-market)	-0.218	0.255	0.392
CZ-NACE – services (High-financial)	-0.327	1.539	0.832
CZ-NACE – services (High-others)	0.319	0.441	0.470
CZ-NACE – services (Low-market)	0.008	0.174	0.963
CZ-NACE – services (Low-others)	0	(omitted*)	
CZ-NACE – services (Others)	0	(omitted*)	
CZ-NACE – manufacturing industry (High-tech)	0.853	0.342	0.013
CZ-NACE – manufacturing industry (Medium High-tech)	0.956	0.179	0.000
CZ-NACE – manufacturing industry (Medium Low-tech)	0.937	0.162	0.000
CZ-NACE – manufacturing industry (Low-tech)	0.594	0.188	0.002
Assets growth before treatment	0.052	0.054	0.329

Source: Authors

**automatically omitted by STATA software due to perfect collinearity – "dummy variable trap"*

Figure 2. Common support



Source: Authors (STATA).