The empirical assessments of the effects of the investment support to agriculture in the Czech Republic

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Abstract

Politicians and taxpayers are increasingly concerned with the assessment of the effects of the investment support measures. The paper concentrates on the evaluation of the investment support of the Rural Development Programme (RDP) 2007-2013 using counterfactual approaches. The overall objective is to investigate deeper the time consistency of the treatment effects on treated of the investment support, and to provide a better insight in the similarity of farms and their counterfactuals. Our analyses show that there are significant effects of the investment support measures of the RDP 2007-2013 in terms of production expansion and GVA improvement. We can also suppose that the support mobilise additional financial sources of banks. It is also evident that effects tend to decline already shortly (one or two years) after the project is completed and the investment object introduced in the production. Analysing the matched pairs and comparing the results of various matching methods and in respect to the samples (FADN, Albertina) we also provide the evidence that the nature and characteristics of the methods and the samples used for the counterfactual analysis matter and that the difference in the estimated effects might be substantial. Therefore, it is important to pay high attention to the sample when conducting the analysis of investment support effects, particularly, to be concerned with the richness of indicators allowing capturing all essential dimensions of farm similarity.

Key words: investment support, counterfactual analysis, matching methods, average treatment effect on treated.

JEL: Q10, Q18

1. Introduction

Encouraging investment activities has been considered as an important instrument for enhancing the competitiveness of European agriculture for long time. The Rural Development Programme for the period 2007 – 2013 included a range of investment support measures aimed at modernisation in agriculture and forestry, adding value to agricultural, food and forestry products or diversification in non-agricultural productions like renewable energy or tourism and non-commercial activities. Naturally, politicians and taxpayers are interested in the assessment of the effects of these measures. For this purpose, the Commission launched the Common Evaluation a Monitoring Framework (CMEF). However, the simple comparison of result indicators (as production or GVA) between supported and non-supported groups suggested in the CMEF is methodologically problematic, since it omits the multiple factors formation and the fact that the measures are targeted to or exploited by only some groups of producers/regions (Michalek 2007). To deal with these shortcomings a more precise counterfactual approach is needed investigating what would have happened if the supported producers did not participate in the programme and then comparing the result indicators (Khandaker et al. 2010). In our previous research (Medonos et al., 2012, Ratinger et al, 2013) we showed using the propensity score matching approach (PSM) and the Mahalanobis metric matching that there were benefits of the investment support measures in terms of improved GVA, labour productivity and cost-revenue ratio in the Czech Republic; and that these effects differ between farm specialisations and farm sizes. In mean time, the matching methods have become increasingly popular, and their possible use for evaluating the investment support under RDP has already received an attention of the Commission (Metis et al., 2015). However, their application in the evaluation practice might be limited by variability of results depending on the time of (supported) investment and monitoring of effects, and on the sample characteristics like the number of farms or the extent of the available or considered structural

characteristics of farms. Exactly, the robustness of the estimated effects is the subject of this paper.

The overall objective of this paper is to discuss the possible reasons for such variability of results of the counterfactual approach based on Roy-Rubin-model (Khandaker et al. 2010). In turn it means i) to investigate deeper the time consistency of results measuring the effects of the investment support, and ii) to provide a better insight in the similarity of farms and their counterfactuals.

The paper is structured as follows: in the next section we briefly introduce our approach. In Section 3 we review the investment support measures of the RDP 2007-2013 in the Czech Republic and show the general picture of the investment behaviour of farms. We look at the results of the matching in Section 4. In Section 5 we discuss and interpret the results. We will suggest further research in the concluding section (Section 6).

2. Methodology and data

Data

In the presented research we use two samples of farms: a sample of published financial indicators of legal entities (Albertina) and FADN, which substantially differ in their numbers of respondents (Albertina ≈1300, FADN ≈600), coverage (Albertina only legal entities, FADN full coverage of farm types and sizes), and the number and nature of available structural and performance indicators (Albertina – only financial data + land use, FADN – financial, production and land use data). FADN includes data on policies, while to the Albertina sample we had to bring them from the other sources

Since the paper is mainly built upon Albertina data we will provide some more details: The source of data in Albertina sample rests in annual reports of companies which are obliged to publish their economic and book keeping figures. Thus this database does not include small individual farms. Since the Albertina database includes only financial indicators, we linked information on the utilised agricultural area (UAA) and structure of land use from Land Parcel Identification System (LPIS). Similarly, we transferred the information on the investment supports published by the State Agricultural Intervention Fund (SZIF) and provided by Ministry of Agriculture (MoA), information about the number and structure of breeding animals from the Animal register and the information on organic orientation of farms which are also provided by MoA.

Table 1 Structure of measures used by supported farms in period 2008-2013

Code	Measures of supported farms	Projects of analysed farms			Share of analysed farm projects in all RDP	
		Numbers of projects	Volume of support (CZK)	Share o volume (%)	Numbers of projects	Volume of support
121	Modernisation of agricultural holdings	1 069	3 188 281 809	59,5%	39,8%	46,4%
122 + 123	Forest mechanisation + Technical facilities in plants (forest. timber)	21	13 403 710	0,3%	1,2%	2,0%
123	Adding value to agricultural and food products	70	149 737 556	2,8%	10,6%	7,6%
124	Cooperation in the development of new products and processes	1	1 084 563	0,0%	2,9%	0,2%
125	Forest infrastructure	2	7 486 208	0,1%	0,5%	0,9%
311	Diversification	166	1 945 578 559	36,3%	47,4%	64,7%
313	Support to tourism	19	55 356 663	1,0%	6,4%	5,3%
	All investment measures	**1 348**	**5 360 929 068**	**100,0%**	-	-

Source: Database of applications for payment according to measures from MoA, own calculations

The most often exploited investment measure in our sample is M121 - Modernization with 60% the payed total investment support followed by M311 – Diversification in non-farm activities with the 36% share. For all measures included in Table 1 we constructed participation variables with 1 for participating in a measure in a particular year and 0 otherwise.

Conceptual framework

Comparing the actual performance of the participating farms in a support measure with the performance if it did not participate in the programme is principally impossible. Instead as much as similar control (not participating) farms are used. Propensity scores (e.g. Khandaker et al. 2010) or Mahalanobis metric are commonly used for matching the treated (participating) farms with controls.

Figure 1 Conceptual framework

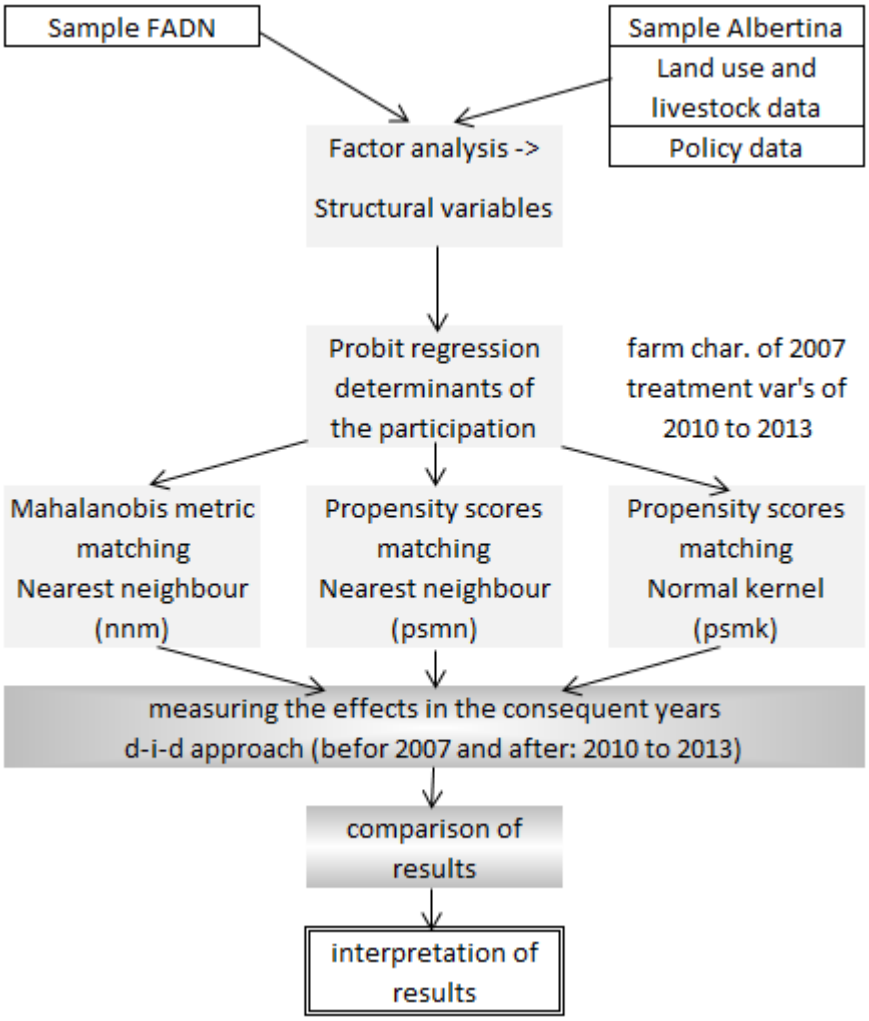


Figure 1 illustrates our approach. In order to choose structural variables on which the similarity is established we first conduct factor analysis. The resulting factors represent the available dimensions of farm characteristics. For further analysis we use the most correlated variable to each factor as structural variables. Second, we do probit regression to understand in which way the chosen structural variables determine the participation of farms in the

programme. Moreover the estimated probabilities of participation (no participation) translate in propensity scores which are the base for matching between participants and controls in one of the used family of methods (Propensity score matching, see for example Khandaker et al. 2010).

Before starting the matching we have to define treatment variables, i.e. a 0-1 variable which distinguish treated (participating) and control farms. These variables are defined for each considered measure like modernisation of agricultural holdings (etc.) and the aggregate of all the investment support (Total investment support). To assure comparability of results over the investigated period, we need to drop those farms which received the support after the final year of the considered investment award (e.g 2010) from the both groups: the participating farms and the controls. Actually, a large number of farms received the investment support also in the following years and thus had to be dropped. Having more information in the FADN sample, we took into account that farms received the investment support in 2004-2006 and farms which benefited from the interest subsidies to investment credits and excluded them from the analysis.

To measure the effects of the investment support we consider five groups of indicators: the performance indicators such as Revenue and GVA, the productivity indicators (labour productivity, Tornquist-Theil total factors productivity), efficiency and capital return ratios and the indicators of capital mobilisation (bank credit indebtedness ratios (Ratinger et al 2013)).

We use the average treatment effect on treted (att) to capture the impact of the investment support measures (e.g. Caliendo and Kopeinig, 2005, Ratinger et al., 2013). The att is calculated as difference in defferences (d-i-d) which means that we first bring the staring points to the same level and then we calculate the net effects (Medonos et al. 2012).

As in our previous research we used propensity score Gausian kernel matching (PSMk) nearest neighbour method with caliper (PSMnnk) (for both we refer to Khandaker et al., 2010) and the Mahalanobis metric nearest neighbour matching (nnmatch) with and without caliper (Abadie and Imbens, 2002). We included the latter (i.e. the Mahalanobis metric matching) , because we can have exact estimate of the variance and thus we can assess the statistical significance of the estimated treatment effect and also we can treat heteroscedasticity (see Abadie and Imbens (2002)).

Gathered data are processed in MS Excel. All matching is carried out in STATA using the procedures: psmatch2 (Leuven and Sianesi., 2003) and nnmatch Abadie et al., 2004). The results are exported in MS Excel workbooks and there further processed in tables and charts.

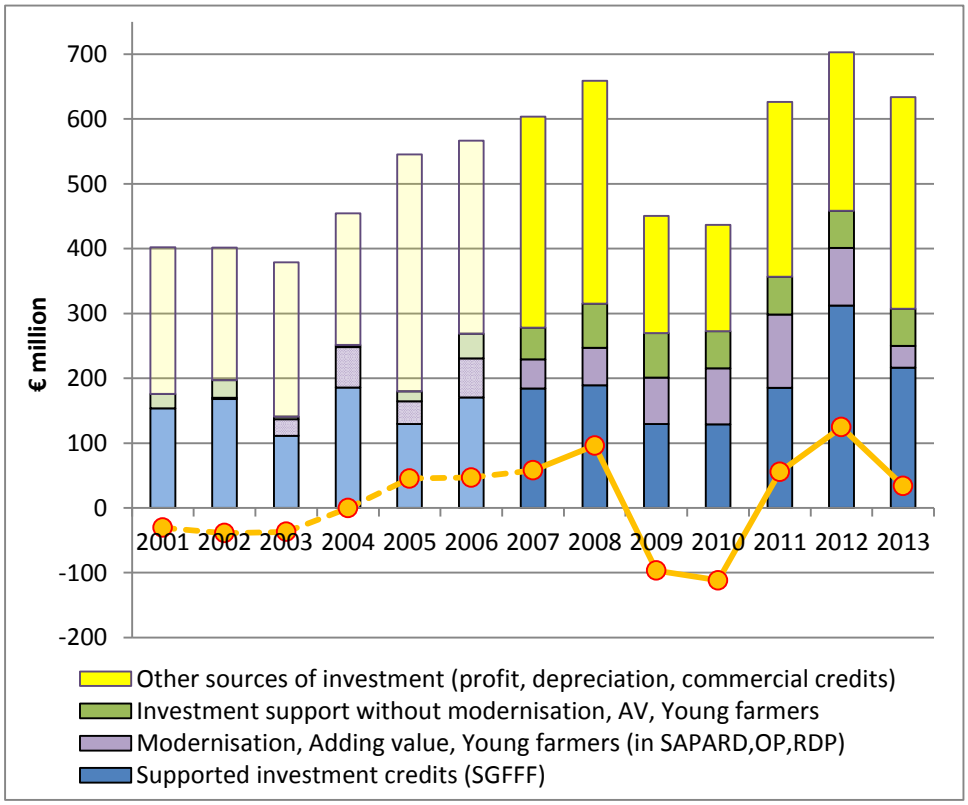
3. Investment support measures in the Czech Republic

Gross fixed capital formation (GFCF) is a basic indicator of investment activity in the economic accounts for agriculture. Indeed, GFCF in the agricultural sector varied substantially in absolute and relative[1] terms over the last decade (Figure 2). It can also be seen from that graph that agricultural GFCF is correlated with the interest rate support to commercial credits of the Support and Guarantee Fund for Farms and Forestry (SGFFF) at least until the EU accession. It is also worth noting that the amplitudes of agricultural GFCF are larger than those of SGFFF support. This can have two explanations: first, the public support (SGFFF) also encouraged private investment activity; and second, investment activities also reflect the sector´s and the overall economic situation: the accession

[1] *With respect to total GFCF.*

expectations[2] in 2001-2003 and the financial crisis of 2008-2009 that proved in farm investment in 2009 and 2010.

Figure 2: Investment activity in agriculture 2001-2013



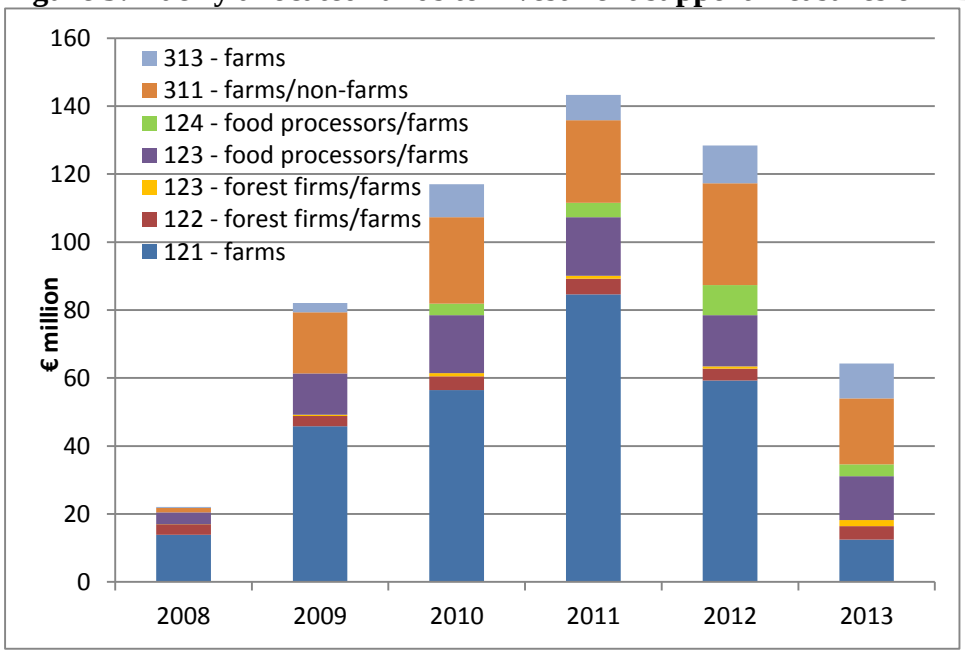
Source: CzSO (EAA), SGFFF, SZIF

New impulses for investment activity had gradually accompanied the EU accession: new market opportunities resulting from joining the common market, financial stabilisation provided by increasing direct payments, the new policy for bioenergy and finally, the investment grants offered by the rural development programmes. The direct payments have substantially increased and stabilised farm income. As a consequence, the direct payments enabled corporate farms to pay off their restitution liabilities. Thus, it was projected in the better financial credibility of both the family and corporate farms vis-à-vis banks and input suppliers. It likely led to higher investment activities in the periods 2004-2008 and 2011-2013 (see figure 2). We can see that during these periods, farms invested above the reproduction threshold (net investment >0 – the yellow line in Figure 2), while in the other years capital stocks declined (net investment <0).

[2] *Including the need to comply with the "acquis communataire", production expansion for creating a solid reference base, etc. One should also note that during these years farmers received generous compensation for bad harvests caused by disastrous weather.*

Investment grants were already provided by the SAPARD[3] in the period 2001_- 2003, but funds were rather limited. Since the EU accession investment grants have become an essential form of the support to investment activities. In 2004-2006, the investment support was a part of the Operational Programme for Agriculture. In the period 2007-2013, it was the main tool of Axis 1 of the Rural Development Programme (measures M121, M123, and M124). While measure M121 (Modernisation of agricultural holdings) attracted farmers' interest that its budget had to be increased twice, the other two measures M123 (Adding value to agricultural and forestry products) and M124 (Cooperation for development of new products, processes and technologies in the agriculture and food sector and the forestry sector) were considered as too demanding, and their potential stayed somehow hidden for farmers. Only 31% of application for M123 came from farmers, the rest were food processors. In Axis 3, farms participated in two investment support measures: M311 on Diversification in non-agricultural activities including bioenergy and M313 supporting to touristic facilities.

Figure 3: Yaerly allocated funds to investment support measures of RDP 2007-2013



Structure of measures: M121 - Modernisation of agricultural holdings; M122 - Forest mechanisation; M123 – Adding value in forests - Technical facilities in plants (forest. timber); M123 - Adding value to agricultural and food products; M124 - Cooperation in the development of new products and processes; M311 – Diversification in non-agricultural production; M313 - Support to tourism.
Source: Database of applications for payment according to measures fromMinistry of Agriculture (MoA), own calculations.

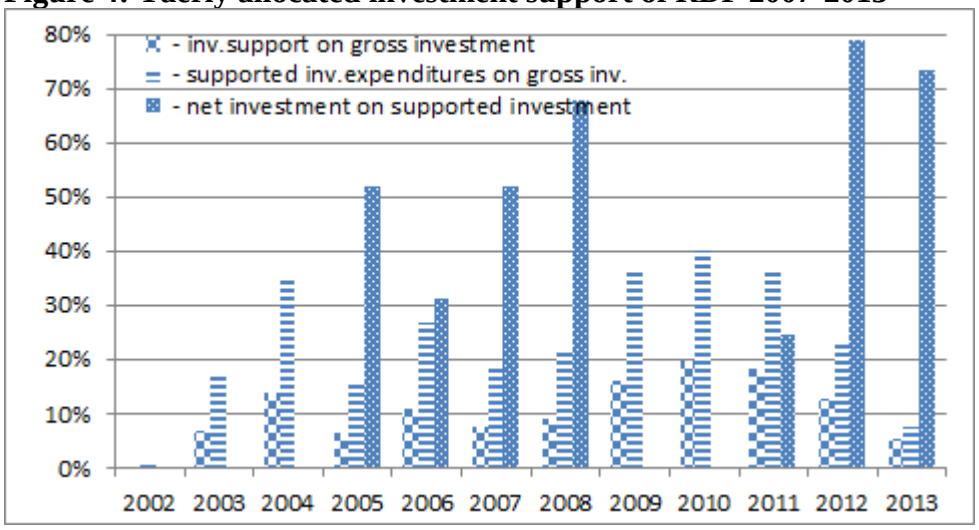
Returning to Figure 3, it is evident that investment support might have stimulated investment over the reproduction of capital since 2005 with exception of 2009 and 2010 when it helps turn off deep decreasing in investment which could come on without this support. Given that in the best four years, net investment constitutes from 50% till 80% of supported investments, we can conclude there was little additionality achieved by the policy.

From the sectoral point of view, most of the support to farm modernization (M121) was directed to the livestock production; in terms of project numbers it was 75.6% and in terms of funds 76.9% in the period 2007-2013. This bias against the livestock sector follows directly from the policy preferences. Other policy preferences realised through preferential

[3] *Special Accession Programme for Rural Development*

criteria were the less favoured areas (LFA). If the project was realised in LFA, then the share of investment support on the total investment expenditures increased by 10%. Projects in LFA acquired 57% of the total volume of the support in M121, but the shares on total support differ between the groups of projects oriented on the livestock production (66% for projects in LFA) and on the crop production (only 26% for projects in LFA).

Figure 4: Yaerly allocated investment support of RDP 2007-2013



Source: Database of applications for payment according to measures from MoA, own calculations

Young farmers who received additional 10 percentage points of the support constituted 29% of all support in M121. Young farmers participated rather in projects for crop production (48% of support volume) than for animal production (23%).

These preferential criteria with different rates of support lead to some variation of the resulted rates of support among farming systems (see Table 2).

Table 2: Average support rate for different farming system in the measure 121

Code	Measure (farm type)	Rate of support
121	**Modernisation of agricultural holdings**	37,1%
121	Field Crops	38,9%
121	Milk (grazng livestock)	46,1%
121	Beef Cattle (grazng livestock)	36,7%
121	Mixed crop livestock	40,4%
121	Granivores	35,8%
121	Rest	38,2%

Source: Database of applications for payment according to measures from MoA, own calculations

4. Results

In the paper we concentrate only on the effects of all investment measures and on the effect of the measure 121 – Modernisation of agricultural holdings. The data allows us investigating the effects of the RDP investment support up to 2012 in FADN and up to 2013 in the Albertina data set.

Structural variables

Using factor analysis we identified factors and to them closely correlated groups of variables representing the size of the holding, profitability, tendency to extensive pastoral farming, long term profitability, farming intensity, capital intensity of farming, farming in other and specific LFA, indebtedness, the level of profit and the previous support to investment (investment support history). The chosen corresponding structural variables are given in Table 3. They are usually if not the most correlated with the factors then the second or the third most correlated with which we had good experience in the previous research.

Table 3 Structural variables (Albertina sample)

Factor	Selected structural variable
Size	Revenue
Profitability	EBIT/Sales ratio
Tendency to Extensive farming	LFA - mountain payments
Long Term Profitability	Long term profit/Total assets
Intensity of farming	Livestock density (per UAA)
Capital intensity of farming	Total assets/UAA ratio
Farming in other and specific LFA	Area in LFA-other than mountain
Indebtedness	Total liabilities/Total assets ratio
The level of profit	EBIT
Being supported in the previous period	Participation in the OP 2004-2006

Source: own selection

Using probit regression we test to which extent the above structural variables determine the participation in the investment measures of the RDP 2007-2013. We consider eight participation (treatment) variables: four of them referring to the all investment supports and four referring to the support to the modernisation of agricultural holdings (M121). In the both groups of measures, the four treatment variables refer to the year up to which we consider participation, i.e. 2007-2010, 2007-2011, 2007-2012 and 2013. Because we do not include farms which got any support later, the number of controls stays the same for either measure while the numbers of participating (treated) farms differ and increase with time. The participation in the Operational Programme for Agriculture and Forestry OP 2004-2006 appears highly correlated with the participation in the investment support measures of the RDP 2007-2013. In turns it means that the same farms applied and got the investment support in the both programming periods (we can also show that a lot of the farms got more than one support in the RDP 2007-2013. However, this variable has appeared to cause problem of balancing in the calculation of the propensity scores, and hence it was taken out of the list of structural variables. The coefficients and the significance of the structural variables is presented in Table 4 (Total Investment Support) and Table 5(M121) in Appendix. .

The size of the holding (represented by Revenue), the unfavourable natural conditions (i.e. being in LFA), livestock (dairy) production intensity and capital intensity contribute positively to the probability of farm participation in the investment support measures (and are significant (at α=0.05) at least in the model for "Total Investment Support"). It corresponds to the programme preferences to LFA and the dairy production (as mentioned earlier), on one hand, and to the unfortunate fact that bigger and capital intensive farms have better access to the programme, on the other hand. Overall indebtedness of a farm decreases the probability of farm participation in the investment support measures.

The same on structural variables and their significance holds more or less for the FADN sample and we are not reporting it here in details.

The effects of the investment support over time

There is a range of indicators considered to measure the effect of the investment support: the expansion of the production represented by Revenue, improved production efficiency measured by GVA, Cost/ Revenue Ratio, improved productivity using Profit/Labour Cost ratio, CF/ Labour Cost ratio, Revenue/Total Assets ratio and total factor productivity, improved profitability and capital return, and a mobilisation of the external resources represented Bank credit indebtedness. All these indicators are assessed in d-i-d terms (thus these should be net effects with eliminated discrepancies between the treated and controls at the beginning of the assessment period (2007). In this paragraph we will concentrate only on four of the above indicators: Revenue, GVA, Capital Return (Net operational surplus/Operational Capital[4]) and Long term Bank Credit Indebtedness. Also we will show and discuss results only for Mahalanobis metric matching, mainly because for being able to have a robust estimation of the standard errors and thus to have a credible assessment of the significance of the effects. The development of these indicators for the total investment supports over time is presented in Figure 5. Note that Ys denotes the end year of the investment support period and Yo denotes the year of measuring the effects.

The investment support leads to the increase of revenue in the consequent years (starting with the end year of the investment support period), with the exception of the year 2011 following the investment period 2007-2010. We can see increasing marginal effect (in respect to time) following the investment period 2007-2010, while for the other two periods (2007-2011 and 2007-2012) the marginal effect is decreasing. The difference in pattern of the revenue effects might indicate that the farms receiving support in 2011 and 2012 expanded the revenue more than the farms investing in the first considered period; or there might be methodological issues. Concerning the former, it can well be that some effects were achieved after a complementary investment was made, since a number of supported in the period 2007-2010 farms got an additional support in the following years (2011 and 2012).

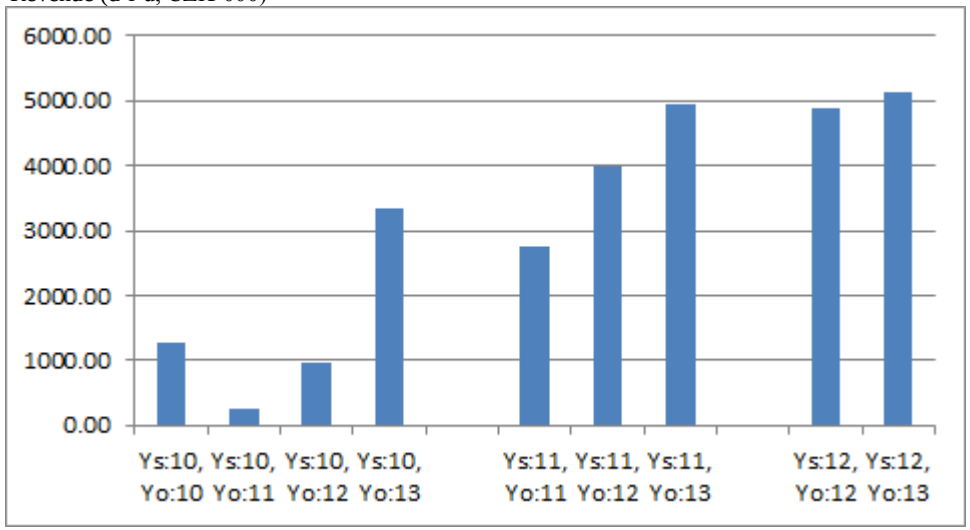
Concerning the second indicator, the farms managed to improve value added (GVA), but the effect (att) does not improve over time (the change is mixed, up and down, in the end not better than in the initial year). The comparison of the development of the indicators of Revenue and GVA suggests that the supported farms increased gradually the production while they managed to improve their efficiency (i.e. also to decrease the costs) only immediately with launching the investment object and not afterwards. Also, it is worth to stress that the atts for Revenue and GVA are insignificant at α=0.05 for the first investment period (2007-2010) and the standard errors increase over time; in turn it means that the individual effects are very variable, negative and positive.

The average effects (att) of Capital Return are moderate for years 2010 to 2012 and large in 2013. Actually, the positive atts are given by the deterioration of the Capital Returns on control farms while Capital Return on the supported farms more or less stagnated. Surprisingly, the large atts for year 2013 are insignificant (at α=0.1). Thus the variability of individual Capital Return effects of the investment support is very high.

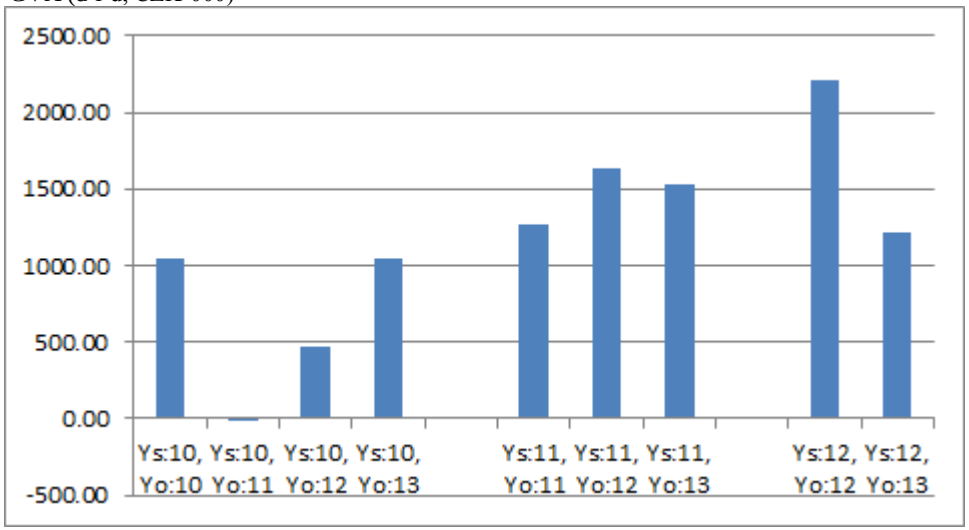
[4] Operational capital = Intermediate consumption + Labour cost + Depreciation

Figure 5 Investment effects (att) over time (Mahalanobis metric matching)

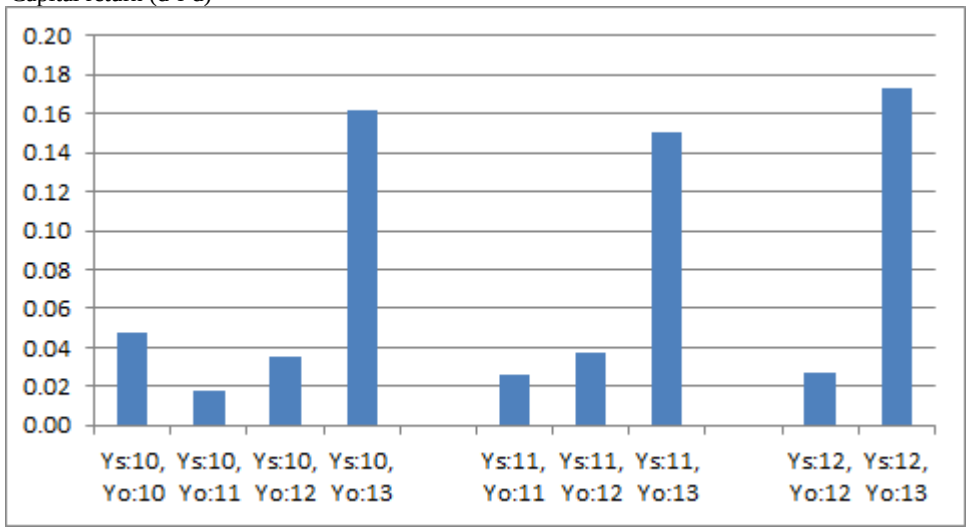
Revenue (d-i-d, CZK'000)



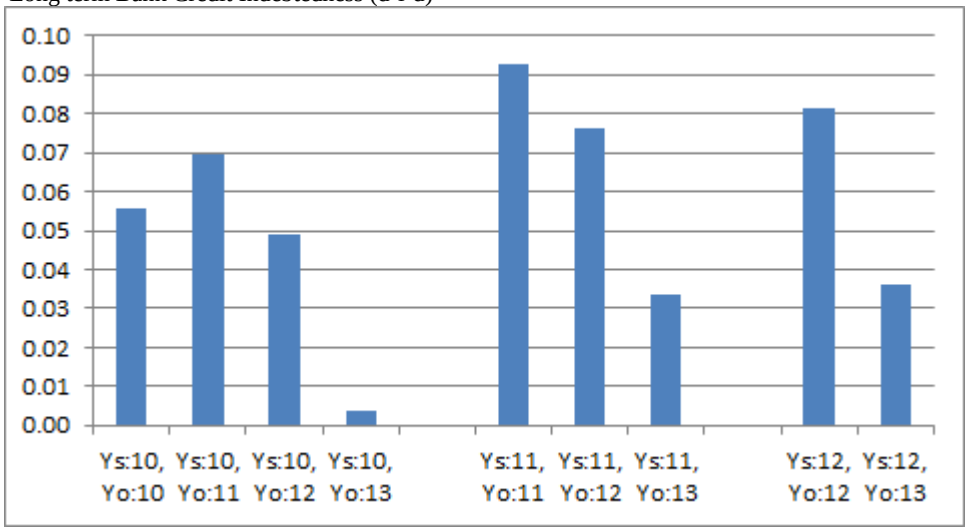
GVA (d-i-d, CZK'000)



Capital return (d-i-d)



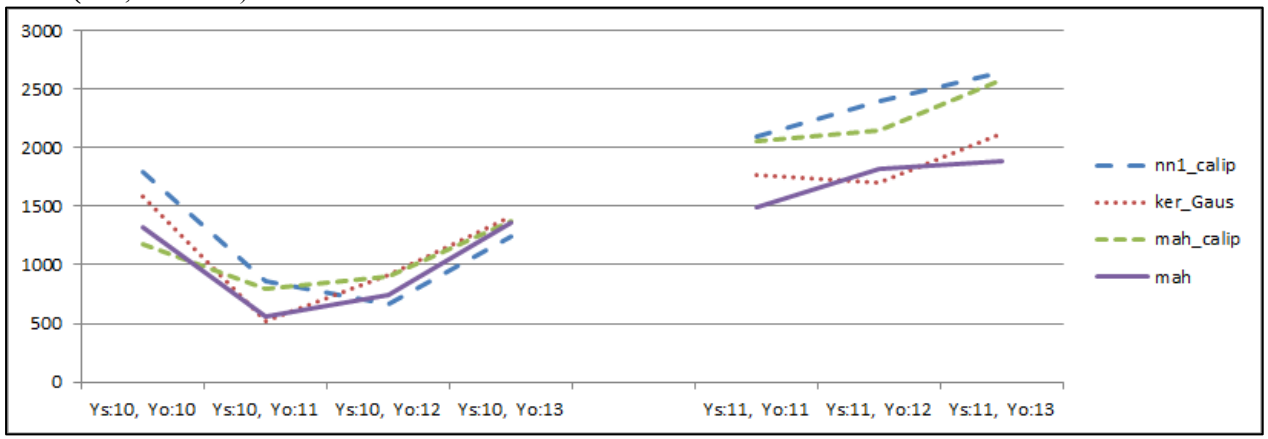
Long term Bank Credit Indebtedness (d-i-d)



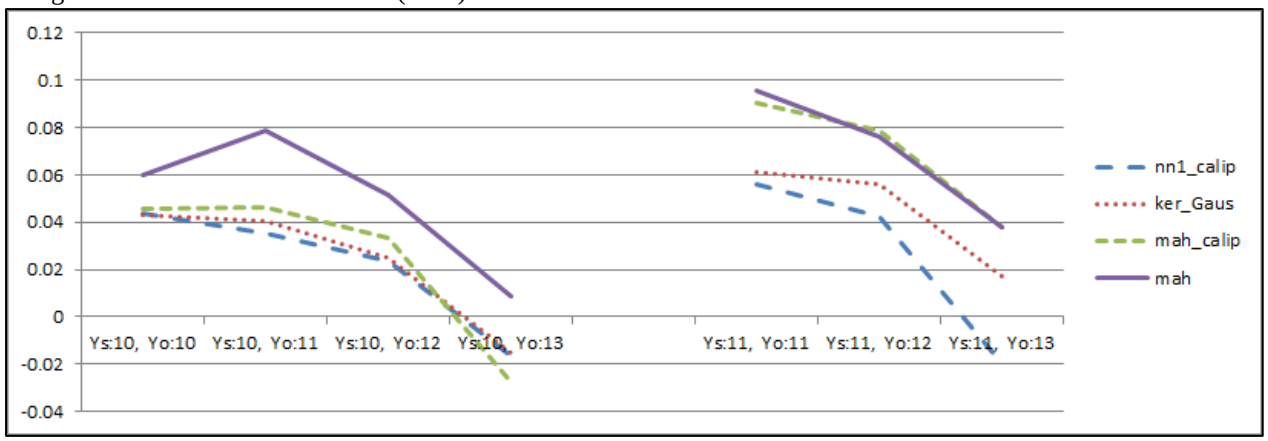
Source: own calculation

Figure 6 Comparison of matching methods (att)

GVA (d-id, CZK'000)



Long term bank credit indebtedness (d-i-d)



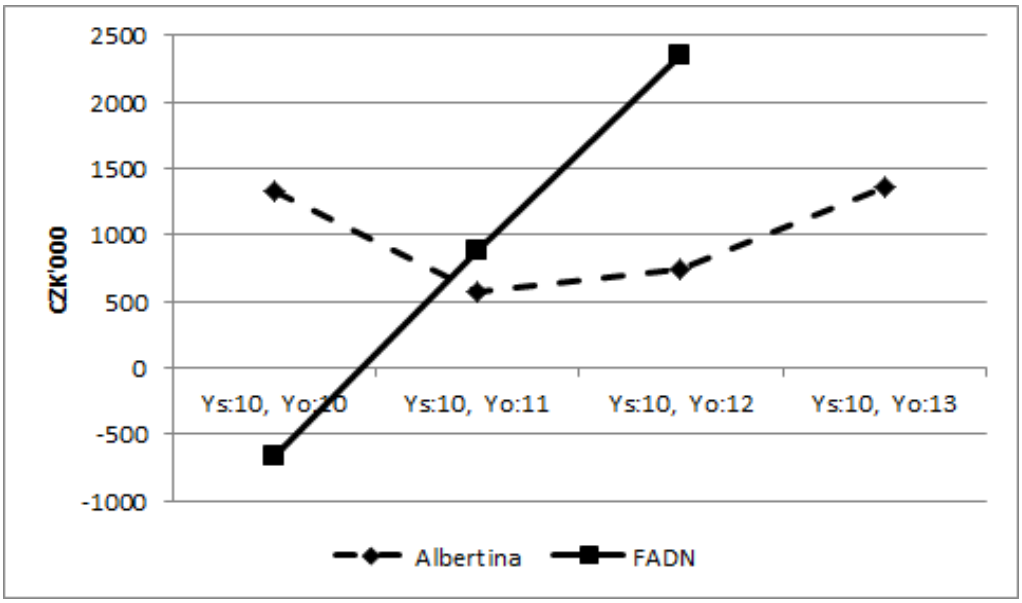
Source: own calculation

The chart in the right-down corner illustrates the development of bank credit indebtedness, which is interpreted as a mobilisation of the external (bank) capital. The indebtedness decline quite markedly after 2011. There are two explanations for it: the first one is technical: the farms pre-finance the investment with commercial credits, which later is significantly reduced after completing the project when the re-payment from the RDP programme is delivered to the account of the participating farm; the second explanation rests in the fact that interest rates continuously declined since 2010. It can be showed that the matched control increased their long term bank credit indebtedness during 2011-2013 which in turn means that they invested using commercial cheap credits.

The other effect indicators are insignificant i.e. their variance is very high, nevertheless they exhibit correct signs, but most of them indicate diminishing effects; it means the highest improvement of e.g. TFP or cost/revenue ratio is in the first year of the evaluation period while in 2013 the respective att is very small.

Looking at Figure 7 we yield completely different pictures of the dynamics of GVA effects (att) for the measure M121 from the FADN and Albertina samples. From the initially negative value, att calculated upon the FADN sample increases linearly in the 2011 and 2012, while the effects obtained from the Albertina sample stagnate. It is highly difficult to provide explanation for such a difference. On one hand, Albertina is much bigger sample and more homogenous (only legal entities and thus large farms) than FADN. In this context, due the requirements on not participating in the investment support programmes in the consequent years after the investment support period for all investigated farms, the FADN sample is reduced significantly limiting the possibility to find truly similar controls (see Section 5). On the other hand, the FADN results correspond to our theoretical expectations that the effects are pronounced in the few next years.

Figure 7 A comparison of GVA effects (att) and their development after the completion of the supported investments in the Albertina and FADN samples (M121)



Source: own calculations

Comparison of matching methods

It seems that a particular difficulty of the matching approach is to find sufficiently similar farms. We used two alternative methods based on propensity score matching (nearest neighbour with caliper and Gausian kernel matching) and a stricter Mahalanobis matching by introducing caliper (constraining the maximum allowed distance). Generally, the methods provide a picture of very similar trends of effects, but the levels differ often substantially. The comparison of the effects (att) for GVA and Long term bank credit indebtedness is given in Figure 6. The selected two indicators illustrate the difficulty in finding the right measurement of similarity. In the case of GVA, the imposed control on the closeness of the treated and control farms yields difference in the effects (att) while in the case of the mobilisation of external capital (indebtedness) the effects are differentiated by the methods (propensity score and Mahalanobis metric matching). This holds particularly for the investment support period 2007-2011; for the first period the methods perform more similarly for these two indicators.

Concerning the other performance indicators, the picture is mixed, sometimes the methods perform similarly sometimes the differences are tremendous. It is worth to note that the effects (att) are mostly insignificant for these performance indicators..

Introducing caliper to the Mahalanobis metric matching appears to have different consequences for the investment support periods (Table 6). For the support period 2007-2010, the average treatment effects on treated (att) of Revenue and Long term bank credit indebtedness decline and often loose significance when introducing caliper, while for the support period 2007-2011 the effects increase and the significance is maintained. The GVA exhibits increasing effects (att) when introducing a caliper.

5. Discussion

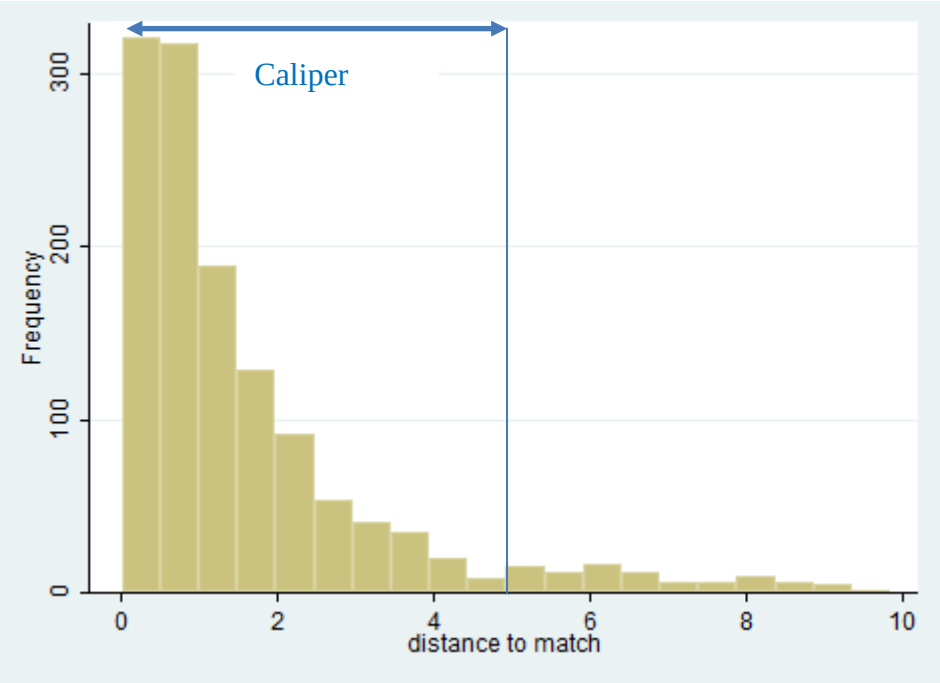
One issue concerning the effects rests in the similarity of treated and control farms at the initial year (2007) in terms of the "effect" variables. It is particularly important for indicators which relate to the size of the farms like Revenue or GVA. It can be shown that the treated and the matched controls differ in size (revenue and GVA) by 14% and 18% respectively (controls are on average smaller) for the "Total investment support" and for M121. The presented percentages are the averages over time of the relative differences if the absolute values of atts calculated for each investment period (treatment variables) and the effect indicator in 2007 divided by the average value of the effect indicator in 2007[5]. Relative indicators like Cost/revenue ratio, Capital return and Bank credit indebtedness exhibit very small difference between the treated and the matched controls (<4%)

Our requirement is that farms should be similar in all available dimensions of their characteristics. However, it is not always the case. The Mahalanobis distance between the treated farms, and the matched control ranges from 0.11 to 931. Such a disperse might lead to the estimated effects (att) which are given by a low similarity of farms and/or to a high standard error which in turn undermines the significance of the effects. The distribution of distances is given in Figure 8. It is clear that the distance is small for the majority of the matched pairs (farms are concentrated to the left, <4), but that there are also quite a few farms with a pretty large distance. Introducing a caliper we cut off the farms with the distance bigger than a certain threshold. In our case the caliper is 5 (Figure 8) that cut off possible problemtic matches but we do not reduce the sample too much i.e. that we still have a sufficient number of pairs to provide good statistics, particularly if we split the sample according to soil-climatic

[5] In the other words we run matching procedures for each treatment variable (i.e. for 2010 to 2013) and the effect variable of 2007 and then we averaged the obtained att in absolute values.

conditions or production orientation[6]. From this perspective, Mahalanobis matric matching with the caliper provides more credible assessment of the effects of the investment support. The same holds for calipper applied to nearest neighbour propensity score matching. It can be supported by finding of Lunt (2013) that a tighter caliper led to greatly reduced bias and closer matches, although some subjects could not be matched. Lunt suggests that a narrow caliper can improve the performance of propensity score matching.

Figure 8 Distribution of the matching distance (Mahalanobis metric)



Source: own calculation

Our hypothesis is that the samples (FADN and Albertina) differ in the capacity to provide sufficiently close counterfactuals to each investment support measure participant, which can realistically be considered as the supported farm itself. Moreover, the closeness of farms depends on the considered dimensions of similarity given either by the subjective selection of structural characteristics or by the limits of the sample i.e. the surveys differ in the number and the nature of collected variables. In this respect it was essential that Albertina was extended of variables offering to capture land use, farm production orientation (crop, intensive livestock and extensive livestock) and soil-climatic conditions (LFA, non LFA). The problem of FADN is that if we impose the requirement that the farms did not received the support before 2007 and after 2010 the number of treated drops to 51 and controls to 373 of which 278 are rather small individual farms, while 90% of supported are farming companies (legal entities).

Our analysis show that the effects differ for different periods of considered supports (2007-2010, 2007-2011, 2007-2012). They differ in the dynamic patterns, the levels of effects and according to the methods. The main explanation rests in the nature of the group of participating farms (treated). On one hand we have more participating farms on the other hand the already treated farms received additional support. On the side of participants we have earlier and recent investments, the earlier one might already be over the maximum of attained

[6] Splitting the sample is not presented in this paper

benefit. To address this issue we might restrict the investment period to maximum of three years, we might limit our focus only on farms which invested once or twice in the period, or which investment support was of a certain size. It might help to allocate better the effects to investments, but we might be exposed to the problem of reduced sample with a small number of treated and control farms.

6. Conclusions

Our analyses show that there are significant effects of the investment support measures of the RDP 2007-2013 in terms of production expansion and GVA improvement. We can also suppose that the support mobilise additional financial sources of banks. It is also evident that effects tend to decline already shortly (one or two years) after the project is completed and the investment object introduced in the production. These are important messages for policy makers who work on new investment support schemes.

We have also showed that there are some methodological and data problems which affect the credibility of results: different samples, different considered periods of support and terms of measuring the effects, and different methods might provide slightly or more substantially different results. Understanding these differences and developing approaches how to overcome them is a challenge for the further research.

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Appendix

Table 4 Probit analysis (participation in any investment measure)

factors of 2007\year	coef. 2010	sig.	coef. 2011	sig.	coef. 2012	sig.	coef. 2013	sig.
Revenue	3.75E-06	**	5.01E-06	**	6.22E-06	***	6.36E-06	***
Profit/Sales ratio	0.020576		0.005378		0.000591		0.001321	
LFA - mountain payments	5.27E-07	*	5.87E-07	**	7.38E-07	***	7.2E-07	***
Long term profitability	0.115816		0.173394		0.187639		0.201144	
Livestock density (per UAA)	0.980939	***	1.067644	***	1.11731	***	1.202259	***
Assets/UAA ratio	0.000122	***	0.00023		0.000153		0.000193	
Area in LFA-other than mountain	0.000235	***	0.000283	***	0.000286	***	0.000285	***
Indebtedness	-0.4229	**	-0.35031	**	-0.29104	*	-0.21035	
EBIT	9.51E-06		9.99E-06		8.43E-06		9.05E-06	

Source: own calculation

Table 5 Probit analysis (participation in M121, Modernisation of agricultural holdings)

factors of 2007\year	coef. 2010	sig.	coef. 2011	sig.	coef. 2012	sig.	coef. 2013	sig.
Revenue	4.31E-06	**	5.75E-06	***	6.46E-06	***	6.76E-06	***
Profit/Sales ratio	0.018571		0.00061		-0.00247		-0.0086	
LFA - mountain payments	6.07E-07	**	8.37E-07	***	8.9E-07	***	8.95E-07	***
Long term profitability	-0.04708		0.050058		0.095422		0.114676	
Livestock density (per UAA)	0.378011	*	0.138532		0.194377		0.223023	*
Assets/UAA ratio	-0.0016	*	-0.0006		-0.00083		-0.00095	*
Area in LFA-other than mountain	0.000278	***	0.000353	***	0.000328	***	0.000335	***
Indebtedness	-0.59504	***	-0.5432	***	-0.48206	***	-0.39352	**
EBIT	3.94E-06		-1.9E-07		2.1E-07		9.9E-07	

Source: own calculation

Table 6 Results of Mahalanobis metric matching – significance of effect indicators

M121 - modernisation	mah Ys:10, Yo:10		mah_calip Ys:10, Yo:10		mah Ys:10, Yo:11		mah_calip Ys:10, Yo:11		mah Ys:10, Yo:12		mah_calip Ys:10, Yo:12		mah Ys:10, Yo:13		mah_calip Ys:10, Yo:13	
	att	sig.	att	sig.	att	sig.	att	sig.	Att	sig.	att	sig.	att	sig.	att	sig.
Revenue (CZK'000)	2718	**	1478		1736		1355		2357		1554		3931	*	3067	
GVA (CZK'000)	1326	*	1183		565		795		746		898		1363		1375	
Cost Benefit Ratio	-0.01		-0.01		0.00		-0.07		-0.01		-0.02		0.00		0.00	
Prof/Lab. Cost	-0.19		0.03		-0.38		0.05		0.02		0.07		-0.16		0.01	
CF/ Lab. Cost	0.36		0.11	*	-0.17		0.10		0.15		0.12		-0.10		0.08	
Profitability	0.01	*	0.01	*	0.00		0.01		0.01		0.01		0.01		0.01	
Reven/assets	0.01		0.01		-0.01		0.01		0.02		0.00		0.03	**	0.02	
Performance 1	0.04		0.01		0.01		-0.01		0.05		0.02		-0.14		0.00	
Capital Return	0.05	***	0.04		0.01		-0.01		0.03	**	0.02		0.30		0.00	
ln(TFP) cross	0.05	**	0.02		0.01		0.00		0.02		0.01		0.02		-0.01	
Bank Credit 1	0.04	***	0.03	***	0.03	***	0.02		0.02	*	0.01		0.00		-0.02	
Longt. Bank Credit	0.06	***	0.05	*	0.08	***	0.05	*	0.05	***	0.03		0.01		-0.03	

M121 - modernisation	mah Ys:11, Yo:11		mah_calip Ys:11, Yo:11		mah Ys:11, Yo:12		mah_calip Ys:11, Yo:12		mah Ys:11, Yo:13		mah_calip Ys:11, Yo:13	
	att	sig.	att	sig.	att	sig.	att	sig.	Att	sig.	att	sig.
Revenue (CZK'000)	3408	**	4679	**	4524	**	4884	**	5254	***	5794	**
GVA (CZK'000)	1492	**	2056	**	1815	**	2146	**	1891	**	2581	**
Cost Benefit Ratio	-0.01		-0.04		-0.01		-0.01		0.00		-0.01	
Prof/Lab. Cost	-0.11		0.03		-0.10		0.03		-0.12		0.05	
CF/ Lab. Cost	0.16		0.06		0.09		0.05		0.06		0.10	
Profitability	0.00		0.00		0.01		0.01		0.01		0.01	
Reven/assets	-0.01		0.00		0.01		0.00		0.02		0.02	
Performance 1	0.09		0.04		0.05	*	0.04		-0.13		0.03	
Capital Return	0.02		0.02		0.03	***	0.04	**	0.27		0.03	
ln(TFP) cross	0.01		0.02		0.02		0.02		0.02		0.01	
Bank Credit 1	0.05	***	0.04	***	0.04	***	0.04	***	0.02	*	0.01	
Longt. Bank Credit	0.10	***	0.09	***	0.08	***	0.08	***	0.04	*	0.04	

Note: mah – Mahalanobis metric matching using nnmatch procedure in STATA (Abadie et al, 2004)..
mah_calip - Mahalanobis metric matching using psamatch2 procedure in STATA (Leuven and Sianesi, 2003)
Source: own calculation