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Economic Effects of Investment Support of Adding Value to Food Products

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Anotace

Důvodem pro zpracování tohoto příspěvku je potřeba analyzovat a vyhodnotit podporu přidávání hodnoty zemědělským a potravinářským podnikům v rámci Programu rozvoje venkova (podopatření I.1.3.1) v kontextu přípravy dokumentů pro programové období 2014 - 2020. Aplikace výsledků výzkumu je prvním krokem k modifikaci pravidel pro poskytování podpory z PRV na programové období 2014 - 2020 tak, aby byly účelně a cíleně poskytovány na podporu potravinářského průmyslu v nových podmínkách. Řešení je z metodologického hlediska založeno na kontrafaktuální analýze a identifikuje hlavní efekty pro potravinářské odvětví s použitím ekonomických indikátorů. Výsledky ukazují, že podpořené podniky si do určité míry upevnily svou ekonomickou pozici. Investiční podpora má pozitivní dopad na finanční stabilitu, protože podpořené podniky v období 2007 – 2010 vykázaly menší pokles rentability v porovnání s nepodpořenými podniky. Investiční podpora zvyšuje produktivitu práce. Efekt na celkové hospodářské výsledky podpořených podniků je tlumen vyššími odpisy, které jsou důsledkem investic do dlouhodobého majetku.

Klíčová slova

Potravinářský průmysl, přidávání hodnoty, strukturální, podpory, ekonomické ukazatele, efektivnost.

Abstract

The reason for this contribution is need for analysis and evaluation of the support of adding value to food products in framework of the Rural Development Programme (sub-measure I.1.3.1) in the context of the preparation of new documents for the new programming period 2014 - 2020. Application of research results is the first step to modification of rules for the RDP granting aid for the programming period 2014 - 2020 in order to be efficient and targeted at food industry in the new conditions. From a methodological point of view the solution is based on counterfactual analysis and identifies the main effects for the food industry using economic indicators. Results show that the supported businesses consolidated their economic position to a certain extent. The investment support has positive impact on financial stability because participants had smaller decrease of profitability than nonparticipants in the period 2007 - 2010. The investment support increases labour productivity. But due to the higher depreciation, as the consequence of investments in fixed assets, the overall effects on economic results are slightly reduced.

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Key words

Food industry, adding value, structural support, economic indicators, efficiency.

Introduction

The economic recession has affected many sectors including food industry. It has increased the level of risk not only for suppliers, especially for farmers, but for the whole agribusiness. The objective of the paper is to evaluate the effects of support of adding value to food products under the Rural Development Programme (sub-measure I.1.3.1, RDP) with regard to the need for creating new strategic documents for the programming period 2014 - 2020. The economic research has not

comprehensively recognized effects of the RDP support sub-measure I.1.3.1. With respect to the need for design the rules of the upcoming programming period of the Common Agricultural Policy, it is necessary to prepare this evaluation.

In the context of EU accession of the Czech Republic it has been pointed out that the food industry offers opportunities for the development of production especially for products with higher added value. It can also stimulate foreign investors to a greater extent (Lukas - Pöschl, 2004).

According to Pokorný et al. (2008), building contacts and cooperation are fundamental prerequisites for the transition to a knowledge-based economy. The potential for innovations attracts the foreign investors focusing on higher added value. Furthermore, it contributes to an increase competitiveness of the region.

Puticová and Mezera (2011) engage in the problems of competitiveness and the performance of the Czech food industry. Both these attributes are evaluated in the framework the domestic manufacturing sector and market, as well as from the point of view of the relations in foreign trade, that means in context with the European and world market. They conclude that the sector competitiveness is not in a critical situation. However, the sector competitiveness assessed by the RCA index and foreign trade is not going to be improved. The stagnation has come. As it follows from the SWOT analysis, the reason is that the opportunities of the sector are not fully utilised. Food producers are facing the basic problems in the output sphere mainly in the domestic market.

As Čechura (2009, 2012) states, the technical efficiency in the food processing industry did not change significantly within the period from 2000 to 2007. The common feature of all analysed branches (food processing industry total, slaughtering, dairy, milling, feedstuffs, beverages) of the food processing industry is that the technological change did not contribute significantly to the development of efficiency in the analysed period. However, the distribution of technical change suggests that the gap between the best and worst food processing companies increased within the analysed period. On the other hand, he concludes that TFP (Total Factor Productivity) in the food processing industry significantly increase within the analysed period. The technological change is an important factor determining the TFP increase. Nevertheless, the improvement in production possibilities has been due more to the diffusion of knowledge generated in another part of the economy, or imported from abroad, than to the sector's own research and development.

Mejstříková, Mezera and Plášil (2011) reported that financial analysis shows that taking into account inter-branch heterogeneity the total profitability of both manufactures (CZ-NACE 10 and CZ-NACE 11) improved in spite of worsened economic conditions, which was a positive trend. It implies certain adaptability of a significant part of enterprises included in this financial economic analysis and their mutual inter-branch comparison.

According to evaluation of the period 2008 – 2010 (Mezera - Mejstříková, 2012), the book value added (in current prices) in the food processing industry increased in the group of small and medium enterprises between 2009 and 2010. On the other hand it fell down in the group of large enterprises (with 250 and more employees) in the same period. Authors assume that support programs and legislative measures are among key instruments for strengthening market and economics position of the Czech food industry.

The paper focuses on the economic effect of investment support targeting at adding value to food products in the Czech Republic. It especially attempts to answer the question if there are any effects on financial performance of supported companies compared to companies without public investment support. The assessment of nonfinancial effects is the challenge for future research.

The paper is organised as follows. First part describes data and methods of counterfactual analysis. The methods of data matching as well as result indicators for assessing financial effects are included. The second part devotes to description of the results. The last part concludes new findings with respect to the needs of the Ministry of Agriculture as the managing authority of the RDP.

Material and methods

Data on investment projects within the RDP measure I.1.3.1 "Adding value to agricultural and food products" is obtained from the Ministry of Agriculture (MoA). The database provides information about applicants (including legal form, region), project name, project assessment process, total investment expenditures, eligible investment expenditures, absolute and relative amount

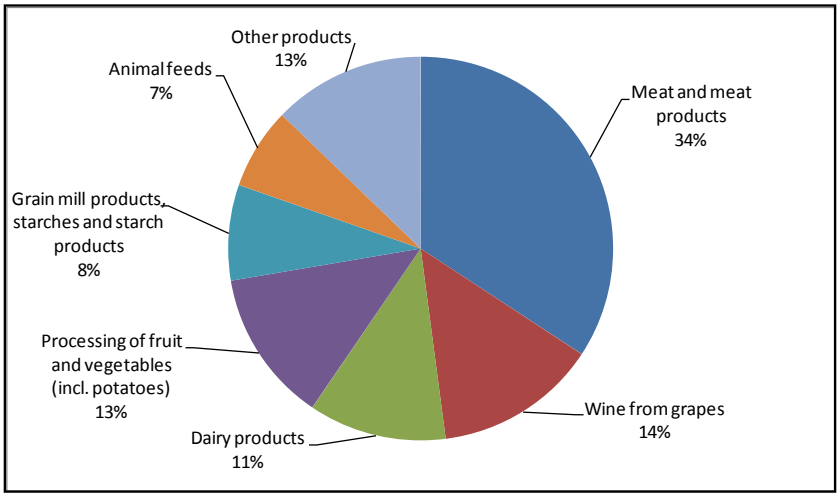
of the investment subsidy. We linked the MoA database with information from a database Soliditet - Albertina, which contains data from financial statements of companies in the CR as well as an overview of the company headquarters, industry, number of employees and total turnover. Thus we can obtain the basic information about companies whose applications were approved for investment between 2007 and 2011.

In the period 2007 – 2011, the MoA registered 1405 applications in measure I.1.3.1, of which 896 were applications by non-agricultural enterprises. Total 519 of 896 applications were approved, i.e. success rate was more than 50 %. Since the basic assumption for counterfactual analysis is that investment has to be in operation, only completed approved applications are taking into account. In the period 2007 - 2011, 336 applications were completed (settled), so it is possible to suppose that investment subject has really launched.

In the period 2007 – 2011, the total value of 336 completed investment projects was nearly 3.50 billion CZK of which about 1.16 billion CZK were investment subsidies from the RDP. The most completed applications were in the Southern Moravia Region (32 %). Figure 1 shows the distribution of completed projects by branch. The most capital-demanding projects were realized by manufacturers of grain mill products, starches and starch products (average investment expenditure per project was 18.0 million CZK) and in the dairy industry (average investment expenditure per project was 15.9 million CZK). On the other side, the least capital-demanding projects were set up by manufacturers of wine from grape (7.5 million CZK per project on average) and by the manufacture of prepared animal feeds (8.5 million CZK per project on average).

For the counterfactual analysis it is necessary to have one sample of supported enterprises and another sample of enterprises with similar structural characteristics that were not supported by RDP in the same period. Because accounting data are available with the lag of t-2, it is possible to use data only for the period 2007 - 2010. Total 245 of 336 applications were completed (settled) between 2007 and 2010, so they can be considered as supported and it is assumed that the investment was put into operation until 2010. The total number of 245 applications represented 178 applicants (individual enterprises) which can be labelled as "participants". Nevertheless, complete full accounting data in 2007 and 2010 are available only for 110 companies, so it is the final basic set of supported subjects for counterfactual analysis (labelled as "participants").

On the opposite side, 313 enterprises from food and beverage industry without investment support from RDP between 2007 and 2010 and with available full accounting data in both years are identified. From this group of nonparticipants it is necessary to select companies with similar characteristics as supported companies. The characteristics shall express company size, branch, capital endowment and capital structure in basic year 2007 (i.e. before public intervention). On the other hand, characteristics should not include covariates based on economic results (like EBIT, cash flow, value added etc.) because they serve as result indicators for subsequent counterfactual analysis. In addition,



Source: own calculation based on MoA database

Figure 1: The share of completed projects by branch (2007 – 2011).

selected variables do not correlate each other (Pearson correlation coefficients did not exceed ± 0.30). Following available indicators for matching participants and nonparticipants are selected:

- total assets (TA) as an indicator of company size,
- debt ratio (DR) as an indicator of capital structure,
- share of current assets to total assets (CA_TA) as an indicator of asset structure,
- share of bank loans to total liabilities (BL_TL) as an indicator of using structure of liabilities,
- current ratio (CR) as a measure of company liquidity,
- share of depreciation and amortization to total assets (DEP_TA).

Ratinger et al. (2012) highlight two serious problems of CMEF (Common Evaluation a Monitoring Framework) and the EU evaluation guidelines which eventually might lead to wrong conclusions on the 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 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). To deal with these shortcomings Ratinger et al. (2012) adopt the counterfactual approach.

Data matching procedure is used to create treatment-control matches based on propensity scores and/or observed covariate variables. Propensity score matching (PSM) constructs a statistical comparison group that is based on a model of the probability of participating in the treatment, using observed characteristics (Khandker et al., 2010). Ideally, one would match each treatment subject with a control subject (or subjects) that is an exact match on each of the observed covariates. As the number of covariates increases or the ratio of the number of control subjects to treatment subjects decreases, it becomes less and less likely that an exact match will be found for each treatment subject. Propensity scores can be used in this situation to simultaneously control for the presence of several covariate factors. The propensity score was introduced by Rosenbaum and Rubin for the first time (1983, 1985). The propensity score for subject i ($i = 1,\ldots, N$) is defined as the conditional probability of assignment to a treatment ($Z_i = 1$) versus the control ($Z_i = 0$), given a set (or vector) of observed covariates, x_i. Mathematically, the propensity score for subject i can be express as

$$e(X_i) = p\ (Z_i = 1 | X_i = x_i) \quad (1)$$

It is assumed that the Z_i's are independent, given the X's. The observed covariates, x_i, are not necessarily the same covariates used in the matching algorithm, y_i, although they could be. Rosenbaum and Rubin (1985) suggest using the logit of the estimated propensity score for matching because the distribution of transformed scores is often approximately normal. The logit of the propensity score is defined as

$$q(x) = \log\left(\frac{1 - e(x)}{e(x)}\right) \quad (2)$$

Different approaches can be used to match participants and nonparticipants on the basis of the propensity score. Greedy data matching is used for propensity score data matching procedure in this paper (like in Božík, 2011 a 2012). Several different distance calculation methods are available in the matching procedures. Gu and Rosenbaum (1993) compared the imbalance of Mahalanobis distance metrics versus the propensity score difference in optimal 1:1 matching for numbers of covariates (P) between 2 and 20 and control/ treatment subject ratios between 2 and 6. *Mahalanobis distance within propensity score calipers was always best or second best, so Mahalanobis distance within propensity score calipers (no matches outside calipers)* is chosen in this paper as distance calculation method. Mahalanobis distance was suggested by P. C. Mahalanobis (1936).

According to Khandker et al. (2010) the main advantage (and drawback) of PSM relies on the degree to which observed characteristics drive program participation. If selection bias from unobserved characteristics is likely to be negligible, then PSM may provide a good comparison with randomized estimates. To the degree participation variables are incomplete; the PSM results can be suspect. This condition is not a directly testable criteria; it requires careful examination of the factors driving program participation.

Table 1 shows results of data matching including mean and standardized differences. One subject of participants is excluded because of extreme values of characteristic variables. After matching it seems to have really similar control group. Figure 2 depicts effects of PSM on branch structure of the sample (by CZ-NACE codes).

After creating group of participants (110 supported companies) and nonparticipants (110 not supported companies) the next step is to make counterfactual analysis, i.e. to make impact evaluation of investment and investment support in biogas energy. First, the relevant indicators have to be selected. In order to make complex impact evaluation mainly based on financial statements, following indicators of profitability, liquidity, activity, capital structure, value added and productivity are identified as suitable for counterfactual analysis.

A) Indicators of profitability:

- Return on Assets (ROA) = EBIT/Total Assets
- Return on Capital Employed (ROCE) = EBIT/ (Equity + Provisions + Long-term payables + Long-term bank loans)
- Return on Equity (ROE) = EAT/Equity
- Return on Sales (ROS) = EBIT/(Sales of Production + Sales of Goods)

B) Indicators of liquidity:

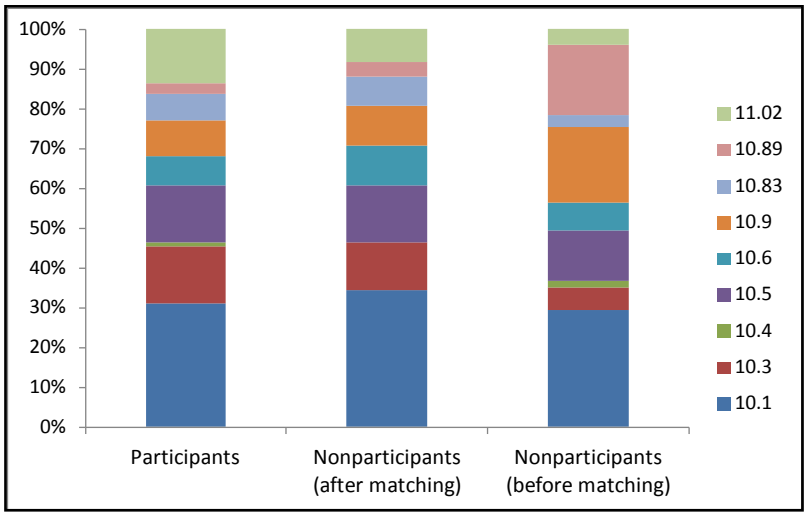
- Current Ratio = Current Assets/Current Liabilities
- Acid Test Ratio = (Current Assets – Inventory) / Current Liabilities
- Cash Ratio = Short-term Financial Assets/ Current Liabilities

Variable	Units	Group type	Participants	N	Mean	SD	Mean difference	Standardized difference (%)
Total assets	´000 CZK	Before matching	Yes	110	242,831	428,803		
			No	313	165,622	359,917	77,210	19.50%
		After matching	Yes	110	242,831	428,803		
			No	110	246,165	480,761	-3,334	-0.73%
Debt ratio		Before matching	Yes	110	0.580	0.21		
			No	313	0.679	0.56	-0.098	-23.29%
		After matching	Yes	110	0.580	0.21		
			No	110	0.591	0.22	-0.010	-4.77%
Share of current assets to total assets		Before matching	Yes	110	0.555	0.18		
			No	313	0.587	0.25	-0.033	-15.19%
		After matching	Yes	110	0.555	0.18		
			No	110	0.561	0.18	-0.006	-3.34%
Share of bank loans to total liabilities		Before matching	Yes	110	0.264	0.21		
			No	313	0.226	0.24	0.037	16.54%
		After matching	Yes	110	0.264	0.21		
			No	110	0.254	0.23	0.010	4.73%
Current ratio		Before matching	Yes	110	1.658	1.44		
			No	313	2.756	6.21	-1.098	-24.38%
		After matching	Yes	110	1.658	1.44		
			No	110	1.476	1.08	0.182	14.28%
Share of depreciation and amortization to total assets		Before matching	Yes	110	0.050	0.03		
			No	313	0.044	0.04	0.005	14.71%
		After matching	Yes	110	0.050	0.03		
			No	110	0.049	0.03	0.001	3.48%

Notes: N = number of enterprises, SD = standard deviation

Source: own calculation

Table 1: Results of PSM – data source for counterfactual analysis.



Source: own calculation

Figure 2: Effects of PSM on structure of the sample by branches (CZ-NACE codes).

C) Indicators of activity:

- Long-term Asset Turnover = (Sales of Production + Sales of Goods)/Fixed Assets
- Inventory Turnover = (Sales of Production + Sales of Goods)/Inventory

D) Debt ratios:

- Debt Ratio = Total Debt/Total Assets
- Credit Debt Ratio = Bank Loans & Overdrafts/ Total Assets
- Share of Bank Loans & Overdrafts to Debts
- Financial Leverage = Total Assets / Equity

E) Value added indicators[1]:

- Value Added per Total Assets
- Value Added per Firm
- Staff Costs per Firm
- Value Added per Staff Costs

F) Other indicators:

- Fixed Assets per Firm
- Share of Fixed Assets per Total Assets
- Depreciation per Firm
- Depreciation per Total Assets
- Sales of Production per Cost of Sales
- Total Revenues per Total Costs

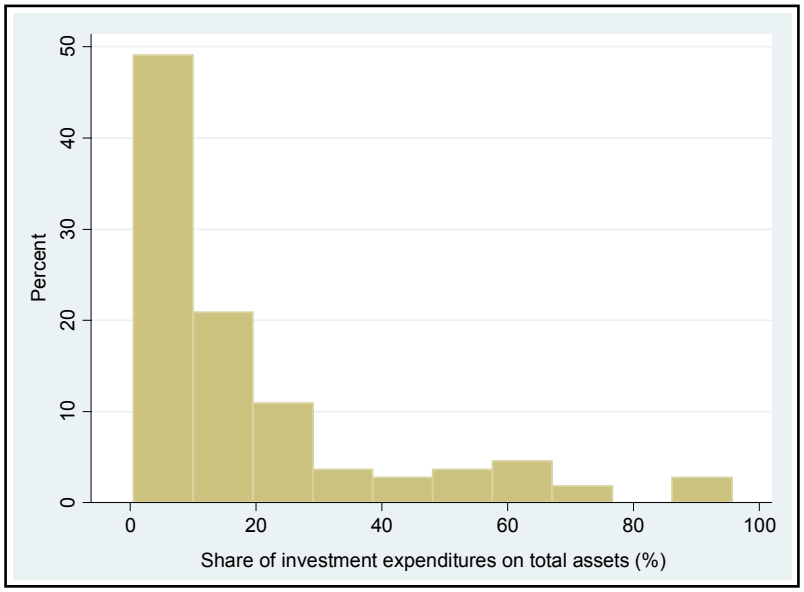
Results and discussion

The extent of economic effects of investment support depends on the relative importance of investments in supported enterprises. As figure 3 shows, about 50 % of the participants have total investment expenditures up to 10 % of total assets. The question is how significantly these relatively less important investments can affect economic results of companies in the food sector. Table 2 gives the information about effects of investment support on profitability, labour productivity and cost efficiency.

The effects of investment support also arise from the change of fixed assets and depreciation per firm (table 2). The participants increased the mean level of fixed assets by 31 % while nonparticipants did not substantially change the value of fixed assets from 2007 to 2010. This is also evident from the share of fixed assets in total assets. Moreover, the participants had significantly higher depreciation per firm as well as per total assets than nonparticipants in 2010.

Results in table 2 indicate higher profitability of supported companies. This finding can raise the question if the investment support by the RDP is targeted at generally more profitable companies or should help less profitable companies to improve their economic results. In the period 2007 – 2010 indicators of profitability dropped in both participants and nonparticipants. The general decline of profitability was caused by systematic global economic recession that affected most industries worldwide. The positive effect is that relatively slower decline in profitability is observable in the group of participants compared

[1] Value added = (Sales of goods – Cost on goods sold) + (Sales of production – Cost of sales)



Source: own calculation

Figure 3: Relative importance of investment expenditures in the supported enterprises.

Indicator	Units	Mean (participants) N = 110			Mean (nonparticipants) N = 110		
		2007	2010	Index	2007	2010	Index
ROA	%	6.79	5.23	0.77	4.56	2.98	0.65
ROCE	%	13.31	8.72	0.66	11.54	6.34	0.55
ROE	%	11.85	6.36	0.54	7.71	4.00	0.52
ROS	%	3.09	2.60	0.84	1.99	1.50	0.76
Value Added per Total Assets	%	31.80	30.03	0.94	30.29	27.74	0.92
Value Added per Firm	´000 CZK	28,835	36,285	1.26	18,460	18,788	1.02
Staff Costs per Firm	´000 CZK	16,592	19,131	1.15	13,061	13,622	1.04
Value Added per Staff Costs	CZK	1.74	1.90	1.09	1.41	1.38	0.98
Fixed Assets per Firm	´000 CZK	39,751	52,023	1.31	33,548	32,796	0.98
Share of Fixed Assets per Total Assets	%	42.56	47.37	1.11	43.16	42.74	0.99
Depreciation per Firm	´000 CZK	4,384	5,454	1.24	3,241	3,832	1.18
Depreciation per Total Assets	%	4.51	5.32	1.18	4.26	4.34	1.02
Sales of Production per Cost of Sales	CZK	1.19	1.22	1.02	1.16	1.18	1.01
Total Revenues per Total Costs	CZK	1.03	1.02	1.00	1.02	1.01	1.00

Source: own calculation

Table 2: Indicators of profitability, labour productivity and cost efficiency.

to the nonparticipants. It can be explained as effect of investment support. Nevertheless, the indicator ROE does not prove such obvious effect of support, so the investment support is not so beneficial for shareholders as for the whole company.

Investment support has important effect on productivity. The participants have higher value added than nonparticipants. Furthermore, they also increased mean value added by 26 % between 2007 and 2010. But in relation to the total assets, the value added slightly dropped in both groups of companies because the rise of value added was reduced by rise of total assets in the group of participants as a consequence of investment. Concerning labour productivity the parallel changes of value added and staff costs need to be compared that can be expressed by indicator value added per staff costs. Labour productivity of participants grew by

9 % while there was a slight decline in the group of nonparticipants in the reporting period. So, higher labour productivity can be considered as one of the positive effects of the investment support by the RDP.

Even if the effects of investment support on profitability and labour productivity are shown, the impact on cost efficiency is not obvious. There is some positive effect if cost efficiency of production is considered (sales of production per cost of sales). When total cost and total revenues are calculated, the effect is zero probably because of higher depreciation and staff costs in the group of participants. Depreciation and staff costs are not included in cost of sales and their growth eliminates the effect of higher total revenues.

The profitability is a result of other financial indicators. Table 3 refers to the indicators of liquidity, turnover and capital structure.

There is no big difference in change of liquidity ratios between participants and nonparticipants. All indicators of liquidity increased in the reporting period. One possible reason is that firms seek to reduce liabilities during crisis and prevent possible problems with their settlement. This statement can be supported by debt ratio that expresses the share of external capital to total capital employed. The participants used relatively higher debts in 2007 (more than 60 %) but they reduced it more sharply than nonparticipants. In 2010 both groups had similar debt ratio at the maximum recommended level of about 50 %. Looking at the difference between indexes of debt ratio and credit debt ratio the relative change of both ratios is similar in the group of participants but it differs in the sample of nonparticipants. That is because the participants reduced liabilities but they increased the share of bank loans and overdrafts (as results from table 3). On the contrary, nonparticipants also reduced liabilities but they did not noticeably increase the share of bank loans. So, the nonparticipants' drop of credit debt ratio is sharper.

Concerning long-term asset turnover and inventory turnover there are also some effects of investment support. The long-term asset turnover dropped more in the group of participants because new investments increased more the level of fixed assets compared to the sales growth. The level of inventories is not affected by investments. Thus the change (index) of inventory turnover has different trend than the long-term asset turnover.

Finally, some disadvantages of such counterfactual analysis can be identified. Firstly, the above processed analysis is based on financial indicators only. For better understanding of all potential effects of the investment support it is very useful to make case studies (like in Ratinger et al., 2012). Long-term organisational viability and competitiveness should not be evaluated solely in terms of financial measures. Investors, policy makers and other stakeholders increasingly seek to evaluate performance with respect to sustainability-the environmental, social and economic performance of an organisation (Yakovleva, Sarkis, Sloan, 2012). The case studies can also help to evaluate the nonfinancial effects on the use of particular inputs, effects on market share, quality of production, staff number and qualification and on the work environment, to indicate past and future investment strategy, problems and barriers in applying for investment support etc. It is a great challenge for future research. Secondly, it is problem

Indicator	Units	Mean (participants) N = 110			Mean (nonparticipants) N = 110		
		2007	2010	Index	2007	2010	Index
Current Ratio	x	1.27	1.44	1.13	1.16	1.31	1.13
Acid Test Ratio	x	0.76	0.82	1.08	0.80	0.85	1.07
Cash Ratio	x	0.07	0.09	1.24	0.05	0.08	1.60
Long-term Asset Turnover	x	2.18	1.80	0.82	2.27	2.10	0.93
Inventory Turnover	x	4.89	4.25	0.87	5.70	4.76	0.83
Debt Ratio	%	60.60	52.52	0.87	57.91	53.05	0.92
Credit Debt Ratio	%	12.44	10.93	0.88	14.70	11.68	0.79
Share of Bank Loans to Total Debts	%	24.98	29.06	1.16	22.86	23.33	1.02
Financial Leverage	x	2.58	2.05	0.80	2.33	2.07	0.89

Source: own calculation

Table 3: Indicators of liquidity, turnover and capital structure.

to find really similar group of nonparticipants because it is not possible to find the same companies (Michalek, 2009). So, the results of counterfactual analysis based on propensity score matching can be biased to a certain extent. Nevertheless, the above described propensity score matching is a good basis for quantitative impact evaluation.

Last but not least, the question of competitiveness of the Czech food industry should be perceived in the European context. For example Wijnands et al. (2008) conclude that the EU food industry's competitiveness is weak. The legal system was positively evaluated compared to the U.S. system, but major improvements are possible. The recommendations are to improve economies of scale, economies of scope, ICT-based supply chain management, and exploit cultural differences through innovation, within a more flexible and streamlined legal framework.

Conclusion

The paper focuses on the economic effect of investment support targeting at adding value to food products in the Czech Republic (measure I.1.3.1). It especially attempts to answer the question if there are any effects on financial performance of supported companies compared to companies without public investment support. About 50 % of the participants have total investment expenditures up to 10 % of total assets. The question is how significantly these relatively less important investments can affect economic results of companies in the food sector.

According to the MoA, the measure I.1.3.1 responds to the strategic objective to improve the competitiveness of agri-food industry by focusing especially on the improvement of the performance of processing enterprises and on the development of new outlets for agricultural products, support for marketing of agricultural products, and the development of innovations within the agri-food production. The analysis shows that the investment support has positive impact on financial stability because participants have smaller decrease of profitability than nonparticipants. The investment support increases labour productivity measured using value added. But due to the higher depreciation, as the consequence of investments in fixed assets, the overall effects on economic results are slightly reduced. The investment support and new investments to adding value to the food products change the structure of debt to the benefit of bank loans and overdrafts. On the other hand, both supported companies and nonparticipants focus on debt reduction in response to global economic crisis. Finally, it can be concluded that some positive effect of investment support are obvious.

The investment support of the adding value to food products should continue in upcoming period 2014-2020. Only the targeted support can be the incentive for enhancing economic „viability" of enterprises as well as the tool for improving competitiveness of the food industry. This plan corresponds with the vision of forming the European food sector as a world "leader" being competitive in the long term.

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