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The Assessment of the Effects of Investment Support Measures of the Rural Development Programmes: the Case of the Czech Republic

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Anotace

Investiční podpory jsou považovány za principiální nástroj pro posilování konkurenceschopnosti českého zemědělství od prvních let ekonomické transformace. Doposavad byla věnována malá pozornost hodnocení současných efektů odpovídajících dotačních programů. Cílem příspěvku je tedy zhodnotit ekonomické a další efekty vyplývající z opatření 121 „Modernizace zemědělských podniků“ v rámci Plánu rozvoje venkova na období 2007-2013 na případu českých zemědělských podniků. Byl uplatněn přístup kontrafaktuální analýzy za účelem vyhodnocení situace, která by nastala, kdyby se podpořené podniky neúčastnily v programu, což je ilustrováno na výsledkových indikátorech. Kvantitativní analýza přínosů programu je doplněna o kvalitativní výzkum na případu 20 podniků, které obdržely investiční podporu mezi roky 2008 a 2010. Kvantitativní analýza potvrzuje významné přínosy investiční podpory v případě rozvoje podnikání (měřeno hrubou přidanou hodnotou) a zlepšením produktivity práce. Tyto výsledky jsou potvrzeny i kvalitativním výzkumem. V příspěvku je také diskutována otázka tzv. mrtvé váhy investičních dotací: údaje o velmi nízké úrovni čistých investic vyjádřené relativně k poskytované podpoře na sektorové úrovni a odpovědi respondentů naznačují možný významný efekt mrtvé váhy.

Klíčová slova

Investiční podpora, kontrafaktuální analýza, propensity score matching, přímé a nepřímé efekty.

Abstract

Investment support has been considered a principal vehicle for enhancing the competitiveness of Czech agriculture since the early days of economic transition. However, thus far, little attention has been paid evaluating the actual effects of corresponding support programmes. The objective of this paper is to assess economic and other effects of Measure 121 “Modernisation of Agricultural Holdings,” of the Rural Development Programme (RDP) 2007-2013 on Czech farms. The counterfactual approach is adopted to investigate what would have happened if the supported producers had not participated in the programme; the resulting indicators are than compared. The quantitative analysis of programme effects is complemented by a qualitative survey on 20 farms that received investment support between 2008 and 2010. The quantitative assessment showed significant benefits of investment support in terms of business expansion (Gross Value Added) and productivity (GVA/labour costs) improvements. These results were confirmed by the qualitative survey. Finally, the issue of deadweight as related to investment support is discussed: the figures on very low net investment relative to the provided public support at the sector level, as well as answers of respondents both indicate possible significant deadweight.

The presented results refer to the research carried out in the two projects – “Multifunctional agriculture for the benefit of society and rural development“(MZe RO0911) conducted by Institute of Agricultural Economics and Information“ and “ The Czech Republic in the European Research Area” (MŠMT LM2010010) conducted by Technology Centre ASCR.

Key words

Investment support, counterfactual analysis, propensity score matching, direct and indirect effects.

Introduction

The paper´s objective is to assess the economic and other effects of Measure 121 "Modernisation of Agricultural Holdings" of the Rural Development Programme (RDP) 2007-2013 as well as the Operational Program - Agriculture (OP), 2004-2006 on Czech farms.

Investment support has been considered a principal vehicle for enhancing the competitiveness of Czech agriculture since the beginning of economic transition (Janda and Ratinger, 1997; Medonos 2007). However, thus far little attention has been paid to evaluating the actual effects of corresponding support programmes. In the 1990s, success of the interest subsidies for investment credits was justified practically only by the high participation rate and the "improved" level of the sector´s gross fixed capital formation (Trzeciak-Duval, 2003, Janda, 2006, Čechura, 2008). The need for a more rigorous assessment arrived with EU development programmes: SAPARD, OP Agriculture and RDP 2007-2013. The considered quantitative indicators for programme assessment are stated in the Common Evaluation a Monitoring Framework (CMEF) (EC 2006; Bradley et al. 2010). These indicators are structured according to the intervention logic concept in input, output, result and impact indicators (Dwyer et al. 2008).

There are two serious problems with CMEF and the EU evaluation guidelines which eventually might lead to incorrect conclusions on regarding success of the programme: i) it is impossible to associate the result and impact indicators (as GVA/GDP) only with policy intervention, since there are a number of other factors and circumstances affecting the results; ii) usually, policy measures either target or are exploited by only some groups of producers/regions, etc., which makes simple comparisons between supported and non-supported groups methodologically problematic (Michalek, 2007, Psaltopoulos et al. 2011). To deal with these shortcomings we adopted a counterfactual approach to investigating what would have happened if the supported producers had not participated in the programme and we then compared the result indicators (Khandaker et al. 2010). Since it is impossible to observe the effects of participation and non-participation in the measure on the same farm, one has to choose or to construct a control farm with identical characteristics from the pool of non-participating producers. To do this we follow a propensity score matching approach (Caliendo and Kopeinig, 2005; Pufahl and Weiss, 2009).

The paper is structured as follows. In the next section we will review the investment support policy of the Czech Republic. Section 3 is devoted to the adopted methodology and in Section 4 we present the quantitative assessment results. To gain an understanding of the actual investment projects and to learn about their effects on farmers, as well as about problems with their implementation, we carried out 20 case studies; they are described in Section 5. Afterwards, both results are compared and conclusions are drawn (Section 6).

Investment support

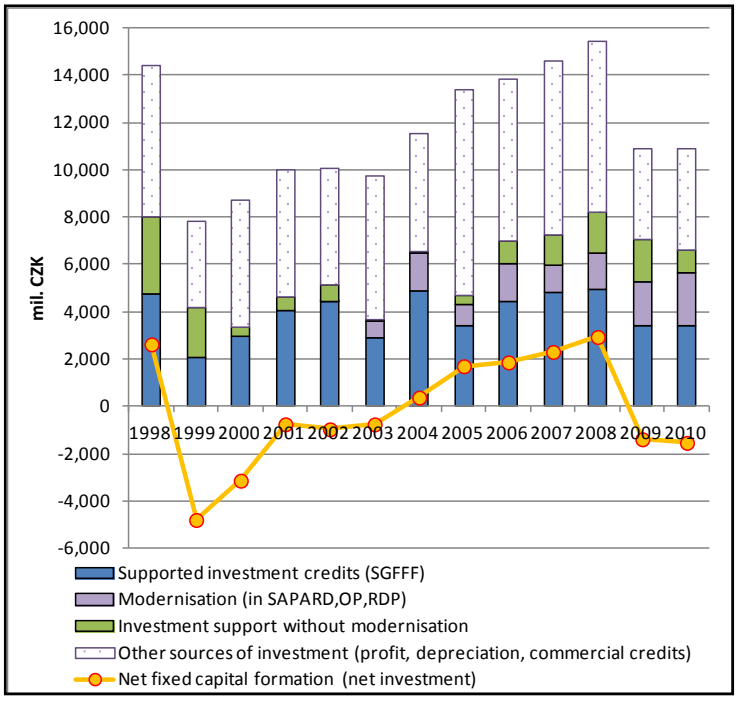
From the beginning of agricultural transition it was clear that there farm had insufficient funds to assure the sector´s prompt recovery. In the early 1990s, the Czech government provided generous investment grants mainly to emerging family farms. Later, the policy concentrated on improving farm´ access to credits by providing interest subsidies and guarantees. The latter addressed the problem of lacking collateral; most of the assets were of doubtful value if the sector declined, while land was owned by external restituents or by the state (Janda and Ratinger 1997). The interest rate subsidy was a principal investment support measure until EU accession, but remains ongoing.

Gross fixed capital formation (GFCF) is a basic indicator of investment activity in the economic accounts for agriculture. Indeed, GFCF the agricultural sector has varied substantially in absolute and relative[1] terms over the last decade (Figure 1). It can also be seen from Figure 1 that agricultural GFCF is correlated with credit support of the Support and Guarantee Fund for Farms and Forestry (SGFFF) at least until 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 reflects the sector´s and the overall economic situation: post-privatisation stabilisation in the late-1990s, accession expectations[2] from 2001-2003 and the recent financial crisis of 2008-2009.

New impulses for investment activity have gradually accompanied EU accession: new market

[1] With respect to total GFCF.

[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.



Source: CzSO (EAA), PGRLF, SZIF

Figure 1: Investment activity in agriculture 1998-2010.

opportunities resulting from joining the common market, financial stabilisation of farms given by increasing direct payments, and finally, investment grants provided by the rural development programme.

According to Bašek et al. (2010) integration in the common market can be seen as a driving factor of markedly increasing farm specialisation: growing specialisation in field crops can be observed in good soil and climatic conditions. The growing concentration of dairy cow herds can also be noticed - not necessarily in specialised dairy farms, which are usually a mixed production system. However, dairy units are large and usually one of the main enterprises on the farm. Pig production has lessened on common farms and nowadays is concentrated in large specialised pig production companies; overall pork production declined continuously and dramatically over the last decade. In contrast, beef cattle saw increases in mountainous and sub-mountainous grasslands. However, these are truly a product of the policy; market opportunities merelydetermine the intensity. This specialisation trend has also been reflected in investment activities.

Direct payments have stabilised farm income. As a consequence, direct payments enabled corporate farms to pay off their restitution liabilities. Thus, they improved the financial credibility of family and corporate farms vis-à-vis banks and input suppliers. They are also likely behind the increased investment activities between 2004 and 2008 (see Figure 1). We can see that during this period, farms invested above the reproductiontreshold (net investment – yellow line in Figure 1), while in most other years capital stocks declined.

Investment grants returned with SAPARD[3], but funds were rather limited. Since EU accession they have become the main form of investment support; from 2004-2006, investment support was included in the Operational Programme for Agriculture, in the current period, it is the main tool of Axis 1 of the Rural Development Programme (measures 121, 123, and 124). While measure 121 (Modernisation of agricultural holdings) has attracted farmers to the extent that its budget has twice been increased; the other two measures 123 - (Adding value to agricultural and forestry products) and 124 (Cooperation for development of new products, processes and technologies in the agriculture and food sector and the forestry sector have been considered as too demanding, and their potential has somehow been hidden from farmers.

[3] Special Accession Programme for Rural Development

Returning to Figure 1 it is evident that the investment support might havestimulate investment over the reproduction of capital only in 1998, and in the period shortly after accession (2004-2008). Given that in the best of years, net investment might constitute only about one-third of supported investments (thus the rate of public co-financing) we can conclude there was no or only very little additionality achieved by the policy. In 1990, the policy´s objective was to assure the reproduction of agricultural capital. Thus, since EU accession additionality has been deemed as achieved.

Most of the investment (more than 40%) goes to machinery and equipment (post-harvest processing, milking cooling equipment etc.). Investment in buildings dropped from almost 50% in 1998 to less than 30% in recent years; farmers' investments in breeding animals account for 20 - 30 % (Figure 2). The emphasis on machinery and equipment in the investment structure might indicate that farmers are more concerned about labour productivity than about the other possible effects of modernisation through investment. Nevertheless, it would be hard to assert that the other two main directions of investment are undervalued; rather we can stress that the sector might have become saturated in terms of agricultural buildings (storages, sheds) and that breeding animals are regularly replaced.

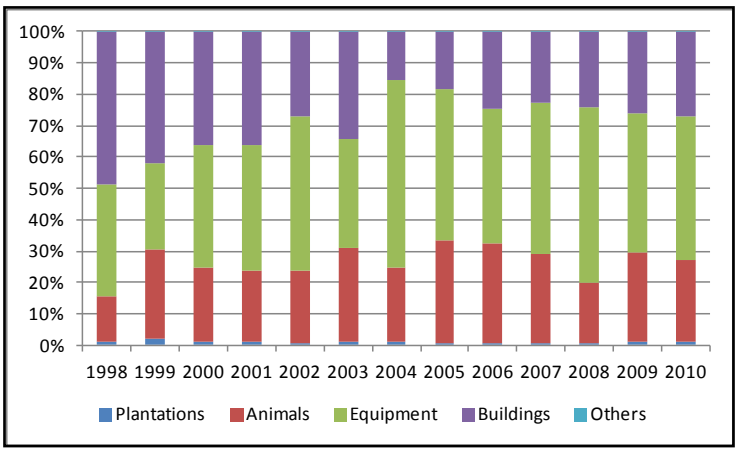
In spite of the contraction of Czech livestock production, most modernisation support went into livestock sectors, particularly dairy enterprises (2008-2010) – see Table 2. This is because there were essential needs (welfare, manure storage and treatment) and because there are significant immediate and tangible benefits from modernisation (higher yields, higher quality, reduction of (hired) labour, improved health of animals – and thus lower variable costs).

Linking investment support (of all kinds) to the performance of the agricultural sectors will provide a preliminary notion about its effect (see Figure 3).

Initially (on the left chart), there is no evident effect of the support programme on the sectoral GVA. The simple statistical analysis (linear regression in the right chart) indicates that there might be about 10% of investment support projected immediately in the agricultural GVA. However, the model is not statistically significant. Also, one should consider a delay of an investment effect. A simple shift of the effect by two or three years, however, does not lead to a significant relationship. It is evident that the sectoral approach is insufficient for assessing the investment programme.

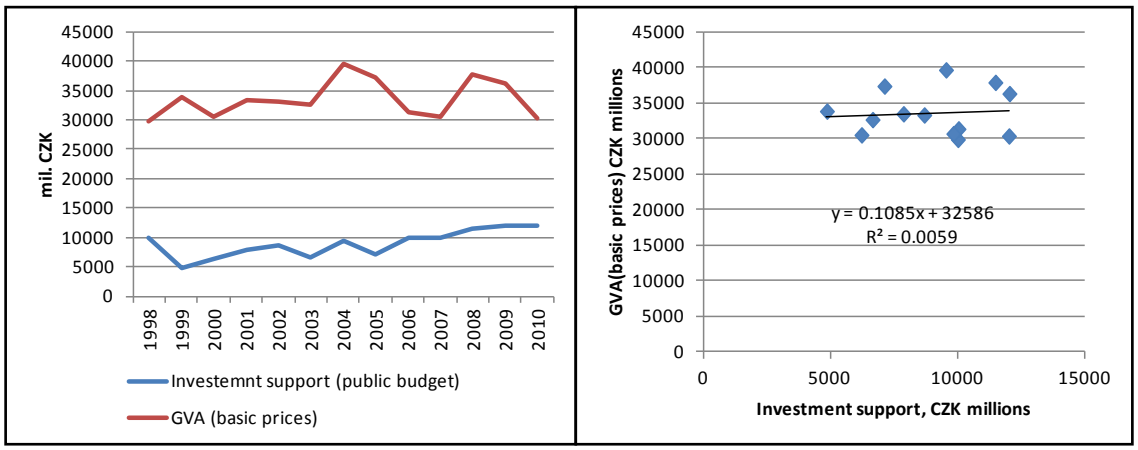
Material and methods

The above figures on the support programmes and the sectoral GVA indicate the difficulties (ambiguity) of judging the policy´s effectiveness and efficiency. Therefore, there exists a need for methods and approaches that enable the evaluator preciselx to assess the mechanisms through which beneficiaries are responding to the intervention. These mechanisms can include links through markets or improved social networks as well as tie-ins with existing policies (Khandker, et al. 2010). To prove that changes in targets are due only to the specific policies undertaken the counterfactual approach is needed (illustrated in Figure 4). The performance of farms participating in an investment



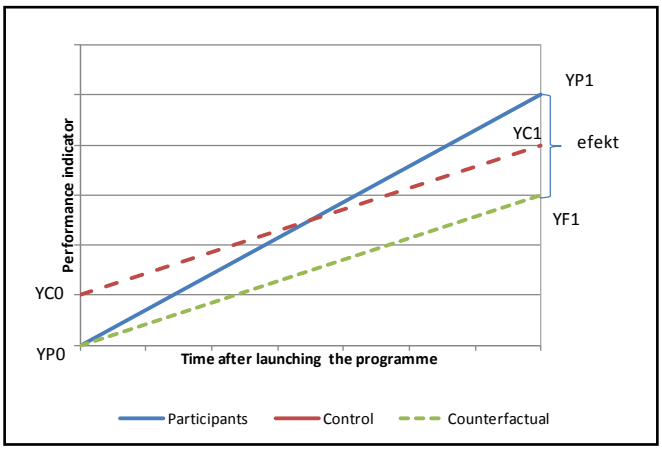
Source: CzSO (EAA)

Figure 2: Investment structure.



Source: CzSO (EAA)

Figure 3: Investment support and sectoral GVA.



Source: Khandker et al. (2010)

Figure 4: The idea of the counterfactual.

support programme (treated) improved from YP0 to YP1. The simple "before and after" comparison (YP1 – YP0) can hardly be accounted only to the programme - if there are changes in the performance independent of the programme - as witnessed by the performance of non-participating (control) farms that also changed from YC0 to YC1 over during the same period. However, the difference between YP1-YC1 does not necessarily represent a correct judgement of the effect of the programme, because it is likely that participating and non-participating groups differ in their structures and pre-programme situations (Khandeker, et al. 2010). The real effect can only be obtained if we know the counterfactual outcome YF1 i.e. what would happen if there were no programme. However, this is principally impossible hence one has to find an estimate.

The standard framework in evaluation analysis that formalises the above problem is provided by the Roy-Rubin-model (Caliendo, Kopeinig, 2005). Let Di denotes a treatment indicator which equals one if individual i receives treatment and zero otherwise. The potential outcomes are then defined as Yi(Di) for each individual i, where i = 1…N and N denotes the total population. The average treatment on the treated (ATT) effect is defined as follows:

$$\tau\_ATT=E[\tau \mid D=1]=E[Y(1) \mid D=1]-E[Y(0)|D=1] \quad (1)$$

The second term on the right-hand side of Equation (1) is the counterfactual; however, it is unobservable. Instead, we have to use E[Y(0)|D=0]. The effect of τATT is truly identified if and only if:

$$0=E[Y(0) \mid D=1]-E[Y(0)|D=0]. \quad (2)$$

The right-hand term of Equation (2) is called the self-selection bias. In non-experimental data, the condition of zero self-selection bias is usually not achievable, and statistical methods must be used

to estimate the average treatment effect on treated (τATT). In this paper we have adopted propensity-score matching (PSM).

Assume that there is a set of observable variables X that are not affected by treatment and that potential outcomes are independent of treatment assignment, i.e.:

$$Y(0), Y(1) \perp D|X, \ \forall X; \quad (3)$$

This condition is known a "unconfoundedness" or the conditional independence assumption. Let us defime the propensity score as P(D = 1|X) = P(X), i.e. the probability for an individual to participate in a treatment given his observed variables, X. The unconfoundedness condition can be rewritten as:

$$Y(0), Y(1) \perp D|P(X), \ \forall X; \quad (4)$$

as it was shown by Rosenbaum and Rubin (1983). Aside from independence, a further requirement is the common support or overlap condition:

$$0<P(D\_i=1 \mid X\_i)<1, \text{ for some i}; \quad (5)$$

which ensures that there are persons with which have positive probabilities to participate as well as to stay outside. The PSM estimator of the treatment effect on treated is then defined as

$$\tau_{ATT}^{PSM} = E_{P(X)|D=1}\{E(Y(1)|D = 1, P(X)) - E(Y(0)|D = 0, P(X))\}; \quad (6)$$

We can understand the PSM estimator of τATT as a mean difference in outcomes over the common support, appropriately weighted by participantś propensity score distribution (Caliendo, Kopeinig, 2005). From the number of methods available for construing the PSM estimator we have chosen nearest neighbour (NN) matching and kernel matching (KM).

Nearest neighbor matching is the most straightforward approach; the individual from the comparison group is chosen as a matching partner for a treated individual that is closest in terms of propensity score. One of the disadvantages of NN matching is that only a few observations from the comparison group are used to construct the counterfactual outcome of a treated individual. Kernel matching (KM) is a non-parametric matching estimator that uses weighted averages of all individuals in the control group to construct the counterfactual outcome. Following Smith and Todd (2005), the ATT effect estimator (6) can be rewritten as:

$$\tau_{ATT}^{PSM} = \frac{1}{N_T}\left[\sum_{Di=1} Y_i(1) - \sum_{Dj=0} w(i,j) Y_j(0)\right] \quad (7)$$

where N_T denotes the number of treated (participating in the programme). In the case of KM the weights w(i.j) are defined as follows:

$$w(i,j) = \frac{K\left(\frac{P(X_j)-P(X_i)}{a}\right)}{\sum_{D_k=0} K\left(\frac{P(X_k)-P(X_i)}{a}\right)}; \quad (8)$$

where *K* is a kernel function and α is a bandwidth parameter. Note that kernel-matching is analogous to regression on a constant term (Khandker et al. (2010)). The main advantage of this approach is the lower variance due to more information used. A drawback is that used observations are possibly bad matches. Therefore, good overlap is of major importance for KM.

The quantitative analysis of effects was completed through the use of 20 case studies. The qualitative survey (interviews with the farm manager) concentrated not only on the manager's subjective assessment of economic benefits from investment support but also on non-economic effects such as improved animal welfare or working conditions, the farm´s business development strategy and how the supported investment fits in, as well as motivations and information-gathering for the given investment project, the use of advisory services, and cooperation with research programs.

We used several sources of data on farm characteristics and performance: - Creditinfo database; LPIS; and data on agricultural supports published by SZIF[4]. The main source was Creditinfo, which is a database built on the annual reports of companies (large legal entities) which are obliged by the Commercial Code to publish their economic and book keeping figures. Creditinfo includes only large farms and only financial indicators. From LPIS we incorporated information on utilised agricultural area and on land use.

All calculations were done in STATA 11.

To gain insight into the process and effects of investment support, we selected 20 representative projects with respect to investment size, legal form, and type and direction of supported investment. Using this sample we conducted qualitative research aimed at business and investment strategies, the importance of the support for implementing the strategy, business environment and effects of the investment for modernisation. We created a questionnaire which included 28 questions structured in 7 blocks (Table 1). The respondents

[4] State Intervention Fund for Agriculture - the paying agency.

were asked to state their qualitative judgement on the investigated issue either on a 3 or 5 point scale[5], or by ordering pre-defined judgments or lines of reasoning.

Besides completing the questionnaire, the interview included open discussion on the implementation process, and lessons learned, and a physical observation of the investigated investment. While the questionnaire was usually completed by the top manager, during the excursion we also met other management staff and workers associated with the given investment.

Results and discussion

The analysis concentrated on Measure 121 of the current Rural Development Programme[6]. The targets of modernisation (investment directions) are summarised below in Table 2. Most of the support was directed towards the livestock sector in terms of volume (57%) as well as amount of funds (72%). This bias against the livestock sector results from the needs of applicants (see section 2) as well as from policy preferences – for example, projects for modernising livestock production received additional points in the evaluation score. The structure of applicants follows the structure of farming and its geographical distribution; livestock production is concentrated more in less favoured areas and applicants make up a similar proportion. Surprisingly, there is higher share of young farmer applicants for crop production projects than in the case of livestock production.

In the Creditinfo database we identified 844 agricultural businesses with all their economic figures for the period 2007-2010. About one-third of these businesses (291) were awarded an investment grant from the Czech RDP (Measure

5 1-poor, 3 or 5 – excellent.

6 i. e. RDP for period 2007-2013.

Block	Questions	Content
I	A	Characteristics of the project holder
II	B-G	Current and past investment strategy
III	H-L, P	Project description including motivations
IV	M-N	Preparation of the project and of the application for a support
V	O, Q-Z	The assessment of project benefits, of fulfilments of expectations, …
VI	AA	Future investment strategy
VII	BB-CC	Business environment for investment

Source: own survey

Table 1: Structure of the questionnaire for a qualitative survey.

Investment object	Completed projects	Support budget	Applicants			
	#	CZK million	Individual	Corporate	in LFA	Young
Livestock	972	2149	32%	68%	69%	20%
Buildings	593	1363	33%	67%	67%	22%
of it dairy cow sheds	122	410	40%	60%	64%	11%
Technique and technology	126	195	27%	73%	63%	14%
Storages for secondary products	105	212	21%	79%	70%	12%
Crop prodution	392	779	39%	61%	27%	32%
Buildings	266	582	43%	57%	23%	37%
Machinery and equipment	126	197	29%	71%	33%	24%
Other	21	52	38%	62%	62%	10%
Total	1385	2980	34%	66%	57%	24%

Source: SZIF

Table 2: Investment objects of measure 121 “Modernisation of agricultural holdings” 2008-2010.

121) during this period; more precisely, they were awarded between 2008 - 2010, because no project was completed in 2007[7]. We lack details about the investment directions of 291 supported farms included in the Creditinfo database; however, it is very likely that their supported modernisation follows the same pattern as those farms participating in Measure 121 (Table 2).

There are significant differences between participating and non-participating farms in the Creditinfo sample: the average utilised agricultural area of participating farms is substantially greater (1,826 ha) than tthat of non-participants (1,084 ha)[8]. In terms of assets[9], the difference is even greater: the average value of assets is more than two times higher in the sample of participants than in the sample of non-participants, and the figures per hectare are CZK 83,882 and CZK 58,518 on participating and non-participating farms respectively. This indicates that participating farms are on average not only substantially larger but also much more capital and labour intensive than non-participating farms (see Table 3 for details). On the other hand, we can show that variation in both sub-samples is quite high and among non-participants significantly higher (for example the coefficient of UAA variation[10] is 0.71 for participants and 0.82 for non-participants). In fact, this high variation is positive for matching, since we likely find similar farms in both sub-samples.

For calculating propensity scores we applied probit regressions (Gujarati, 1988) on a set of structural variables (UAA, revenue, the share of grasslands, cash flow, depreciation and credits to total assets ratio). These structural variables are commonly considered factors affecting investment and thus they are deemed as possible determinants of farm participation in the modernisation programme. The first two variables represent size of the business; the share of grasslands indicates whether a farm is located in the less favoured area (LFA); the remaining variables refer to financial sources for investment. The probit regression showed that size variables are poor insignificant determinants of participation (Table 4). Note, however, that the multicoliearity of structural variables might be behind that. The distribution of estimated propensity scores is illustrated in Figure 5; a good overlap is evident.

We tested two matching algorithms: nearest neighbour matching (in Stata attnd) and kernel matching (attk and psmatch2). In this paper we present kernel matching with the standard Gaussian kernel ($K(u) = \exp(-u^2 / 2)$), and with the standard and Mahalanobis metric (Rubin, 1980, Stata – psmatch2). That is, in Equation (8). Pj – Pi is replaced by the metric d(i,j) = (Pj – Pi) S-1(Pj – Pi), where P refers to the 2x1 vector of propensity scores and S is the pooled within-sample (2×2) covariance matrix of P based on the sub-samples of both the participating and non-participating farms. Standard errors of the average treatment effects are calculated using bootstrapping.

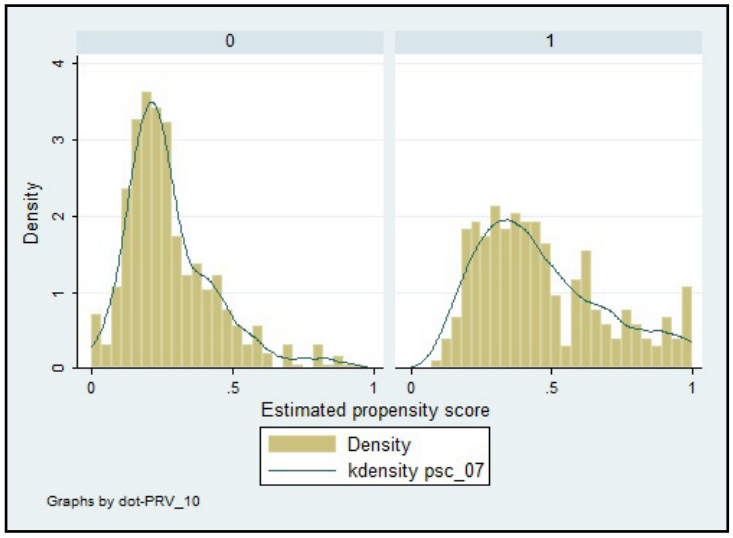
We chosen 6 performance variables (Table 5) on which we measured the results of the investment support programme. Four of these variables relate to value added and productivity in both: their state and their dynamics. In addition we examined profit and the cost/revenue ratio.

[7] We consider only completed projects.
[8] The both figures for 2010
[9] Of the balance sheet
[10] Coefficient of variation = standard error/mean

Indicator	Unit	2007		2010		Index 2010/2007	
		Participating	Non-particip.	Participating	Non-particip.	Participating	Non-particip.
Total assets	CZK '000/farm	146,633	63,082	153,188	63,405	104.5	100.5
UAA	ha/farm	1,831	1,100	1,826	1,084	99.8	98.5
The share of grasslands	%	21.2	23.7	21.8	24.2	102.8	102.0
Total assets/UAA	CZK '000/ha	80.1	57.4	83.9	58.5	104.7	102.0
Gross cash flow	CZK '000/farm	16,419	7,631	13,851	5,757	84.4	75.4
Cash Flow/UAA*	CZK '000/ha	9.0	6.9	7.6	5.3	84.6	76.6
Labour cost/UAA*	CZK '000/ha	12.0	8.9	11.2	8.5	93.9	95.5
Bank credits/total assets*	%	13.0	11.7	16.2	12.2	123.9	103.9

*weihgted average
UAA - Utilised Agricultural Area
Source: CreditInfo (2011), LPIS (2011), SZIF(2011)

Table 3: Characteristics of participating and non-participating farms in the Creditinfo sample.



Source: own calculations using STATA procedure pscore (probit regression)

Figure 5: Distribution of propensity scores of participation in the measure 121 of the Czech RDP.

dotprv_10	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
UAA_07	-8.720E-05	8.380E-05	-1.04	0.298	-0.0002514	0.000077
Grasslands_07	3.637E-01	1.955E-01	1.86	0.063	-0.0195112	0.7469707
cash_flow_07	2.230E-05	1.140E-05	1.95	0.051	-8.76E-08	0.0000447
revenue_07	2.180E-06	2.630E-06	0.83	0.407	-2.97E-06	7.34E-06
depreciation_07	7.060E-05	2.210E-05	3.19	0.001	0.0000272	0.0001141
cf/LC_07	-1.046E-01	4.799E-02	-2.18	0.029	-0.1986166	-0.0105046
credits/TA_07	2.038E-01	4.814E-01	0.42	0.672	-0.739722	1.147386
_cons	-1.045E+00	1.280E-01	-8.16	0	-1.295746	-0.7939477

Source: own calculation (STATA)

Table 4: Results of probit regression.

Acronym	Description	Applied by
GVA_	Gross Value Added	Božík et al. (2011)
GVA/LC	Productivity measured by the ratio of GVA over labour costs	
dGVA_	Change of GVA over 2007-2010	
d (GVA/LC)	Change of producivity over 2007-2010	
Profit	Profit	Michalek (2009)
Cost/rev	Cost Revenue ratio	

Source: own proposal

Table 5: List of performance (result) variables.

The effect of Measure 121 "Modernisation of agricultural holdings" based on kernel matching is summarised in Table 6. Both metric approaches provide similar results; the main difference is in significance levels. The average treatment effect differs substantially only in the case of productivity change.

With the exception of profits, all variables exhibit a significant effect of the investment support to modernisation in one or the other matching models; creation of GVA and labour productivity are significant in both models. In the case of the profit variable, the extremely high variation results in the large differences of averages between participants

	Total	Treated	Controls
Farms	837	290	547

attk (standard metric)

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat	P	sig.
GVA_10	Unmatched	21051	7173	13877				
Gross Value Added	ATT	21051	15035	6016	1275	4.717	0.000	***
GVA/LC_10	Unmatched	0.859	0.952	-0.093				
Productivity	ATT	0.859	0.636	0.223	0.066	3.403	0.001	***
dGVA_07_10	Unmatched	-5624	-3792	-1832				
Change of GVA	ATT	-5624	-7080	1457	773	1.884	0.068	*
d (GVA/LC)_07_10	Unmatched	-0.211	0.474	-0.685				
Change of productivity	ATT	-0.211	-0.273	0.062	0.086	0.714	0.309	
Profit_10	Unmatched	3060	1425	1635				
	ATT	3060	2126	934	1439	0.649	0.323	
Cost/Revenue_10	Unmatched	0.953	0.975	-0.023				
	ATT	0.953	0.984	-0.031	0.015	-2.072	0.047	*

psmatch2 (Mahalanobis metric), 837 observations

Variable	Sample	Treated	Controls	Differ.	S.E.	T-stat	P	sig.
GVA_10	Unmatched	21051	7173	13877	1218	11.39	*1.77813E-24*	
Gross Value Added	ATT	21051	14491	6560	1788	3.670	0.001	***
GVA/LC_10	Unmatched	0.859	0.952	-0.093	0.787	-0.120	0.396	
Productivity	ATT	0.859	0.644	0.215	0.114	1.880	0.068	*
dGVA_10_07	Unmatched	-5624	-3792	-1832	634	-2.890	0.006	
Change of GVA	ATT	-5624	-7063	1439	948	1.520	0.126	
d (GVA/LC)_10_07	Unmatched	-0.211	0.474	-0.685	1.318	-0.520	0.348	
Change o productivity	ATT	-0.211	-0.443	0.232	0.096	2.410	0.022	**
Profit_10	Unmatched	3060	1425	1635	889	1.84	*0.073638428*	
0	ATT	3060	1941	1119	1258	0.890	0.268	
Cost/Revenue_10	Unmatched	0.953	0.975	-0.023	0.019	-1.170	0.201	
0	ATT	0.953	0.965	-0.012	0.011	-1.100	0.217	

Treated = participating in mesure 121 of RDP
Controls= non-participating
Source: own calculation (Stata 11)

Table 6: Results of matching (attk and psmatch2 in Stata).

and constructed controls (CZK 1.1 million) to be statistically insignificant.

Case studies

The sample includes 7 individual and 13 corporate farms. All surveyed farms received support from the present rural development plan (2007-2013), which includes Measures 121 and 123. These investment projects comprised 7 farms that were oriented towards crop production, 10 farms towards animal production, and 3 farms towards food processing products. The average size of total investment expenditures of the examined projects reached 15.7 mil. CZK, with the average amount of support 4.2 mil. CZK. That is, the rate of support was 39% on average. All projects were already realised at least one year before the interview, and mostly run under full operation.

In terms of farm strategies and objectives of investment, 75% of the projects[11] were qualified by respondents as development investments, i.e.

[11] There was possibility to label more possibilities therefore sum gives more than 100%.

investments intended to increase a farm´s ability to produce and sell products or services. The remaining; 25% of projects indicated replacement investments or greater operational efficiency. Moreover, 15% of all projects were required to comply with legislative (environmental) requirements on production and 30% were realised in animal production to increase animal welfare standards.

Investments during the 5 years that were realised in the context of farm development strategies were aimed at; growth (60% of cases); quality improvement (55%); and increased specialisazion (10% of respondents focused solely on increased specialisation, and a further 15% of respondents invested in additional specialisation).

These strategies obviously result not only from market opportunities and opportunities to provide public services, but also from internal conditions. Market opportunities were identified as the most significant factors by half of the respondents, with the average score being 4.5 on a 5-point scale. On the other hand, factors indicating a surplus or absence of capacity were designated as less important (only 1/5 of the respondents indicated a lack of land (average score 2.0) or a shortage of qualified employees (average score 1.0) as the most important factors.

Most information on possible innovations was acquired by supported investors from farmer' organisations and internet sources. Both of these knowledge sources are considered as two basic levels in the present conception of knowledge transfer (KT) in agriculture[12]. Specialised advisory services (the uppermost-level of the KT system) were not included among the predefined answers, but were also not mentioned as a source of information in any case study. Also, from the other questions and informal interviews it was clear that using publicly-supported farm advisory services is restricted only to preparing the investment support application, and that cooperating with research institutions is done quite seldom. This conforms with findings from other sources that indicate the knowledge transfer from research to farm practices is weak. The actual investment decision is based on advice from input suppliers, and often on the experience of other farmers who have already invested in the new technology[13].

From the perspective of motivation to participate in the programme, the measure oriented towards farm modernisation and increasing value added is firstly considered as an opportunity to receive support for realizing one´s own innovation plans by 80% of respondents (45% of respondents had only this type of motivation). For approximately one-third of the investigated supported farms, their participation in the programme was also considered exclusively an opportunity to receive additional financial means for investment. For another one-third of the respondents, one motivation to participate was a need to meet legislative requirements for farm operations.

The importance of investment support is also possible to evaluate with an assessment of implications in cases where support would not be received by a farm - the-so-called-"deadweight effect"- of investment support. Interview results show that in 35% of cases, the investment project would not be realised without further support. Further, 30% of respondents would invest in a reduced size, (on average 42%, with a range of 30-60%) of the financial framework of the actually-realised supported investment. On the other hand, 35% of projects would be fully launched without investment support. However, two-thirds of respondents in this group would carry out investments later, or at the expense of other investments on the farm that would not be realised under these circumstances.

The average economic size of farms in the second group that would realise investment without support but at a reduced size; is the highest (155,000 CZK of total assets), and received 10 % more endorsed projects compared to the others two; also, the average size of investment costs per project was about 20 million CZK. Farms that would not undertake a project at all are on average by one-quarter smaller (measured by total asset value) compared to the second group and the average size of their projects is 16 million CZK. The third group of farms that would realise a project even without support varies in economic size between two mentioned groups, but the average size of authorised projects is the smallest at – 12 million CZK. For these farms the supported investment projects are relatively more important, so they would realise them without support at the expense of other investments. It is

[12] So called "introductory advice" provided by farmers' organisations was co/financed from public funds between 2005 and 2009, the reason for stopping co/financing were budget cuts of the Czech government.

[13] Thus it depends on farmer's network.

possible to conclude that the deadweight effect of the RDP is not so high because only 12% of respondents would realise an investment project without any restrictions. Moreover, projects on these farms were only halfway realised.

When we attempt to evaluate the effects of investment support, it is necessary to know how important the supported investment was for the farm. For 47% of respondents, this supported investment stood for a strategic project influencing the prosperity of the farm. This importance is also underlined by the fact that the realised investment caused an increase of farm revenue (production) by 90% on awerage and the share of revenues from this supported activity comprised an average of more than one-third. These projects are especially oriented towards animal production and storage capacities. Surveyed farms also had projects that they rated as middle-important (42%) ans less important (11%). These projects had primarily non-economic objectives, e.g. improving animal welfare, or smaller investment projects of all types and do not induce a dramatic production increase (with the exception of one project).

The average pay-off period of supported projects is estimated to be seven years, but varies considerably, from 4 to 15 years. Mostly the supported projects contributed to an improvement of total farm revenues by an average of 18% and/oran average 12 % total cost reduction. The most common and the most significant cost reduction was in labour costs, followed by costs of repairs and maintenance, energy cost, and medicine and feedstuffs. More than half of the respondents agree that supported projects help them increase, in principal, the stability of their income; for an other one-quarter of the farms, this benefit is less important. From the non-economic effects, quality improvement and production security were mentioned first, followed by improvements in animal welfare and animal production efficiency.

Conclusions

Our quantitative assessment showed significant benefits from investment support in terms of business expansion (GVA) and productivity (GVA/labour costs) improvements. These results were confirmed by the qualitative survey, which showed that production expansion and productivity increases were primary investment objectives (and strategies) on most of the farms. Thus, public support enabled farms to achieve their strategic objectives.

Respondents from the survey of 20 supported farms declared that the supported investment was important for their prosperity. However, we could not prove this in the quantitative assessment in terms of profit and cost/revenue ratio; ATT are in favour of participating (treated farms), but the variances are too high to have statistical significance.

We learned that most of the investigated farms have a business development strategy and that investment support enabled the farmers to accomplish their goals more timely and to a greater extent than would be possible without it. It can be seen in Table 3 that the ratio of bank credits to total assets increased dramatically on participating farms over the investigated period while on non-participating farms this ratio was almost the same in 2010 as it was in 2007. This indicates that the policy (Measure 121 of RDP) encouraged farms to take credits, and that some credit constraints exist for farms, which might prevent them from participating in the investment support programme.

The case studies reveal that supported investments allow farms to realise increased income. This overall improvement stems from increase in animal production efficiency, overall revenue increase, and also the relatively important reduction of operational costs, especially labour costs. Moreover, respondents indicated a range of other qualitative non-economic benefits such as impriving the quality and security of products, decreasing losses, and improving animal welfare.

The issue of deadweight as it relates to investment support was also discussed: the figures on very low net investments relative to the provided public support at the sector level indicate possible significant deadweight. However, this insight is incomplete since it does not take into account any post-accession restructuring of the sector and multiannual and multi-enterprise character of investment at the farm level. According to respondents from the case studies, the deadweight effect of the RDP does not seem to be so high because only 12 % of respondents would realise an investment project without any restrictions. Moreover, these projects were on average only halfway realised.

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References

[1] Bašek, V. et al. České zemědělství šest let po vstupu do Evropské unie – The Czech agriculture six years after EU accession. Research study of Institute of Agricultural Economics and Information, 2010.

[2] Božík, M. Hodnotenie efektov opatrení podpory investícií Programu rovoje vidieka 2007-2013 na úrovni fariem, Economics in Agriculture, 2011. XI., N° 1, p. 58-71.

[3] Bradley, D., Dwyer, J., Hill, B. The Evaluation of Rural Development Policy in the EU. EuroChoices. 2010, 9 (1), p. 15-20. ISSN: 1478-0917

[4] Čechura, L. Theoretical-empirical analysis of the role of the SGAFF in financing of farmers' activities. Agricultural Economics, 2008, 54 (10), 476 - 488. ISSN: 0139-570X.

[5] Caliendo, M., Kopeinig, S. Some Practical Guidance for the Implementation of Propensity Score Matching, IZA DP , 2005, No. 1588. p. 28.

[6] Dwyer, J., Bradley, D., Hill, B. Towards an enhanced evaluation of European rural development policy - Reflections on United Kingdom experience. Economie Rurale, 2008, 307, p. 53-79. ISSN: 2105-2581.

[7] EC. Handbook on, Guidance document (including all Guidance Notes A-O), 2006, http://ec.europa.eu/agriculture/rurdev/eval/guidance/document_en.pdf.

[8] Gujarati, D., N. Basic Econometrics, McGraw-Hill, 1988. p. 467-500. ISBN: 978-0-07-233542-2.

[9] Janda, K. and Ratinger, T. Strategies for Capital Formation in Agricultural Cooperatives – The experience of the Czech Republic. In: Transformation Strategies with Particular Reference to Capital Formation in Agricultural Cooperatives in CEEC, FAO. 1997.

[10] Janda, K. The Comparative Statistics of the Effects of Credit Guarantees and Subsidies in the Competitive Lending Market, Prague Social Science Studies, Economics series EC-007. 2006.

[11] Khandker, S., R. Koowal, G., B., Samad, A., H. Handbook on Impact Evaluation; Quantitative Methods and Practices, World Bank 52099. 2010, p. 241. ISBN: 978-0-8213-8028-4.

[12] Medonos, T. (2007) Investment activity and financial constraint of the Czech corporate farms). Ph.D. thesis, Faculty of Economics and Management, Czech University of Agriculture, Prague. 2007.

[13] Michalek, J. Quantitative Tools for ex-post evaluation of RD Programmes. Working Paper Advanced-eval, deliverable No. 2. Version: March 2007.

[14] Psaltopoulos, D., Balamou, E., Skuras, D., Ratinger, T., Sieber, S. Modelling the impacts of CAP Pillar 1 and 2 measures on local economies in Europe: Testing a case study-based CGE-model approach. Journal of policy modeling, 2011, 33 (1), p. 53-69. ISSN: 1873-8060.

[15] Pufahl, A., CH.R. Weiss Evaluating the Effects of Farm Programmes: Results from Propensity Score Matching. In: European Review of Agricultural Economics, 2009, 36 (1), 79–101. ISSN 1464-3618.

[16] Rubin, D.B. Bias Reduction Using Mahalanobis-Metric Matching. Biometrics, 1980, 36, 293-298. ISSN: 1541-0420.

[17] Trzeciak-Duval, A. Agriculture finance and credit infastructure – conditions, policies and channels. Agricultural Economics, 2003, 49 (3), p. 106-112. ISSN: 0139-570X.