

EVALUATION OF EFFECTS OF INVESTMENT SUPPORT IN THE CZECH DAIRY INDUSTRY

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Abstract

NÁGLOVÁ ZDEŇKA, ŠPIČKA JINDŘICH, GÜRTLER MARTIN. 2016. Evaluation of Effects of Investment Support in the Czech Dairy Industry. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64(4): 1345–1351.

The article deals with investment subsidies which were drawn by enterprises of the dairy industry in 2007–2013. It is a subsidy within the Rural Development Programme 2007–2013 and the National subsidies. This article aims to assess whether these subsidies have contributed to higher economic efficiency of enterprises. The impact of investment grants to economic indicators (sales, debt ratio, labour productivity and production consumption) is evaluated. 35 dairy enterprises that drew investment grants, were analyzed in total. According to the results, grants from national sources have a greater impact on the economy of businesses. National subsidies improve labour productivity, sales and production consumption. Impacts of subsidies drawn from the Rural Development Programme are less noticeable. These subsidies affect only the production consumption by its decreasing. The market situation in 2008 and 2009 also influenced the rated indicators.

Keywords: dairy industry, investment grants, Rural Development Programme, National subsidies, economy of business, efficiency, fixed effect model

INTRODUCTION

There have been many changes since the new reform of the Common Agricultural Policy (CAP) for the period 2014–2020 was defined, both, in the first pillar (direct payments) and in the second pillar (Rural Development Programme-RDP). Rural Development Programme 2007–2013 should allow the conditions for the growth of competitiveness of the country in food commodities, supporting the diversification of economic activities, creating jobs and reducing the unemployment rate. Since this programming period is already completed, it is important to evaluate whether the aid resulting from the RDP fulfilled its purpose, ie. if it have contributed to higher economic efficiency of enterprises and to their savings.

The article deals with the effectiveness of investment aid in the food industry focusing on the dairy industry. According to Menrad (2004) and Rodgers (2011) an investment activity is an essential prerequisite for increasing the competitiveness of businesses of every industry. It enables businesses to become more technologically intensive and

effective. According to Knudson *et al.* (2004) investments help businesses to create business plans, marketing strategies, they allow certification of business processes and so on. According to Wijnands *et al.* (2008) the competitiveness of the EU food industry is weak. They recommend improving economies of scale and innovation. The issue in the food industry is examined for example by Putíčová and Mezera (2011) who analyzed the competitiveness and performance of the food industry in the Czech Republic in the context of domestic production and foreign trade. Their results say that competitiveness is not in a critical situation but it will not increase, more likely stagnate. Czech market was analyzed by Čechura and Hockmann (2010) who identified the uneven development of the food industry. The results indicate serious problems including the problems of the capital market. Large differences among the analyzed companies were found.

Within the food industry the article focuses on the dairy industry, which is among the major branches of the Czech food industry, it is on the third place according to reported revenues (it contributes by

14 % to the sales of food industry) and is the fourth most significant employer in the food industry, over 8,500 persons were employed there in 2014 (MoA, 2014).

The article refers to the issue of providing support from the RDP 2007–2013 under Axis I, measure I. 1.3 Adding value to agricultural and food products (including sub measure I. 1.3.1 Adding value to agricultural and food products and I. 1.3.2 Cooperation in developing new products, processes and technologies in the food industry). This measure comes second in terms of the total amount of funds expended under Axis I (over 20 %), most funds were spent on measure under Axis I. 1.1 Modernisation of agricultural holdings. Analysis of the effects resulting from these measures, are already being addressed by the authors Medonos *et al.* (2012) and Rättinger *et al.* (2013). According to the authors investment aid brings benefits in case of business development and productivity improvement.

The evaluation of impact on economy of enterprises of measure I. 1.3 as a total, was made by the authors Mezera *et al.* (2014) and Mezera and Špička (2013) in the Czech Republic. Those rated sub measures I. 1.3.1 in the context of the preparation of documents for the programming period 2014–2020. The results point to strengthen economic position of the enterprises supported by subsidies. Support has a positive impact on financial stability, they improve the labour productivity. Method PSM (Propensity Score Matching) was used for the analysis. Mezera *et al.* (2014) also discuss the evaluation of sub measure I. 1.3.2 using an online survey and interviews. Their results pointed out that such aid helps to reduce debts. Špička *et al.* (2015) examined the area of innovation activities in the Czech dairy industry. Their goal was to compare and identify differences among innovators in Czech dairy industry. They were engaged in the analysis of projects supported from the RDP – sub measure I. 1.3.2 from 2007 to September 2013. The results show that innovations stabilize their profits, increase their competitiveness.

Impacts of investment aid in the manufacturing, respectively food industry, were also examined abroad. Few studies that focus on the impact of subsidies on the corporate economy are listed below. Further studies are listed in the part Results and Discussion. Ghazalian and Furtan (2007) suggest that investment activity can have a positive effect on the performance of food business, vertical co-operation and increase in food products export. According to Mroczek (2013) the last decade has been a period of intense development of the Polish food industry, which was the result of Poland's accession to the EU. The result was a significant boost of investment and increase of the value of fixed assets in enterprises of food industry (commonly observed in all sectors of the food industry). Investments in active parts of businesses (machines, equipment) significantly improved the performance of the Polish food industry. Skuras *et al.* (2006) dealt with the effect

of investment subsidies on productivity growth in the Greek companies in food and beverage industry. The results of their research question the effectiveness of the capital donations on increased productivity. Ankarhem *et al.* (2010) dealt with the effect of subsidies on investments during 1990–1999 on the performance of companies in Sweden using the method of Propensity Score Matching (PSM). Companies that have received grants did not have better performance measured by return on equity when compared to the second group. In most years, the recipients of grants did not hire more employees. These results call into question the use of investment subsidies as a public policy tool to improve the performance of companies. Bernini and Pellegrini (2011) examined the impact of investment subsidies in Italy, also using the methods of PSM. Capital subsidies have a positive impact on revenues (about 8–10 % higher than in non-subsidized firms) and on employment of subsidized companies (an increase of 16–17 %), subsidized firms also increased fixed assets (by 39–40 %). Value added is also positively affected. The cost of debt measured by debt interest on output is higher (around 19–21 %) in subsidized firms. The impact on employment is questionable. The negative impact of subsidies on the efficiency or productivity was demonstrated for example by Lee (1996); Bergström (1998); Harris and Trainor (2005); Criscuolo *et al.* (2009). The positive impact of the investment subsidies was demonstrated by Carlucci and Pellegrini (2005). Other studies focus on the effects of innovations on the corporate economy. According to Geroski and Toker (1996) innovations have a significant impact on the positive sales growth (used OLS regression model) in manufacturing businesses in the UK. Roper (1997) used data from the UK, Ireland and Germany and showed that product innovation is also a positive contribution to revenue growth. The impact of innovation and investment on revenues is one of the anticipated results and is a temporary period of increased sales. Despite an improvement in product performance and/or reduction of costs, the enterprise is able to capture a larger part of the market demand (Freel, 2000). The growth of non innovators was more sensitive to changes in macro environment. In contrast, numerous studies dealing with innovation in small businesses confirm the strong positive influence between product innovation and sales growth (Roper, 1997; Moore, 1995). Innovation can lead to a reduction in employment (in case where the original product innovation affects labour savings through technology) (Hall, 1994). If there is an increase in employment, then it is related to sales growth and competitiveness improvement, which can be regarded as a consequence of successful innovation. However, sales of innovators are not so different from the non innovators but the number of their employees increases and they have a significantly lower level of profit per employee (Freel, 2000). Brouwer *et al.* (1993) confirmed the significantly positive impact of innovation (of

products) on employment growth, also Moore (1995); Westhead and Cowling (1995); Tether and Massini (1998). In contrast, other studies suggest that innovative activity is not positively related to creation of jobs (Kalantaridis and Pheby, 1999). Del Monte and Papagni (2003) report a positive relationship between innovation and revenue growth in their analysis of Italian manufacturing firms. The authors measured growth as revenues and number of employees, these indicators are higher for companies with investment activity. Labour productivity is higher in companies with innovative activities. Return on sales do not show significant differences between firms. On the other hand, according to Geroski *et al.* (1997), innovation activities are not related to revenue growth, employment or labour productivity in the UK.

The existing records of impacts of investment aid for food business economics show that they vary widely and are questionable. Therefore, it is necessary to analyze the Czech environment and compare the results with already existing studies. This article aims to assess whether the investment subsidy flowing to the dairy industry has a positive effect on selected economic indicators (sales, labour productivity, production consumption and debt ratio) for the 2007–2013 programming period.

MATERIALS AND METHODS

The article used selected items from financial statements originating from the database Albertina, managed by Bisnode company. The indicators used for evaluation of effectiveness of investment aid were compiled from the files.

The indicators are:

- sales (from sales of own products and services),
- debt ratio (the ratio of total liabilities to total assets),
- production consumption (consumption of materials, energy and services),
- labour productivity (measured by the ratio of value added and personnel costs),
- sales to total assets ratio,
- production consumption to sales ratio.

These indicators were used with respect to the previously conducted research in area of impact assessment of the investment subsidies on the corporate economy. A clear direction of action is also not shown for selected indicators, and therefore it is necessary to check the effects in the Czech environment. The article focuses on dairy businesses, which benefited from a subsidy from the Rural Development Programme for the period 2007–2014 within the Axis I, Measure I. 1.3 Adding value to agricultural and food products (including sub measure I. 1.3.1 Adding value to agricultural and food products and I. 1.3.2 Cooperation in development of new products, processes and technologies in the food industry) or received funding from national sources, respectively National subsidies in agriculture and the food industry by

the Ministry of Agriculture (Grant program 13 Supporting the processing of agricultural products and increasing the competitiveness of the food industry). Companies were selected from the database Albertina according to the prevailing CZ–NACE 10.5 (includes 10.51 Milk processing and cheese making and even 10.52 Production of ice cream) with complete financial statements for the years 2007–2013 (ie. the whole programming period of RDP). This created set of 71 enterprises of the dairy industry. These enterprises were verified for drawing subsidies. Information regarding the drawing of subsidies (from the RDP and the National subsidy) was obtained from Registry of grant recipients administered by the Ministry of Agriculture. 35 out of 71 companies draw subsidies.

A fixed effects model was used for the analysis of sales of the enterprises in milk industry, labour production, debt ratio, production consumption, ratio of sales to total assets, ratio of production consumption to sales and their dependency on investment subsidies. Thus, assuming fixed effects over individuals we can propose the following panel data regression model, also known as the fixed effects model, i.e.

$$y_{it} = \alpha + x'_{it}\beta + u_{it} \quad i = 1, \dots, N; \quad t = 1, \dots, T$$

where i denotes the cross-section dimension and t the time-series dimension. Henceforward let i be a slower index. Therefore y_{it} is an observation of a dependent variable for i -th unit in time t ; α is a scalar common to all entities; x'_{it} is i -th row of $NT \times K$ matrix X , which contains observed values of K regressors; β is a K -dimensional parametric vector; and for u_{it} we can write

$$u_{it} = \mu_i + v_{it}$$

when μ_i is an unobservable and time independent individual specific effect, or fixed effect, for i -th unit and v_{it} is an iid disturbance term with mean zero and variance σ . Above stated regression is possible to estimate through a least squares dummy variables (LSDV) estimator, see for example Baltagi (2008). Diagnostics of the fixed effect model includes Chow test for poolability (Chow, 1960), Durbin-Watson statistics for serial correlation in residuals (Baltagi, 2008) and Wald test for groupwise heteroskedasticity, in this case see for example Greene (2000). In some of the regressions below, we use also dummy variables (dt variable) for modelling time specific effects and their significance test by the classic Wald test. As seen from the output, heteroskedasticity and autocorrelation are present in the model and therefore robust estimation of a model was chosen, ie. Arellano's estimate covariance matrix (Arellano, 2003).

File Characteristics characteristics

The file includes 35 dairy companies which in 2007–2013 drew subsidies. According to the publication Panorama of Food Industry 2014 there

were a total of 184 enterprises subjects in 2013 in the Czech Republic. Therefore the analysis covers 19 % of the enterprises of the dairy industry. The file includes 26 medium-sized companies and 9 large companies. The prime criterion for determining the size of enterprises was the number of employees. Businesses with 50 to 249 persons as middle sized and enterprises employ 250 people or more as large. Table I compares sample size and total number of companies in the milk industry. These enterprises are mainly in the Czech ownership (28 companies), the number of analyzed foreign-owned enterprises is 7 (an enterprise with foreign ownership greater than 50 % is considered as a foreign enterprise). There are enterprises from all regions except Liberecký and Ústecký regions, where there are no analyzed businesses.

I: *Sample size and total number of companies*

	<i>Middle-sized</i>	<i>Large</i>
Sample	26	9
Total number of companies	31	9

Source: own processing

Note: Chi-square test = 0.8065; critical value ($df = 1$, $\alpha = 0.05$) = 3.841. The sample represents the structure of total population

Following Table II shows the amount of drawn resources under the RDP (Axis 1, sub measure I. 1.3) and National subsidies (National programme 13) per business. Table I used the abbreviation "NS" for National subsidies and grants from the Rural Development Programme 2007–2013 used the "RDP". The average amount of grants from the RDP is significantly higher than from the National subsidies. Only two companies drew from the RDP funds in 2007, however, since 2010 this number of businesses has expanded. In the case of drawing

National subsidies the gradual reduction has occurred from 2010, there was no enterprise drawing funds from National subsidies in the last two years.

Table III lists the basic economic indicators that are analyzed. That means labour productivity, debt ratio, sales and production consumption. The table shows the average values, standard deviation, min and max values.

RESULTS AND DISCUSSION

The effect of grants (National subsidies according to the principles of Ministry of Agriculture and grants from the Rural Development Programme 2007–2013) was tested by fixed effect model on selected economic indicators, ie. on labour productivity, debt ratio of enterprise, sales, production consumption, sales to total assets ratio and production consumption to sales ratio. The following table IV shows the results of the model. The values in parentheses indicate the standard deviation, p-value is listed in the brackets. In addition, the table also shows the influence of each year, but only those that significantly affected the value of indicator. In the file resulted only the effects of variables dt_2 and dt_3 , ie. the influence in 2008 and 2009.

The first examined variable is the labour productivity, respectively the impact of subsidies on its amount. According to the estimated model, the grant from the Rural Development Programme for 2007–2013 had no significant impact on labour productivity. However, National subsidies significantly affect its amount in a positive way. Every thousand of CZK of National subsidies (resp. funds from the National programme 13) increased labour productivity by 0.031 CZK (at significance level $\alpha = 0.1$). Despite a slight increase in productivity, national subsidies fulfill the purpose for which they are provided. This means they help to increase the competitiveness of food, respectively dairy

II: *Development of resources drawn from National subsidies and the RDP in 2007–2013 per enterprise (in CZK)*

	2007	2008	2009	2010	2011	2012	2013
RDP	6,455,735	17,034,850	17,164,227	13,309,553	22,638,531	26,593,600	16,49,071
NS	2,672,696	7,178,186	4,347,580	3,375,429	4,384,339	0	0

Source: own processing according to the Ministry of Agriculture

III: *Economic indicators of dairy enterprises in 2013*

	<i>Labour productivity</i>	<i>Debt Ratio</i>	<i>Sales</i>	<i>Production consumption</i>	<i>Sales/Total assets</i>	<i>Production consumption/Sales</i>
Average	0.64	61.88	930,314.6	773,561.9	3.18	0.88
Standard deviation	0.43	23.94	1,112,566	912,770.5	12.07	1.06
Min	-1.25	14.99	450	1,055	0.02	0.36
Max	1.66	122.19	5,231,699	4,153,469	7.25	2.34

Source: own processing.

Note: table is presented in thousands CZK, debt ratio in %, sales/total assets and production consumption/sales in CZK

businesses. Labour productivity as a whole was also affected by the market situation in 2008 which increased the labour productivity by 0.28 thousand CZK. Increase in labour productivity was due to the reduction of value added, respectively part forming the value-added (sales) which increased the total value of labour productivity. Labour productivity growth through investment aid in the Czech food industry (sub measure I. 1.3.1) was also demonstrated by authors (Mezera and Špička, 2013). Similarly, it was demonstrated by Medonos *et al.* (2012) in grants under the RDP 2007–2013 measure I. 1.2.1 Modernization of agricultural holdings in case of Czech farms.

Testing the impact of subsidies on the debt ratio of enterprises was not proved to be statistically significant. Grants from the RDP or National subsidies do not have a significant impact on debt ratio and do not burden on businesses financially. However, research of Mezera *et al.* (2014), who focused on the evaluation of sub measure I. 1.3.2,

have shown that investment aid helps to reduce debt to the firms that are involved in drawing subsidies.

It is possible to evaluate the impact of the National grant program 13 as positive and statistically significant for sales of the company (at a significance level $\alpha = 0.05$). Every thousand CZK of National subsidies will bring 38.5 thousand CZK revenues. Therefore grants significantly help businesses increase their sales. The subsidies apply to investments in modern equipment and applying new technologies, investments with changes in the manufacturing process, improve processing, quality and the introduction of environment friendly technologies. These investments help dairy enterprises to improve their position on the Czech market through quality improvement, wholesomeness and quality of their products and by this increase of their competitiveness, marketing and sales. The market situation in 2008 also contributed to the development of indicators of revenues which significantly reduced the sales of dairy enterprises

IV: Fixed effect model – results

	Labour productivity	Debt Ratio	Sales	Production consumption	Sales/Total assets	Production consumption/ Sales
Intercept	0.6386	120.9510	91,8675.0	752,080.0	7.92558	0.8790
	(0.1021)	(45.7640)	(5,4175.0)	(41,939.9)	(4.47239)	(0.0388)
	[<0.0001]	[0.0089]	[<0.0001]	[<0.0001]	[0.0779]	[<0.0001]
RDP subsidies	-5.15*10 ⁻⁶	0.0002	-3.1275	-2.2974	2.64*10 ⁻⁵	-1.01*10 ⁻⁵
	(4.47*10 ⁻⁶)	(0.0002)	(2.2572)	(1.2377)	(2.60*10 ⁻⁵)	(1.09*10 ⁻⁵)
	[0.2501]	[0.4080]	[0.1674]	[0.0649]	[0.3125]	[0.3541]
National subsidies	3.07*10 ⁻⁵	-0.0006	38.4815	35.3449	-0.0002	-6.62*10 ⁻⁵
	(1.73*10 ⁻⁵)	(0.0020)	(19.2581)	(20.131)	(0.0002)	(7.05*10 ⁻⁵)
	[0.0776]	[0.7661]	[0.0470]	[0.0807]	[0.3772]	[0.3482]
dt_2	0.2871		-50,137.5			
	(0.1363)		(25,597.7)			
	[0.0364]		[0.0515]			
dt_3			-155,003.0	-137,644.0		
			(58,581.1)	(55,292.7)		
			[0.0088]	[0.0136]		
Wald test for common significance of time variables	10.1006	14.3231	14.7924	18.8527	11.0252	4.1603
	[0.1205]	[0.0262]	[0.0219]	[0.0044]	[0.0876]	[0.6549]
Wald test for groupwise heteroskedasticity	323,207.0	174,966.0	31,121.1	27,279.7	60,042.0	72,382.4
	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]
Chow test for poolability	1.9536	1.1366	115.6850	107.3210	1.2245	1.2773
	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]	[0.1973]	[0.1538]
Durbin-Watson statistics	2.0172	1.1505	0.5726	0.7203	1.1396	2.2677
	[0.9772]	[<0.0001]	[<0.0001]	[<0.0001]	[0.0002]	[0.9988]

Source: own processing.

by 50,137.5 thousand CZK (at significance level $\alpha = 0.1$) as well as the following year, 2009, when the sales declined by 155,003 thousand CZK (at significance level $\alpha = 0.01$). In these years there was a decline in agricultural product prices, a decline in production and a decline in milk purchases of milk dairies. In both those years there was a decline in prices of dairy products on the world market due to the production growth of suppliers outside the EU and also due to a decrease in demand for milk and milk products due to the crisis. Despite these negative influences national dairy subsidies have helped businesses to stabilize their revenues. The positive impact of investment aid to businesses has been demonstrated in a number of foreign studies, such as Bernini and Pellegrini (2011); Geroski and Toker (1996); Freil (2000).

Influence of the cost item was chosen as the last observed variable, i.e. production consumption. Statistically significant effect of subsidies from the RDP and National subsidies appears in this variable. Every thousand CZK from grants from the Rural Development Programme will reduce production

consumption by 2.3 thousand CZK (at significance level 0.1). RDP subsidies help businesses to reduce their consumption of materials, energy and services and to achieve savings and improve efficiency of dairy enterprises. In the case of National subsidies it leads to the opposite effect. Every thousand CZK of National subsidies will increase production consumption by 35.3 thousand CZK (at significance level 0.1). The influence of 2009 is evident here, it resulted in decrease of production consumption by 137,644 thousand CZK. The cause of a significant decrease in production consumption can also be a drop in the prices of purchased milk and thus the reduction of the volume of milk for further processing in dairies. National subsidies had a negative impact on production consumption (the growth), primarily because these aids were drawn during the crisis.

The grants from RDP and National subsidies have no statistical significant impact on the last two tested variables, sales to total assets and production consumption to sales.

CONCLUSION

The article dealt with the evaluation of the impact of investment aid drawn from the Rural Development Programme for 2007–2013 and the National subsidies (National programme 13) on selected economic indicators. The results indicate that National subsidies have more significant impacts – on sales of businesses and labour productivity. These two indicators increased. A significant factor is also the production consumption, which increases due to the drawdown of subsidies. Grants drawn mainly from EU funds (RDP grants, respectively subsidy within the sub measure Adding value to agricultural and food products) significantly affected only one indicator – production consumption, which is reduced. Their impact is not seen in other indicators. Therefore, it is necessary to carry out evaluation of investment projects and evaluate the impact of RDP subsidies in other sectors of the food industry. Monitoring of the status of ongoing projects during using grants and even after their completion and relying primarily on indicators which may show the effects of the aid (comparison of inputs and outputs, the evaluation of results) needs to be consistent.

Acknowledgement

This article was created with the support of the Internal grant agency of the Faculty of Economics and Management of the Czech University of Life Sciences Prague. Grant title: Analysis of the Effectiveness of Investment Aid in the Field of Food Industry. Registration number 20151028.

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