Estimating Treatment Effects of a Training Programme in Slovakia Using Propensity Score Matching[1]

*Miroslav ŠTEFÁNIK**

Abstract

Submitted article brings evidence from administrative data on registered unemployed in Slovakia. This data is explored to evaluate a training programme which is a part of the portfolio of active labour market measures provided by Slovak governmental bodies. To evaluate the programme, we look at individuals' chances of getting a job, during the period of 15 months after undertaking the programme. Performance on this indicator is compared between participants and a control group, which is selected ex post using the propensity scores matching approach. The results reveal evidence on negative average treatment effects on the treated, when examined for Slovakia and Bratislava district, where over the half of the trainings is provided. Since the results are contradictory when compared across regions, negative effect of the training measure on employability of participants can be assigned to mistakes in its implementation.

Keywords: *policy evaluation, employability, propensity scores matching*

JEL Classification: C21, J68, J64

1. Introduction

Slovakia is the sixth worst performing EU member state in terms of unemployment rate[2] and fourth worst performing EU member country in terms of long term unemployment.[3] Despite this worrisome situation Slovak government's expenditures on labour market policies (LMP) (including services and LMP supports)

* Miroslav ŠTEFÁNIK, Institute of Economic Research, Slovak Academy of Sciences, Šancová 56, 811 05 Bratislava 1, Slovak Republic; e-mail: miroslav.stefanik@savba.sk

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[2] 13.7% in 2013 based on Eurostat figures based on the EU Labour Force Survey.

[3] 10.0% in 2013 based on Eurostat indicator Long-term unemployment (12 months or more) as a percentage of active population, acquired by the EU Labour Force Survey.

was only 0.791% of the country's GDP in 2011. Spending on training active labour market measures was only 0.236 million of Euro, which makes Slovakia the European Union country with the lowest spending on active labour market policy training measures.[4]

Moreover, existing spending is done with a lack of analysis about its efficiency. Few evaluation studies which were prepared in this area were based on descriptive statistics. None of them have used regression based methods nor counterfactual analysis. The implementation of such scarce, but relevant findings into policy practice has shown to be problematic. Because of these reasons, active labour market measures are often implemented inefficiently what can deform their final impact.

1.1. Description of the Programme

This paper focuses on one training measure from the portfolio of active labour market measures administrated by the Central Office of Labour, Social Affairs and Family (COLSAF), which is the main implementation agency of the Ministry of Labour, Social Affairs and Family of the Slovak Republic (MLSAF). The training program in our point of interest presents the dominant publically funded training framework available to unemployed throughout the country.

Training is provided based on Law (Act No. 5/2004 Coll.), where it is officially defined as one of the active labour market measures (ALMM). It is implemented through regional offices of COLSAF. These were in 2011 relatively autonomous in contracting external providers of training. Most of these trainings should be provided through projects approved at the central level by COLSAF or MLSAF. Training can be provided to any person who is registered as unemployed in case of:

a) lack of vocational knowledge and skills,

b) need of change of vocational knowledge and skills with respect to the demand on the labour market,

c) losing the ability to work in a current job (Act No. 5/2004 Coll.).

Under these conditions training could be provided on the other day after the person gets registered as unemployed. Up to 100% of costs related with the training can be covered by the regional offices of COLSAF. Although training can be provided to any registered unemployed person, because of capacity limitations, only around 0.2% of unemployed registered in 2011 participated in the programme in 2011.

[4] Counted per persons wanting to work active labour market policy (ALMP) expenditures on training in Slovakia was only 0.74 Euro in 2011.

1.2. Treatment Effects of Training Measures

Many studies are pointing at positive effects of training on earnings. For example in the UK, using matching methods (Blundell, Dearden and Sianesi, 2004) reports positive effects of formal educational programmes (between 26.8 and 40.1). Lechner (Lechner and Melly, 2007) reports positive effects of training programmes on employment as well as on earnings 84 months after the training, using propensity score matching for Germany. From a country more similar to Slovakia (Juznik Rotar, 2012) reports positive effects of an active labour market policy training program on youth unemployed' chances for reemployment using unemployment registers from Slovenia. In general, studies evaluating the effects of training on participants' chances of getting employed show positive effects, especially when evaluating longer periods (Dehejia and Wahba, 2002).

Based on Slovak data on registered unemployed, studies from the Nineties are pointing at positive effects of ALMM on individual exit rates from registered unemployment (Lubyová and van Ours, 1999) and on aggregate outflows from registered unemployment (Burda and Lubyova, 1995).

A more recent report on monitoring of ALMM in Slovakia, prepared for MLSAF, distinguishes particular ALMM, but avoids analysing the training programme in the scope of our interest (Barošová et al., 2012). Therefore there is only one evaluation study available from the environment of MLSAF dealing with the same training measure this paper is focusing on (Bořík and Caban, 2013). This study is based on descriptive statistics, processing data from the registers linked to the social insurance data. Authors of the study conclude that the measure is effective and they are underlining a higher probability of finding a job after the measure is taken in Bratislava region.

Methodology of these studies is based mostly on aggregate data and is not contra factual. Contra-factual evaluation using a quasi-experimental approach was used in a study prepared for the Ministry of Finance of the Slovak Republic (Harvan, 2011). Due to insufficient access to data, the abovementioned analysis tries to combine information on registered unemployed with the information from the EU-Labour Force Survey. Combination of the data sources makes the results of the analysis less reliable, but it still remains a first application of a quasi-experimental approach in evaluating ALMM in Slovakia. This study deals only with two measures (which are not presented here) and compares their net effects with costs related with the measure.[5]

[5] For a broader discussion on effectiveness and costs related to unemployment and ALMP see also Mýtna-Kureková, Salner and Farenzova (2013), Štefánik et al. (2014), Konig and Domonkos (2014).

From European perspective, Slovak active labour market policy is relatively stronger in measures subsidising employment and under-financed on training measures (Lehmann and Kluve, 2008), what is often a point of critique from international organisations such as the European Commission, OECD or the World Bank (Batcherman, Olivas and Dar, 2004).

2. Data and Methodology

Administrative data from the COLSAF registers were made available for the purposes of the analysis. These are the registers, based on which the training support is granted. Complete information gathered about the registered person via the entry form (including demographic characteristics and employment history) was provided for all unemployed individuals who appeared in the database during the period between 1st January 2011 and 31st March 2013. Additionally information on participation in active ALMM since 2004 was provided. For those who appeared in the registers in the abovementioned period we are able to link their basic characteristics with their participation in ALMM since 2004.

When estimating the treatment effects of the training programme we focus on those unemployed in the registers which were registered at least one day during the calendar year 2011 (between 1st January and 31st December 2011). In case there is more than one period of unemployment in the year 2011, we take into account only the latest. Based on this definition we can include 671 053 individuals, unemployed in 2011. Out of these, only 1 334 received training under the analysed ALMM training programme in the calendar year 2011.

Selected individuals can be, after receiving the training, followed in the database for at least 15 months. This is because we have evidence on their presence in the database until 31st March 2013.[6]

2.1. Descriptive Statistics of the Target Group

According to the Law, training under the evaluated programme can be provided to any unemployed from the database. Despite this, average characteristics of participants differ from the average characteristics of unemployed in the database. The following Table 1 shows average figures for selected characteristics of unemployed.

Average proportions of selected variables differ slightly between participants and the rest of the database. For example average proportion of males in the database was 52.73%, but among the participants the proportion of males was

[6] 15 months = from 1st January 2012 to 31st March 2013.

only 43.03%. Average age of training participants is a little higher than the average in the database (35.46 vs. 36.74). Over one half of the participants in the trainings are from the Bratislava region, this is in contrast with its lowest proportion on total unemployed in the database (56.97% vs. 6.34%). There are no trainings provided in Kosice region and only few in Presov region, which are the regions with the highest share of unemployed in the database. The proportion of unemployed with no, or only elementary education, is higher in the database, than among the participants. Also unemployed with tertiary education relatively more often participate in the training programme.

T a b l e 1

Average Proportions of Selected Characteristics of Unemployed (in %)

	Database	Database without trained	Trained	Control group
Male	52.73	52.75	43.03	43.03
Age	35.46	35.46	36.74	36.74
Slovak	87.46	87.45	94.08	94.08
Bratislava region	6.34	6.24	56.97	56.97
Trnava region	8.48	8.49	2.70	2.70
Trencin region	9.35	9.32	21.89	21.89
Nitra region	12.78	12.80	4.12	4.12
Zilina region	11.53	11.55	3.22	3.22
Banska Bystrica region	15.39	15.40	9.97	9.97
Presov region	18.97	19.01	1.12	1.12
Kosice region	17.16	17.20	0.00	0.00
No education	3.69	3.69	0.60	0.60
Elementary education	20.58	20.61	5.55	5.55
Secondary education	64.78	64.79	57.35	57.35
Tertiary education	10.96	10.91	36.51	36.51
Has children – less than 10 years of age	1.49	1.49	0.60	0.60
Long term unemployed	54.73	54.72	56.07	56.07
No. of non-missing observations	669 016*	667 682	1 334	1 334

* There was 671 053 persons registered as unemployed for at least one day in 2011, out of these 669 016 provided the information on all the characteristics listed in Table 1. The difference is caused by missing information.

Source: Author‘s calculations using data provided by COLSAF.

In the right column the average proportions for the control group are displayed. When rounded to two decimal places, average figures for participants and the control group appear to be the same.

2.2. Methodology of Measuring the Treatment Effects

A quasi-experimental approach, using an ex post control group, was chosen for measuring of the treatment effects of the evaluated training programme. Such choice is based on the promising results of this approach presented in Dehejia and Wahba (1999; 2002). In line with (Caliendo and Hujer, 2005) applying this methodology rests on two main assumptions. First is the assumption of

unconfoundedness, saying that outcomes of non-participants have the same distribution as the outcomes of participants with the same (or similar) personal characteristics.[7] Second assumption is the assumption of overlap. Individuals' characteristics used to predict participation in the measure have to overlap for the group of participants and non-participants. This is called the area of common support. Based on this assumption, estimated results have to be limited only to individuals from the common support (Blundell, Dearden and Soanesi, 2004).

Matching participants with non-participants with similar characteristics was done in R statistical software using the MatchIt package.[8] We have used the combination of exact matching and the nearest neighbour matching method. Exact matching was performed by gender, age-group,[9] education level[10] and region.[11] Within these subgroups the values of the propensity score variable were used to select the nearest neighbour. One nearest neighbour was selected as a member of the control group for each participant. Each treated individual was, therefore, linked with one twin. No replacements were allowed; meaning each member of the control group was unique and linked with only one treated individual.

The propensity score variable was created estimating a logit equation, where the probability of participation in the treatment is the dependent variable:

$$\log it(p) = \beta_0 + \beta_1 X + \varepsilon$$

with X being the vector of individual characteristics of registered unemployed and ε representing the error term. Under X we have involved all the information available from the database, which significantly contributed to the model, namely:

- date of entering the registry of unemployed and other variables referring to the duration of current and previous entries of the individual in the registry of unemployed,
- dummy for long term unemployment,
- age,
- dummies for history of participation in other ALMM,
- dummies for education level and field of education,
- dummies for district,
- dummy for marital status,
- information on subjective evaluation of his own situation on the labour market.

[7] Pointing at this assumption earlier was Heckman, Ichimura and Todd (1997).

[8] For technical documentation see: Ho et al. (2011).

[9] Age groups: 0 – 29, 30 – 39, 40 – 49, 50+.

[10] No education, Elementary education, Secondary education and Tertiary education.

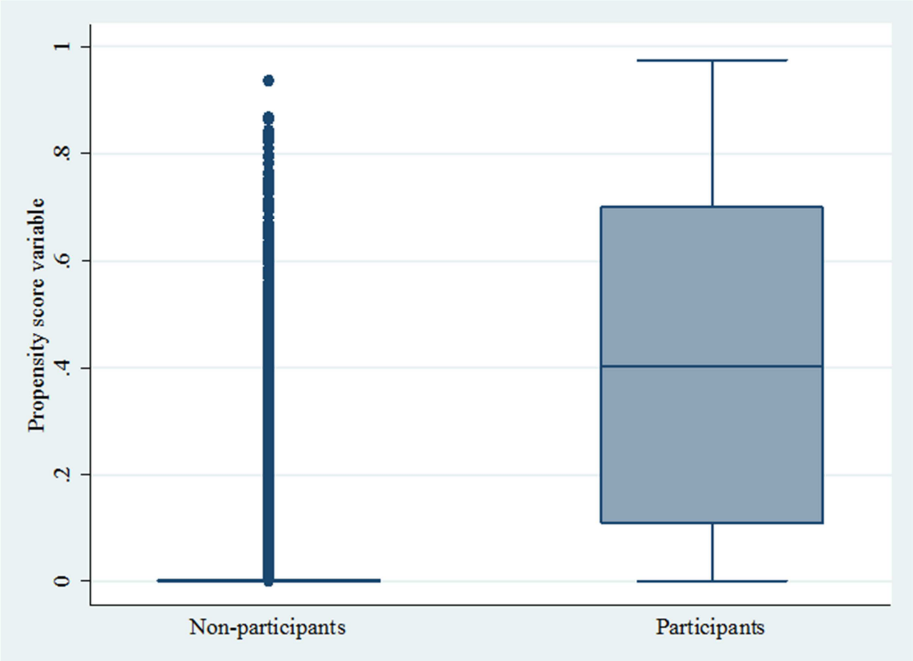
[11] 46 districts based on 46 regional COLSAF centres.

In the first step we have included all possible explanatory variables provided in the data. In the following step, all variables which had not a statistically significant contribution to the model (using 5% level of significance) were excluded. Statistically not significant variables were left in the model only if a categorical variable was included as a set of dummies and some of the dummies were statistically significant.[12]

Employing these explanatory variables, an equation was estimated with a Pseudo R-square of 0.7025, sensitivity 42.61% and specificity 99.98%.[13] Based on this estimation, we were able to project the propensity score variable for 1 329 participants and 666 886 non-participants. The rest of the observations were dropped because of missing values for some of the explanatory variables. The following graph shows the distribution of the propensity score variable for participants and non-participants.

F i g u r e 1

Distribution of the Propensity Score Variable for Participants (1) and Non-participants (0) in the Training Programme



Source: Author's calculations using data provided by COLSAF.

[12] If at least one of the dummies related to a categorical variable was statistically significant we have included the whole group of dummies.

[13] Complete results of the estimation can be found at: <http://ekonom.sav.sk/uploads/journals/Stefanik/annex4/annex1.txt>.

As can be seen from the Figure 1 the mean of the propensity score variable is clearly different for participants and non-participants, but both distributions share a dominant part of their ranges. Because the non-participants' distribution is much more numerous, finding control group units for participants will not become problematic because of the lack of common support. Furthermore this is a favourable evidence to support the assumption of overlap.

Outcome indicator

Since, from the registers of unemployed we are not able to follow the exact employment status of individuals after leaving the database, our analysis has to rely on the information about exiting the database and the declared reason of exit. A proxy for getting employed is constructed based on the fact if an individual left the database with the declared reason being entering a job. The reliability of the information on the declared reason of exit was limited mainly because in about 30% of exits the reason was not declared. An assumption had to be taken, that all not declared exits are due to other reasons than entering a job. Under this assumption the acquired results were similar to the employment rates, reported by a recent MLSAF study Bořík and Caban (2013), which uses a more precise indication of employment status based on the data from social insurance.

Thus, our outcome indicator is the employment status, based on the above described proxy. Provided data allow us to fill in this indicator for the period of 15 months following the end of the measure.

The start of the evaluation period is set to 1st January 2012, thus we are able to follow the employment status until the end of March 2013. Employment status during these 15 months will be reported as well as the average treatment effect on the treated, which were counted using the Matching package in R.[14]

3. Results

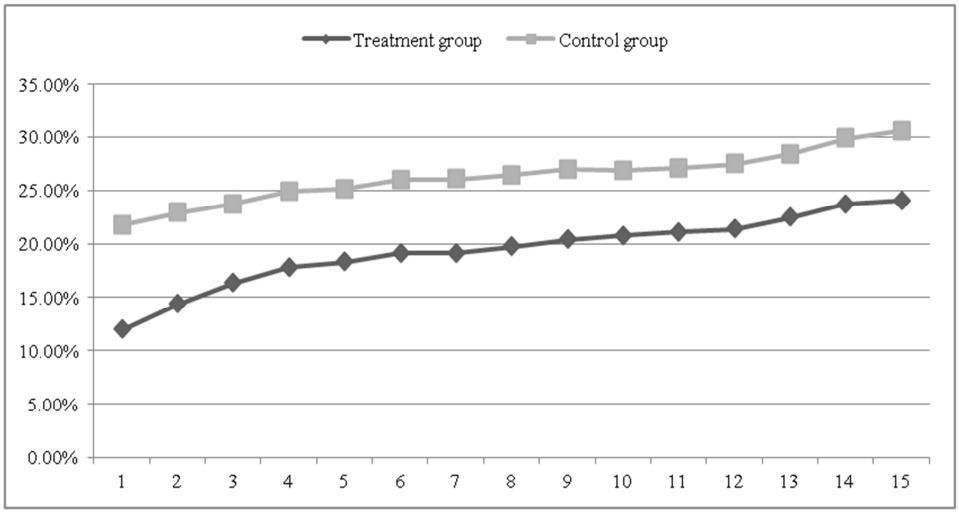
The results for Slovakia are in contrast with internationally observed evidence, where a dominant part of the studies present evidence about positive effects of training programmes on employment outcomes.[15] Administrative data on registered unemployed in Slovakia draw a different picture. The following graphs show the proportion of those, who left the database because of finding a job in 15 months after the training. This proxy for the "employment rate" is displayed for participants in the programme and the members of the control group selected ex-post from individuals in the database of unemployed.

[14] For more information on this package see Sekhon (2011).

[15] See for example Juznik Rotar (2012), Lechner and Melly (2007), Dehejia and Wahba (1999).

G r a p h 1

Proportion of Employed Participants and Members of the Control Group 15 Months after the Programme Counted for Slovakia



Source: Author's calculations using data provided by COLSAF.

Graph 1 shows that the proportion of those who left the database because of finding a job is higher in the case of members of the control group, than in the case of the treatment group. The balance between these two groups is satisfactory (shown in Table 1). Under the assumption that unobservable factors do not play a role, we can conclude that there is a negative treatment effect of the evaluated training programme. These proportions are counted as the average for individuals from the whole country.

Graph 2 shows results structured in the same way, but counted as the average of unemployed for Bratislava district only.[16]

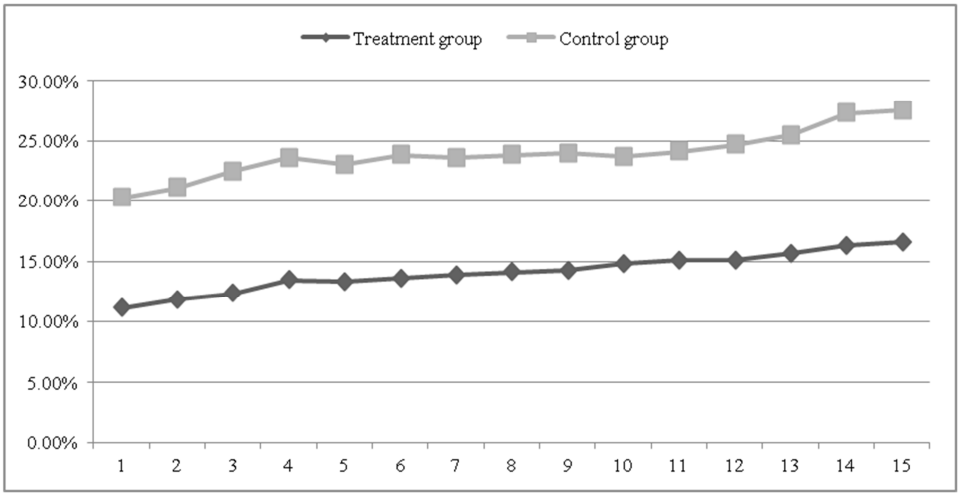
In Bratislava, the observable negative effect is even bigger, in comparison to the country average. After 12 months 15.11% of the treated and 24.74% of the control group exited the database because of finding a job. Bratislava region dramatically differs from the rest of the country for almost all economic, as well as social indicators. It is the most urban region in the country; it is concentrated around the capital city, which attracts the majority of the capital flowing into the country, but also the capital which is allocated within the country. Due to this, unemployment rate remains around 6% which is in contrast to the country average, which is around 15%.[17] Bratislava is always specific when looking at the

[16] In this paper, when we refer to Bratislava region we refer to a bigger unit on NUTS 3 level ["Bratislavský kraj" in Slovak], while by Bratislava district we mean a smaller region of COLSAF regional centre – app. NUTS 4 level ["obvod bratislavského úradu práce" in Slovak].

structure of occupations, educational structure or labour productivity. It is therefore hard to interpret the difference between Bratislava and the Slovak average, because it could be caused by one of many various specifics of this region.

Graph 2

Proportion of Employed Participants and Members of the Control Group 15 Months after the Programme Counted for Bratislava



Source: Author's calculations using data provided by COLSAF.

In Bratislava district over half of the total trainings, provided under the evaluated training programme, were provided (56.97% see Table 1). This is in contrast with the low share of this district on total unemployed. As a result, the availability of the trainings to unemployed in Bratislava is significantly higher. This could negatively influence its impact on employability.

The interpretation is constrained, also because the evidence on treatment effects for the rest of Slovakia is ambivalent. Graph 3, below, shows slightly higher chances of getting a job for the participants in last three months of the reference period. What is not observable from the graph is that the heterogeneity of the effects between regions and subgroups gets much higher than in case of Bratislava. This, in combination with limited frequency of observations, brings statistically not significant differences.

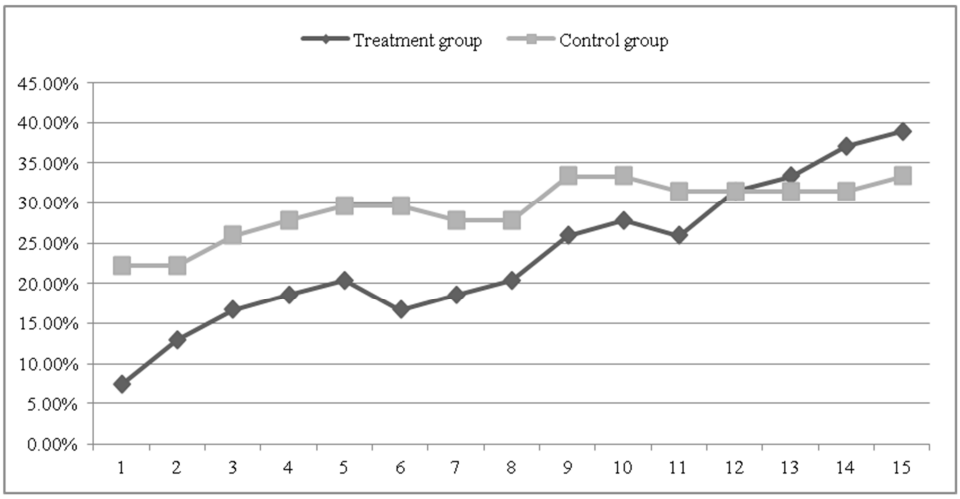
Banska Bystrica district presents a district providing the clearest positive evidence with higher proportion of participants getting placed into jobs than the members of the control group. It is 34.04% of the participants versus 17.2% of

[17] Unemployment rate based on administrative data on registered unemployed was 5.72% for Bratislava and 14.44% for Slovakia in 2012. Based on the Labour Force Survey it was 5.62% for Bratislava and 13.94% for Slovakia in 2012.

the members of the control group placed in a job after 12 months. These proportions were calculated from only 47 individuals in each group and therefore need to be interpreted with caution.

Graph 3

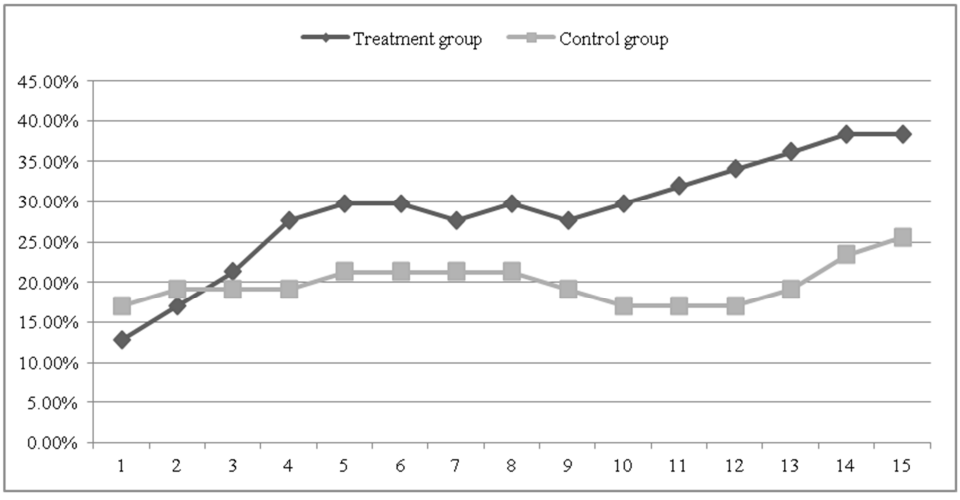
Proportion of Employed Participants and Members of the Control Group 15 Months after the Programme Counted for Slovakia without Bratislava



Source: Author's calculations using data provided by COLSAF.

Graph 4

Proportion of Employed Participants and Members of the Control Group 15 Months after the Programme Counted for Banska Bystrica District

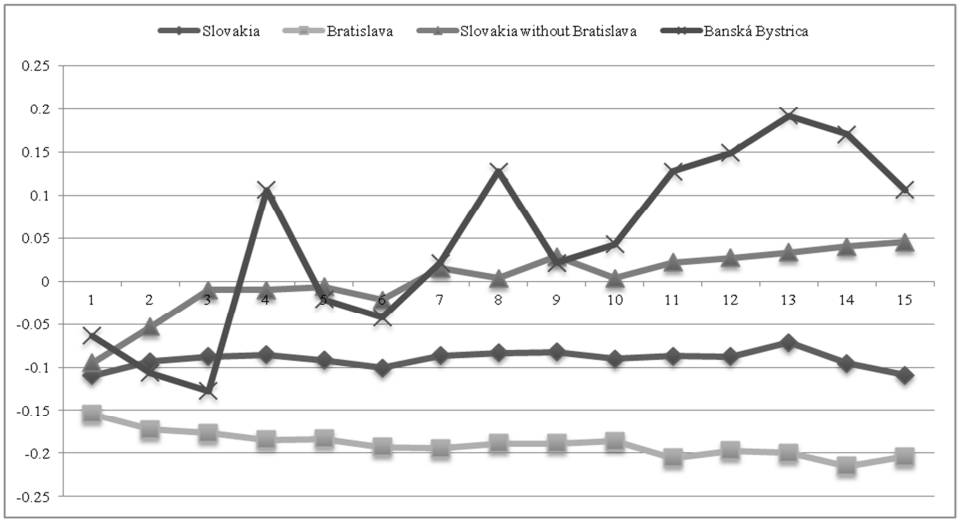


Source: Author's calculations using data provided by COLSAF.

When counting the average treatment effects on treated for the 15 month period, we get statistically significant negative figures for Bratislava and whole country and statistically not significant effects for the rest of the country without Bratislava, as well as Banska Bystrica district.

G r a p h 5

Average Treatment Effects on Treated[18]



Source: Author's calculations using data provided by COLSAF.

Average treatment effects on treated (ATT) confirm a clear negative effect of the programme in Bratislava, practically during the whole period of 15 months. Statistically significant and negative, but half as intensive are the ATTs for the whole country.

4. Discussion

Using propensity score matching to perform a contra-factual evaluation of a training measure revealed negative average effects of the measure. High regional heterogeneity of the results suggests, that implementation of the measure plays an important role in its final effect. Presented evidence, therefore hints that there are differences in implementation of the training programme, which substantially influence the effect of provided training on employability of participants. Furthermore the differences in implementation are to a big extent determined regionally. This is observable from the data and it can be also expected based on the way training is organized (via regional COLSAF centres).

[18] Figures used to construct Graph 5 can be found in the online annex at: <http://ekonom.sav.sk/uploads/journals/Stefanik/annex4/annex2.htm>.

Based on the data, which were made recently available, there is clear evidence that the evaluated training programme has on average negative impact on employment chances of participants in Slovakia. Negative effect is higher for Bratislava district and over half of the trainings are provided in Bratislava. This district therefore significantly contributes to the shape of ATTs counted for the whole country.

ATTs were measured 15 months after the training. Negative effects observable for Bratislava district were increasing slightly in time. Negative effects acquired as the average of the country showed no clear trend during the period of 15 months. If we look at the average of Slovakia without Bratislava, a significant negative effect disappears. There are districts to be found, which bring some significant positive effects, as for example the district of Banska Bystrica.

Evidence from these districts gives us a reason to believe, that negative effects observable for the country do not speak against the application of training measures in Slovakia in general, but only say about the way an existing measure is implemented in each particular district. The results of this analysis definitely should not be interpreted in the sense that the (positive) effects of training measures in Slovakia are relatively lower (or even negative) in general and financing of ALMM should be therefore adjusted in favour of other measures. Such interpretation would be contra-productive because training measures have, in other countries, proven to be effective in fighting long term unemployment, which presents the most urging area of ALMP in Slovakia.

The interpretation of the results presented here should therefore be limited to the effects of implementation of a particular training measure. When interpreting the results one should also be aware of the limitations of the analysis. The most important limitation is caused by the length of the reference period.

Positive effects of training programmes reported by other empirical studies are measured after a longer period. Data, examined in our case, allowed following of the effects for only 15 months after the training, what appears not to be sufficiently long. On this data we can observe an initial negative effect of the measure,[19] which is disappearing, or declining in time.[20] Longer evaluation period would probably reveal existing positive long-term effects more clearly.[21]

[19] This could be caused by the „lock in“ effect of the measure.

[20] This is not true for Bratislava district.

[21] To try to solve this problem, we would need another export from COLSAF. This is being prepared right now, during the time of this study. Longer evaluation period and more appropriate aggregation of districts would be possible on the newer version of the data. Thanks to this, we would be able to look more closely for any positive effects of the training programme. Regions or subgroups, where training is provided with positive effect on employability would be available afterwards for a more detailed evaluation.

At this point of the analysis a robustness check of the results was done. This was limited by character of the data. First we have used a different method for selecting the control group members. Instead of nearest neighbour matching we used the, so called, caliper matching.[22] The criterion for being selected into the control group was again the distance of the propensity score variable. In the case of caliper matching, instead of looking for one nearest neighbour, all individuals which were within 0.1 units of the standard deviation from one of the participants were selected into the control group. This method suits the data less than nearest neighbour matching method because of the shape of the propensity score variable distribution (see Figure 1). It also has brought initially negative significant and later negative not significant average treatment effects[23] for Slovakia.

Other way of controlling the reliability of the results was running the same analysis on a random selection from the original database. This has brought basically the same results. At last, the same analysis was performed on those who appeared in the database and participated in the measure in the second half of the year 2011. This decreased statistical significance of ATTs because of lower numbers of participants, but provided basically the same results, showing negative (initially significant) ATTs for Slovakia and even more negative and significant results for Bratislava district.[24]

To improve the empirical strategy propensity scores matching could be complemented with a different non-experimental evaluation method such as the instrumental-variable based approach, or the selection model introduced by Heckman (Heckman, Ichimura and Todd, 1997). Unfortunately existing export, to this day, does not offer any option for constructing an instrumental variable, but this will be a matter of the following research.

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[22] For more information on the methodology see Sekhon (2011).

[23] Complete results of the robustness check can be found at: <http://ekonom.sav.sk/uploads/journals/Stefanik/annex4/annex3.htm>.

[24] Complete results of the robustness check can be found at: <http://ekonom.sav.sk/uploads/journals/Stefanik/annex4/annex3.htm>.

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