The Impact of Subsidies on Czech Firms

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Abstract

In the Czech Republic there has been invested a lot of money to the human capital through the European Social Fund. The Human Resources and Employment Operational Programme plays an important role by providing subsidies for the training of employees and an introduction of modern forms of management and human resource development.

This paper summarizes the application of the regression discontinuity method to test whether there is an impact of EU assistance on employment in supported firms in 2009. The estimations were conducted with a sample with 1 176 supported and 87 rejected applicants. The estimation results suggest that the impacts of the intervention on employment is positive and statistically significant. The employment change in supported firms was on average about 10–15 p.p. higher than in unsupported firms.

Keywords

Counterfactual impact evaluation, regression discontinuity design, European Social Fund, employment

JEL code

C13, J08

INTRODUCTION

The EU Cohesion Policy programming period 2007–2013 is in progress. The EU funding is oriented to improvement of the economic situation of the regions that are lagging behind.

Naturally, one starts to be interested in the actual impact of this policy, whether it has achieved its goals. Since, the policy has been in progress for several years, it is possible to conduct impact evaluations on already implemented projects.

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The nature of the policy program precludes the usage of the standard statistical techniques (such as regression analysis) for impact evaluation. The reason is that the selection of economic agents (firms) to the program is non-random and the assumptions usually made when applying standard statistical techniques, such as regression analysis, are typically violated. Therefore, the econometric and statistical community has proposed a bulk of methods, which can – under some assumptions – be applied for impact evaluation under the name Counterfactual Impact Evaluation (henceforth CIE). More details of information can be found in Morgan and Winship (2007) or Khandker et al (2010), who explain the reasons of failure of the standard techniques and overview the most common CIE approaches.

Until now, there have been just few impact evaluations of the EU Cohesion Policy using the methodology of the Counterfactual Impact Evaluation, for recent development see the example ASVAPP (2012), Pokorski (2011) or GEFRA, IAB (2010). To authors' best knowledge; there has not been such an impact evaluation study in the Czech Republic.

Our study employs the CIE approach to identify the impact of the European Social Fund (ESF) on the Czech companies. One of the aims of this study is to provide evidence about the impact of the intervention on employment in companies as the employment is a long-term objective of the EU strategies.

The study deals with the Human Resources and Employment Operational program (HREOP), support area 1.1 which is focused on investments in human capital in companies and development of systems that help to increase the flexibility of the workforce, increase their knowledge and skills. The aim of this intervention is to increase the adaptability of employees and employers (Ministry of Labour Affairs, 2012). It is therefore not directly targeted at the unemployed, but it helps to avoid potential unemployment. According to the Ministry of Labour Affairs (2012) the implementation of this intervention should help to develop professional knowledge, skills and competencies of employees and employers and expand potential for the application of more flexible forms of employment and introduce modern forms of management and human resource development.

In this paper we present results obtained by the application of one particular CIE technique – the regression discontinuity design (RDD) method on a data set of a supported and an unsupported firm applying for a grant of the HREOP. We present the results for the years 2008-2009 after the first year of the research project. The first part describes a selection of data and the selection process of applicants in the HREOP 1.1. The specification of the methodology and our final results follows.

1 DATA AND METHODOLOGY

1.1 Data

In the HREOP the selection process is based on the assigned point ratings of independent appraisal experts. Each project gets randomly its own two appraisal experts who assess the quality of the project application and who score it from 0 to 100 points according to specified criteria. There is a strict rule in the HREOP which does not allow support projects with a score less than 65 points. The selection mechanism of application works as follows:

- If both appraisal experts score the application less than 65 points, the project is rejected;
- If both appraisal experts score the application more than 65 points, the project is recommended for support;
- If one of the appraisal expert´s score the application less than 65 points and the second one more than 65 points, the third appraisal expert assesses the application and according to his/her given score the project is rejected or accepted.

There is also the possibility that the cut-off point needed for obtaining the support could be above the 65 points in the case of the lack of allocated money. But it was not in the case of analyzed calls for proposals as there was enough money in studied call for proposals. Thus, all applications with more than 65 points are recommended to be supported.

Within the support area 1.1 we have analyzed three very similar types of calls for proposals together (Calls 35, 39 and 60). The following table shows the number of supported and rejected applications in particular calls.

Table 1 Calls 35, 39, 60 – The Size of the Data Sample

	Number of applications in the calls for proposals			CZSO data sample	
	Applications submitted	Applications supported	Applications rejected	Firms supported	Firms rejected
Call 35	1 802	1 064	738	896	55
Call 39	347	98	249	111	20
Call 60	462	182	280	169	12
Total	2 611	1 344	1 267	1 176	87

Source: Monit 7+, CZSO

We obtain data on Czech firms from the Czech Statistical Office (CZSO). CZSO do not collect data for each firm from our data sample, and therefore the size of the data sample decreases but it is still large enough. Information on applications is transformed to a data set on particular firms as some firms applied for the support more than once.

We prefer to work with official data rather than with the own firm's estimate. Indeed, Betcherman, Daysal and Pagés (2010) pointed out that when reporting results of support, companies have a tendency to overestimate the number of jobs created compared to the actual situation. Therefore, we use the indicator of employment measured independently with an annual periodicity (data by CZSO). By using the official data, we are able to solve this methodological pitfall.

1.2 Methodology

We have used the regression discontinuity design method to estimate the impact of the intervention on employment. The analysis focused on the immediate effect of intervention because the tests have been done on ongoing projects. The impact is tested as 2008 represents a pre–treatment period and 2009 the quasi post–treatment period.

The data used for our analysis are the data of the Czech Statistical Office on firms between 2008 and 2010. The data concern limited companies and joint stock companies which were suitable applicants for HREOP support.

The RDD method is based on the comparison of units (here companies' projects) with score points around a cut-off point, which determines the probability of receiving the treatment (here the support from the HREOP). The idea is based on the assumption that the distribution of the units in the neighbourhood around the cut-off point is almost random. If the cut-off value significantly influences whether the company receives the treatment, the treatment is for the firms in the neighbourhood around the cut-off point is almost random and is statistically valid to compare the outcomes of supported and unsupported firms from that neighbour.

There are two versions of the method: the sharp version, where all units below the cut-off point do not receive the treatment and all units above the cut-off do receive it and the fuzzy version where just the probability of receiving the treatment changes (from a small value to a large one). In the sharp version, the average causal effect is estimated as the difference in the mean values of the investigated indicator for units just above and those just below the cut-off value. In the fuzzy version, the average causal effect is estimated as the ratio of the above mentioned difference in the mean values of the indicators divided by the difference in probabilities of receiving the treatment around the cut-off.

Given some further assumption, it can be shown that the method has good internal validity, at least for the units around the cut-off points. One of the critical assumptions is that only the probability of receiving treatment and the indicator values change abruptly around the cut-off value. If there is another variable, which also changes abruptly at the cut-off value, then the identification of the treatment effect is not possible: in such a case, it would not be possible to identify, whether the change in the investigated indicator is due to the treatment or due to that variable.

There are various techniques for estimating the mean values of the investigated indicator around the cut-off value. The most common techniques include running two separate regressions of the indicators based on score points for units below and above the cut-off value. These regressions may be parametric (the indicator is regressed on few first powers of score points) or fully non-parametric. The fitted values based on the two regressions at the cut-off value are then compared[6]. In the fuzzy variant, the analogical regressions are estimated for probabilities of receiving the treatment. See Lee and Lemieux (2009) for further discussion and technical details of the method.

Given the selection process, in our case the cut-off point is at 65 score points. Since in our data all projects with an average score over 65 received support, whereas projects with an average score less than 65 did not receive support, it is possible to apply the one-way fuzzy version of the RDD model. We have also tested several variables (such as the size of companies, or its characteristics, such as dummy variables for NACE categories) and we have not found that any of these variables change abruptly around the cut-off points.

We have evaluated the impact of support on the following two indicators:

- Employment 1 – Percentage change in the number of employees as to fulltime jobs between 2008 and 2009, this variable (as well as the following one) is used to model the impact of support on employment;
- Employment 2 – Percentage change in the number of employees as the number of persons between 2008 and 2009.

RDD estimates the average impact of an aid in the border area of points needed to obtain support by differences of expected (mean) values of indicators for projects which score is closely above or below this border. We apply several methods to estimate the expected (mean) values in order to increase the robustness of our results. These methods are:

- Nonparametric regression (we used Watson-Nadaraya's estimator (Nadraya 1964), with a time smoothing window set up by cross-validation);
- Polynomial regression (tested with varying degrees of polynomials; to estimate the coefficients of polynomials, we used ordinary least squares method);
- Robust polynomial regression (we used robust regression to estimate the coefficients of polynomials, which is – unlike the ordinary least squares method - less sensitive to outlying observations);
- Semi-parametric estimation based on the fit of the generalized skew-normal distribution.

The first two methods are standard according to the econometric literature (e.g. Lee, Lemieux, 2009). We have used the third method because of the sensitivity of the polynomial regression model estimated by least squares method to outliers. The fourth method has been used because of its flexibility; see Ma and Genton (2004) for further details. Standard errors of estimations and p-values for all methods were approximated via bootstrap (Davison, Hinkley, 1997).

[6] Alternatively to the parametric approach, one can run just one regression on the whole sample, and the regression model must include the dummy variable equal to one if the score points are above the cut-off and zero otherwise as well as the product of this dummy variable with all powers of score points. It can be shown that such approach can be then interpreted as the instrumental variable regression, see Lee and Limieux (2009).

2 RESULTS AND DISCUSSION

All methods have found significant effect of support on change in the number of employees. A reasonable estimate of the impact varies between 5 to 10 percentage points. The reader can see the summary of results for each method in Table 2.

Table 2 Results of all examined calls for proposals (35, 39, 60)

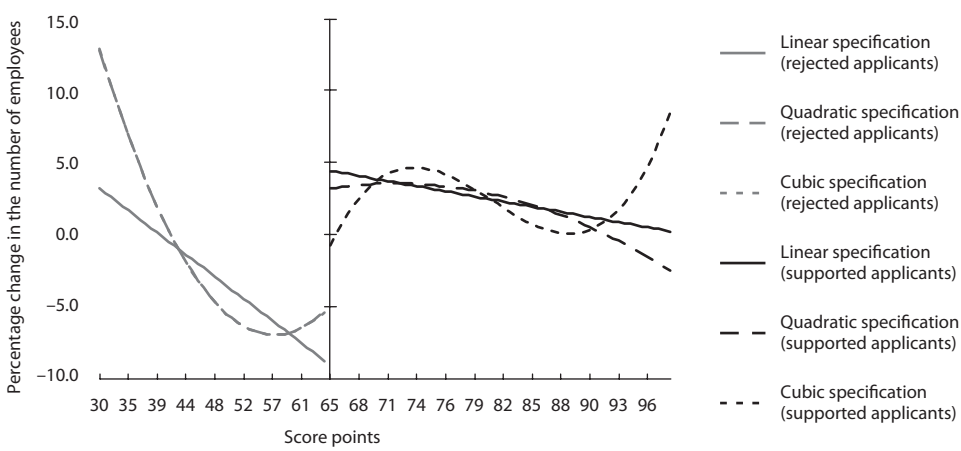
Method	Note	Indicator	
		Employment 1	Employment 2
Skewed normal distribution	linear	11.68***	12.34***
	linear and cubic	10.36**	4.52*
Nadaraya-Watson estimator	smoothing by cross-validation (CV)	8.89	9.80
	smoothing 5-times more than CV	10.74	13.28
	smoothing 5-times less than CV	8.42	7.19
Polynomial regression	linear	13.19***	14.05***
	quadratic	8.57*	12.73**
	cubic	4.59	9.71*
Robust polynomial regression	linear	7.88**	6.53*
	quadratic	6.71	6.99**
	cubic	6.05	4.61

Note: *** indicates significance at 1%, ** indicates significance at 5%, * indicates significance at 10%.
Source: Monit 7+, CZSO, Own calculations

The average change in employment of supported firms has low correlation to the average number of points. On the other hand, unsupported firms with a few points have on average a smaller decline in employment than unsupported firms around the left border of 65 points. That suggests that the RDD model results should be taken into account only as a local and the results obtained by RDD cannot be extrapolated to the whole sample of firms. The method has high internal validity, but low external validity.

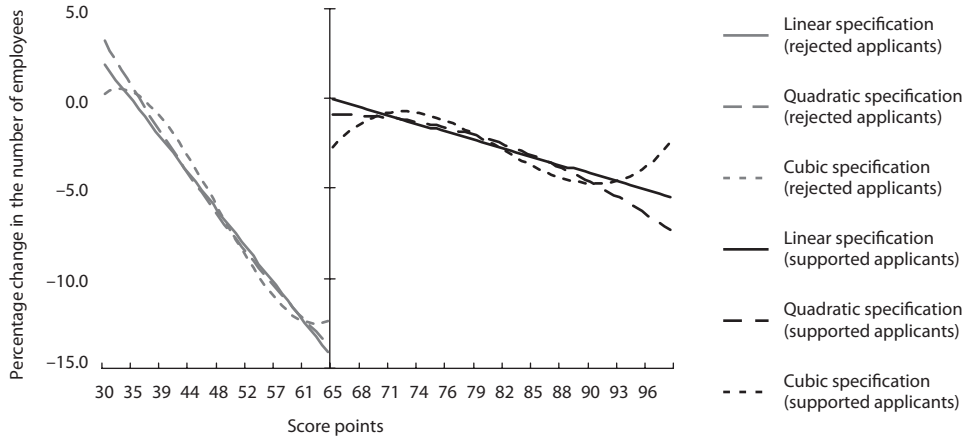
The following figures illustrate the estimation results for fitted polynomial curves. Estimated impact can be represented as the difference in the values of curves in the area of discontinuity (at the cut-off point of 65 points).

Figure 1 RDD estimation - number of employees as fulltime jobs



Source: Own calculations, CZSO, Monit7+

Figure 2 RDD estimation – number of employees as number of persons



Source: Own calculations, CZSO, Monit7+

CONCLUSIONS

The application of the RDD method on data of employment from the CZSO suggests the statistically significant results indicating a positive impact of subsidies of training in firms on employment. We have found the significant results for both indicators. The reasonable range of the impact is from 5 to 10 percentage points.

The average decline in employees as fulltime jobs was between 5 to 15% (and a slightly larger decline in the number of employees as number of persons) for unsupported firms from the left neighbourhood of 65 points. The average change in employment moves to zero for supported companies. It means that unsupported firms decreased their workforce by 7% of their employees unlike supported firms that were able to preserve the size of their workplaces, at least partially as the effect of the ESF subsidies, which is not a bad result given the macroeconomic recession in the 2008–2009 period.

Although the results seem positive, an important question remains whether the results are sustainable even after the end of the intervention. For example, Girma, Görg, Strobl and Walsh (2008) find that the supported jobs in Ireland usually last 4 years after receiving grant and than the effect disappears after it. Although the answer to that question would be of great importance for a long-term strategy of labour market policy, it cannot be answered now, as it has not leap enough time since the start of the implementation of the project. Nevertheless, we plan that it will be the subject of our future research.

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