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Evaluation of the Economic Impacts of the European Rural Development Program in Austria

Oliver Meixner[1] , Franz Schlögl[2], and Manfred Pichlbauer[1]

[1]*Institute of Marketing & Innovation, Department of Economics and Social Sciences*
University of Natural Ressources and Life Sciences, Vienna, Feistmantelstr. 4, 1180 Vienna / Austria
[2]*Strategie | Projekte | Schlögl, Hlawkag. 6/1/30, 1100 Vienna / Austria*
oliver.meixner@boku.ac.at; office@schloegl.co.at

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ABSTRACT

The results of an ongoing evaluation process of EU subsidies of the European Rural Development Programme 2014-20 are presented (2nd intermediary report). By means of personal interviews of subsidised companies in the Austrian food and beverage sector, the impact of subsidies on profitability, competitiveness, and related variables are approximated. Data sources are, amongst others, conventional business data collected by personal face-to-face interviews, as well as financial statements of companies. The results show that subsidies in general have positive effects. In addition, two third of the sample would change their investments significantly or even refrain from investing at all without public support.

Keywords: Rural development programme; European Union; evaluation, business data

1 Introduction

Worldwide, public funding is used to reach specific goals with respect to regional development, in particular to promote economic welfare, while addressing environmental and social issues, or—more generally—public goods (e.g., Villanueva et al., 2015; Quiroga et al., 2019; Hermann et al., 2017, Sarvašová et al., 2019). These transfer payments are also under review by scientists with respect to their effects, scope, and impacts on the agricultural sector as well as on the economy and society as a whole. For example, Claassen et al. (2008) analyzed the cost-effectiveness of agri-environmental payments in the US. For decades, the EU has also been providing a number of subsidies for the European agricultural sector to promote rural development (regional structural funds, in particular the European Regional Developmental Fund; Charron, 2016). In addition to environmental and social goals, public funding is intended to increase the competitiveness of the agricultural sector within the food supply chain. This paper will focus only on subsidies granted for economic purposes within the Rural Development Program 2014–20 (RDP) of the European Commission. Additionally, most of the subsidies of the RDP are dedicated to other goals with social or ecological purposes (European Commission, n.d.).

In Austria, the Federal Ministry for Sustainability and Tourism is assigned the responsibility to distribute and guarantee the effective use of EU funds. The Ministry is obligated to review the success of the national RDP every two years (2017, 2019, and at the end of the RDP). To evaluate the success of the RDP public funding, the Ministry designated several independent evaluators for all kinds of areas (economic, social, and environmental targets).

The Institute of Marketing and Innovation (University of Natural Resources and Life Sciences, Vienna) took over the responsibility to evaluate the economic part of the RDP. In particular, the evaluation scheme focuses on target P3 of the RDP: "*Promoting food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management in agriculture*". The relevant focus area 3A addresses the competitiveness of producers: "*Improving competitiveness of primary producers by better integrating them into the agri-food chain through quality schemes, adding value to agricultural products, promotion in local markets and short supply circuits, producer groups and inter-branch organisations*" (European Commission, 2014). Public support for this focus area alone amounts to about 540 million Euros (in total, the public spending within the Austrian RDP 2014-20 amounts to almost 8 billion Euros). The measures of focus area 3A relevant for evaluation amount to more than 300 million Euros.

To approximate the effectiveness of the public spending, a sample out of all subsidized companies has been evaluated by means of several data sources: In addition to secondary data provided by the companies themselves, we conducted a number of in-depth personal interviews collecting business data, personal estimation of effects, satisfaction with application and transaction procedures, organizational issues, etc. The intention was to approximate the net effects of public funding in view of economic development in rural areas.

Meanwhile, the second intermediary report was finished, and in total, 69 companies were extensively evaluated for the report. At the end of the evaluation process, beyond 2020, a reliable estimation of net effects of the RDP should be possible in terms of economic development by including a comparative sample of companies that did not take part in the RDP. The intention of this contribution is to present intermediary results. An open discussion within the scientific community about the methodological approach and the validity and reliability of approximations and results should be initiated. After a short introduction to the European Rural Development Policy, the methodology of our evaluation procedure is presented, the empirical field is described, and the results are presented. The paper concludes with a section containing a discussion, limitations, and future outlook.

2 The European Rural Development Policy

The European Commission describes the rural development policy as follows: "The EU's rural development policy helps the rural areas of the EU to meet the wide range of economic, environmental and social challenges of the 21st century. Frequently called 'the second pillar' of the Common Agricultural Policy (CAP), it complements the system of direct payments to farmers and measures to manage agricultural markets (the so-called 'first pillar')" (European Commission, n.d.). The direct payments amount to 100 billion Euros from 2014 to 2020 (about 8 billion Euros for Austria).

Confirming the Regulation (EU) No 1305/2013, a "rural development policy should be established to accompany and complement direct payments and market measures of the CAP and thereby to contribute to that policy's objectives…" (§ 2) (EU, 2013). The main purpose of our study lies in the evaluation of economic support for agricultural holdings and companies, which is laid down in § 15 of the Regulation: "In order to improve the economic and environmental performance of agricultural holdings and rural enterprises, to improve the

efficiency of the agricultural products marketing and processing sector, including the setting up of small scale processing and marketing facilities in the context of short supply chains and local markets, to provide infrastructure needed for the development of agriculture and forestry and to support non-remunerative investments necessary to achieve environmental aims, support should be provided for physical investments contributing to these aims" (EU, 2013). Due to the large amounts of the subsidies, it is of primary importance to implement efficient evaluation schemes within the EU member countries (Andersson et al., 2017). In this context, relevant publications and analytical results are presenting a broad variety of results. For example, there is a "strong correlation […] between the amount of gross agricultural production and the volume of subsidies granted" (Vozarova and Kotulic, 2016). Other studies have revealed that—on a farm level—subsidies had positive effects on technical efficiency but were negatively correlated with productivity (Kumbhakar and Lien, 2010). Several studies have focused on specific agricultural sectors (Dolman et al., 2012; Kleinhanß et al., 2007) or regions (Vozarova and Kotulic, 2016). Within our contribution we do both, we analyzed the effects of subsidies on Austrian manufacturing companies (processing sector) and on farmer cooperatives, individual farmers, and networks within the agricultural sector. Therefore, the main research question is this: *Is it possible to validly measure the effects EU subsidies granted for investments intended to support positive economic effects (in view of competitiveness, efficient production, and profitability) for the Austrian agricultural sector and its position within the food supply chain?* In this respect, some authors have mentioned that most empirical research studies have placed their focus on the effects of subsidies on performance indicators (Blanes and Busom, 2004). We know from the literature that subsidies usually motivate companies to increase their competitiveness, for example by investing more in research and development activities (Huergo and Moreno, 2017). If this is true for our empirical field, too, participation in the RDP should result in the fundamental positive development of companies.

3 Methodology

3.1 Economic target and result indicators

To quantify the effects of the subsidies, the EU specifications concerning input, output, and result and impact indicators are relevant (Andersson et al., 2017). In accordance with studies like those of Dolman et al. (2012), Andersson et al. (2017), and others, the second intermediary evaluation focuses on a systematic comparison of beneficiaries before and after investments covering a number of relevant business indicators. In particular, the following priority, focus area, and target/result indicators are relevant for these comparisons:

- Related priority 3: Promoting food chain organization, including processing and marketing of agricultural products, animal welfare, and risk management in agriculture
- Focus area 3A: Improving competitiveness of primary producers by better integrating them into the agri-food chain through quality schemes, adding value to agricultural products, promotion in local markets and short supply chains, producer groups and organizations and inter-branch organizations
- Target indicator: Percentage of agricultural holdings receiving support for participating in quality schemes, local markets and short supply circuits, and producer groups/organizations

To approximate the effects of investments, a number of result indicators were developed, as has been done in the literature (Ehrmann, 2010; Quiroga et al., 2017). We collected data concerning economic variables like sales, profits, return on investment, added value, capital structure, and staff-related indicators (employment). These indicators refer to a time period before and after the investments. The data were collected by personal, in-depth interviews as well as by analyzing company reports and related information. In all, we got reliable data reflecting the financial and economic situation of the investigated companies/organizations before and after the investments. With this it should be possible to approximate the effects of public funding within the agricultural and food sector (at least at the end of the RDP after 2020; we will come back to this point at the end in Chapter 5: Discussion, limitations, and outlook). Although other approaches would be feasible, too—e.g., Villanueva et al. (2015) used a choice experimental approach to approximate the effect of public support on the production of environmental public goods and of farmers' preferences—our approach is definitely appropriate to assess the *economic development* of companies and the effects of investments in view of *competitiveness* (and by that the economic effects of public funding). In addition, the second intermediary report only addresses supported companies. In the future, nonsupported companies will also be analyzed to validly assess the effects of subsidies (as was done by Espinosa-Goded et al. [2013], who compared contractors and noncontractors of agri-environmental schemes). To approximate the influences and dependencies of the various indicators, we used a simple correlation analysis as done by Vozarova and Kotulic (2016).

3.2 Empirical field

The empirical field of this study comprised all Austrian companies/organizations that got support for their investments within the RDP 2014-20, priority 3, focus area 3A (Table 1). Until the end of 2018, total public support amounted to 2.8 billion Euros (without land-related subsidies). Approvals covered 57.1% of the total public support. However, we were only responsible for the evaluation of specific, mainly economic activities/targets (only the codes listed in Table 1).

Table 1.
Selected activities/targets of RDP in Austria—approvals and payments

Code [a]	Activities/targets	Public support [Mio. €]	Approvals			Finished by end of 2018	Evaluation	
			Appli-cations	Support [Mio. €]	% of public support		n (%)	Investments [Mio. €]
3	Quality schemes for agricultural products and food	133.0	43 458	79.6	59.8			
3.1.1	New participation in quality schemes	91.0	43 431	55.6	61.1	189 [c]	[c]	[c]
3.2.1	Information and sales promotion activities of agricultural co-operatives	42.0	27	24.0	57.0	8	3 (37.5)	1.5
4	Investments in physical assets [b]	904.3	21 075	552.4	61.1			
4.2.1	Processing, marketing and development of agricultural products	123.5	293	88.7	71.8	168	63 (37.5)	126.0
16	Co-operation [b]	117.4	143	59.2	50.4			
16.04.1	Horizontal and vertical co-operation between members of supply chains/short supply chains, local markets, and respective sales promotion activities	7.5	17	3.0	40.2	7	3 (42.9)	0.3
16.10.1	Implementation and operation of clusters	33.9	12	19.8	58.3	0	0	
16.10.2	Implementation and operation of networks	16.0	1	10.5	65.6	0	0	
16.10.3	Co-operation producer groups/ -organisations, cooperatives, sector associations	3.8	4	3.4	91.4	0	0	
Total (without land-related subsidies)		2 847.3	86 855	1 626.7	57.1			
Total (including land-related subsidies)		7 698.4						
Total (relevant for evaluation)		317.7	43 785	204.9	64.5	[c]		
Total (relevant for evaluation excl. 3.1.1) [c]		226,7	354	149,3	65,9	181	69 (38.1)	127.8

[a] selected activities/targets relevant for study; codes are not identical with EU classification
[b] including all other activities/targets [codes] not listed in Table
[c] Code 3.1.1 will be evaluated at the end of RDP (beyond 2020)
Status: 30 June, 2019; source: own calculations based on data from Federal Ministry Republic of Austria Sustainability and Tourism (BMNT), Section II/1

In all, the evaluation covers 317.7 million Euros of public support, of which 65% of that sum were approved through the end of 2018 (31% were paid out). The most important single activity is code 4.2.1, "*Processing, marketing and development of agricultural products*" (123.5 million Euros of public support), followed by code 3.1.1, "*New participation in quality schemes,*" with 91.0 million Euros. Code 3.1.1 activities (quality schemes) will be evaluated at the end of the RDP after 2020 because the single subsidies are low (more than 43,000 applications). The second midterm evaluation includes the evaluation of activity/target codes 3.2.1, 4.2.1, and 16.04.1. It is not possible to evaluate codes 16.10.1–16.10.3 as no project was finished until the deadline of the second midterm evaluation (end of December 2018). The number of approved projects (without code 3.1.1) is 354, with a total support sum of 226.7 million Euros. By the end of 2018, 181 of these projects had been terminated.

4 Results

The following section presents selected results of the evaluation process done so far. After a general description of the sample, we will briefly show insights into investments and the outcome of those. After that, selected result indicators are presented to analyze the economic outcome, including approximations of the effects of public support.

4.1 Sample size and structure

Through the end of June 2019, the sample size amounted to 69 companies/organizations, almost all of them from code 4.2.1 (*processing, marketing, and development of agricultural products*; *n*=63), which has by far the highest number of applications (other than code 3.1.1) and finished projects. Three evaluations belong to code 16.04.1 (*co-operation*), and another three to code 3.2.1 (*information and sales promotion activities of agricultural co-operatives*; Table 1). Given the sample size (*n*=69), we evaluated 38.1% of all finished projects. Most of the investigated companies/organizations are from the sectors of fruits and vegetables (*n*=14), milk and milk products (*n*=14), and arable crops (*n*=12) (Table 2).

Table 2.
Sectoral structure of sample

Sector	*n*	*n*%
Fruits and vegetables, incl. ornamental plants	14	20.3
Arable crops (grain incl. corn, oilseeds and protein plants), seeds and planting materials	12	17.4
Wine	8	11.6
Meat	6	8.7
Milk and milk products	14	20.3
Oil pumpkin, other oil and fibre plants, healing and spice plants	2	2.9
Eggs	2	2.9
Others	5	7.2
(Agricultural co-operatives) [a]	(6)	(8.7)
Total	69	

[a] Per se, co-operatives do not belong to one specific sector and would be usually summarised amongst "Others" if they cannot be assigned to one specific sector (e.g., farmers market co-operatives).

4.2 Investments

On average, the investigated companies/organizations invested about 1.85 million Euros (mean *M*). The median *MD* amounts to 750,000 Euros. However, the span of investments is very broad, with a minimum investment of 20,000 Euros and a maximum of 17 million Euros (standard deviation *SD*=2,139,494). The overall distribution of the investments can be taken from Table 3. The total investments amount to about 127.8 million Euros. The majority of these investments refer to code 4.2.1 (126 million Euros; Table 1).

Table 3.
Investments (*n* = 69)

Distribution	
Mean *M*	1 851 705
Standard deviation *SD*	2 139 494
Quantiles	
Minimum	20 000
Lower quantile (25%)	211 000
Median *MD* (50% quantile)	750 000
Upper quantile (75%)	2 000 000
Maximum	17 000 000
Total investments	127 767 619

Most of the investments were done to purchase new machines or production facilities (*n*=51, i.e., 73.9% of all companies invested in new machines/production facilities; multiple answers were possible). Of the companies, 49.3% (*n*=34) invested in improvements of production processes, 36.2% (*n*=25) in storage, and 33.3% in buildings (*n*=23).

About one-fourth of companies made direct investments in marketing and sales (*n*=18, 26.1%). The analysis clearly shows the importance of production-related investments.

Public support was very important concerning the willingness to invest: Less than one-third of the companies would have made investments to the same extent even if no subsidies were available (*n*=21; 30.4%); 36.2% would have reduced the investments (*n*=25), and the rest would not have invested at all (*n*=23; 33.3%).

4.3 Selected economic result indicators

In the following section important economic result indicators are presented (before and after investment). Because not all indicators could be calculated for all participating companies, *n* is usually lower than the full sample size (*n*=69).

Change in capacities and degree of production capacity utilization: One of the most important nonmonetary output variables is the change in capacities (production, storage, and machines). The participants in the study produced various goods and services and delivered a broad diversity of capacities (pieces produced, tons, hectoliters, etc.). In all, 51 of 69 companies were able to deliver reliable data for production capacities before and after the investment (*n*=49 for storage and *n*=44 for machines). The distribution of the change in production and storage capacities can be taken from Figure 1. The missing data (18 for production capacity) resulted from the inability to deliver valid data, e.g., because the overall capacities within a farmers' cooperative could not be estimated. In addition, the target of two of the projects was to generate completely new capacities. For these projects before/after comparison of capacities was not feasible.

Due to the investments, production capacities of most companies/organizations rose significantly (*M*: +71.7%; *MD*: +31.3%; Table 4 in the Annex). While the majority of production changes ranged between no change to +70%, some companies more than doubled, tripled, or even quadrupled their production capacities. Changes in storage and machine capacities were similar and can be taken from Table 4 in the Annex.

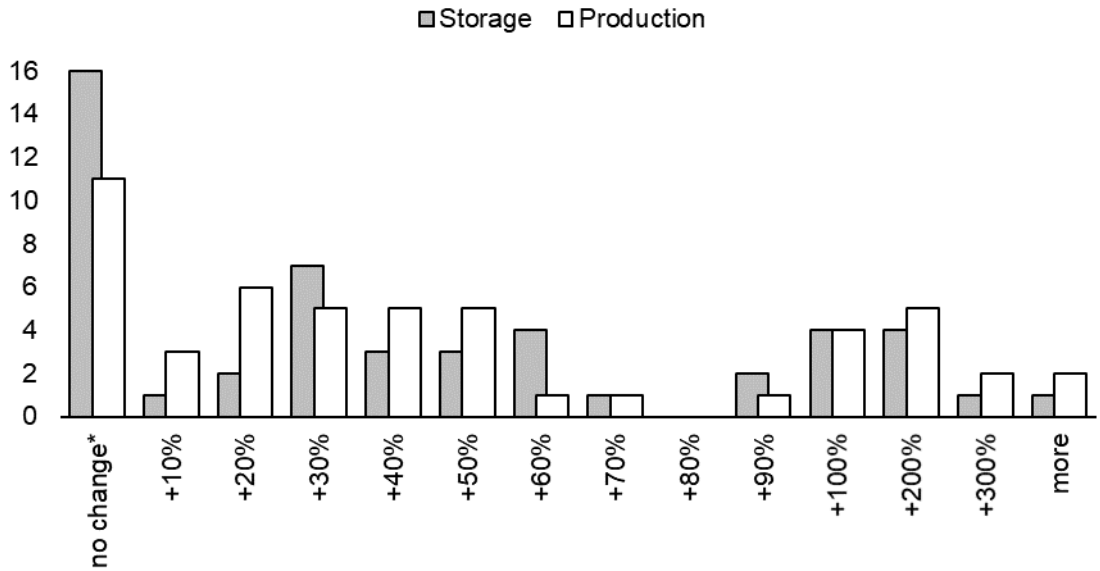

Figure 1. Distribution of production and storage capacities, all evaluated companies/organizations (end of 2018; *n*=51 production], *n*=49 [storage])

At the same time, the degree of *capacity utilization* went down (on average by -8.9% from 88.9% to 80.0%) (Table 4 in the Annex) which is not surprising in view of the significant rise in capacities.

Table 4.
Capacities and degree of capacity utilization before and after investment (I)

	Change capacity			Degree of capacity utilisation		
n	51	49	44	49	49	
	production %	storage %	machines %	before i. %	after i. %	change %
Distribution						
Mean	+71.1	+52.4	+57.0	88.9	80.0	-8.9
Standard deviation	72.4	49.9	198.0	43.9	39.8	
Quantiles						
Minimum	0.0	-30.0	-36.9	30,0	42,0	+12.0
Lower quantile (25 %)	+7.9	+0.0	+0.1	90,0	70,0	-20.0
Median (50 % quantile)	+31.3	+29.3	+36.8	99,0	80,0	-19.0
Upper quantile (75 %)	+93.0	+66.7	+195.7	100,0	95,0	-5.0
Maximum	+566.7	+400.0	+1935.1	105,0	120,0	+15.0

Capital and return on investment (ROI): Capital structure and ROI deliver important result indicators characterizing the overall financial situation and development of companies/organizations and the success of their investment. On average, *total capital* increased by +1,393,917 (*M* increased by +16.7 %). The equity capital ratio went down by -0.021 points but was still very high, reflecting almost half of the total capital (Table 5).

Table 5.
Capital structure and ROI before and after investment

	total capital before i.	total capital after i.	total capital change	equity ratio before i.	equity ratio after i.	equity ratio change	ROI before i.	ROI after i.	ROI change
n	41	40		41	40		41	40	
Distribution									
Mean *M*	8 349 895	9 743 812	+1 393 917	0.510	0.489	-0.021	0.100	0.077	-0.023
Standard deviation *SD*	10 280 589	11 401 185		0.31	0.30		0.101	0.047	
Quantiles									
Minimum	35 600	39 000	+3 400	-0.52	-0.50	-0,03	-0.060	-0.018	+0,042
Lower quantile (25 %)	1 340 617	1 822 158	+481 540	0.21	0.25	-0,04	0.022	0.035	+0,013
Median *MD* (50 % quantile)	3 092 731	3 858 787	+766 056	0.52	0.44	+0,08	0.056	0.064	+0,008
Upper quantile (75 %)	8 499 500	10 105 986	+1 606 486	0.82	0.72	+0,11	0.100	0.089	-0,010
Maximum	106 837 000	116 665 000	+9 828 000	1.00	1.00	+0,00	1.043	0.257	-0,787

ROI decreasing from 0.100 to 0.077 (*M* decreased by -0.023 points). Taking *MD*, ROI rose from 0.056 to 0.064. The group of companies with a rising ROI more or less equaled the group with a decreasing ROI (with a small group of companies with no change of ROI). Therefore, we could not identify a clear trend within our evaluation sample. The same conclusion can be drawn for the other capital-related indicators: For both capital and ROI, range of the indicators was large, which clearly reduced the degree to which the results can be generalized.

Sales, profit, and value added: To approximate the economic success of the investments, several output variables were measured. Sales and profit numbers allowed for the estimation of the market success of the companies/organizations before and after the investment. In addition, value added was approximated.

Table 6.
Sales and profit

	sales before i.	sales after i.	sales change	profit before i.	profit after i.	profit change	Value added before i.	Value added after i.	Value added change
n	52	53	51	48	46	43	41	40	40
Distribution									
Mean *M*	10 884 015	12 321 078	+1 437 062	275 530	337 888	+62 358	3 210 207	4 088 398	+878 192
Standard deviation *SD*	21 041 319	23 099 016		442 310	445 636		16 695 503	18 062 533	
Quantiles									
Minimum	6 900	11 310	+4 410	-880 000	-800 000	+80 000	-56 383 595	-59 718 607	-3 335 012
Lower quantile (25 %)	442 026	637 099	+195 073	34 904	51 779	+16 875	84 105	183 607	+99 502
Median *MD* (50 % quantile)	1 688 500	2 000 000	+311 500	102 500	157 104	+54 604	483 766	734 319	+250 553
Upper quantile (75 %)	10 142 186	10 475 411	+333 225	461 181	519 430	+58 249	3 677 000	5 220 000	+1 543 000
Maximum	108 564 448	115 000 000	+6 435 552	1 800 000	1 600 000	-200 000	91 185 727	97 443 241	+6 257 514

On average, *sales* and *profits* rose significantly (M_{sales}=+1,437,062 [+13.2%]; M_{profit}=+62,358 [+22.6%]; Table 6). But again, the variation of the change in sales and profits was large. In particular, there seemed to be one group of companies that succeeded in increasing sales to a much higher extent compared to all other companies (Figure 2). Distribution of profits showed comparable results, but the changes were even more diverse. Therefore, the calculation of *M* and *MD* might be misleading, as the heterogeneity of individual results was remarkable (*SD* in Table 6). Overall, most companies were seen to increase their sales and profits, and in all likelihood they could benefit from investments and subsidiaries.

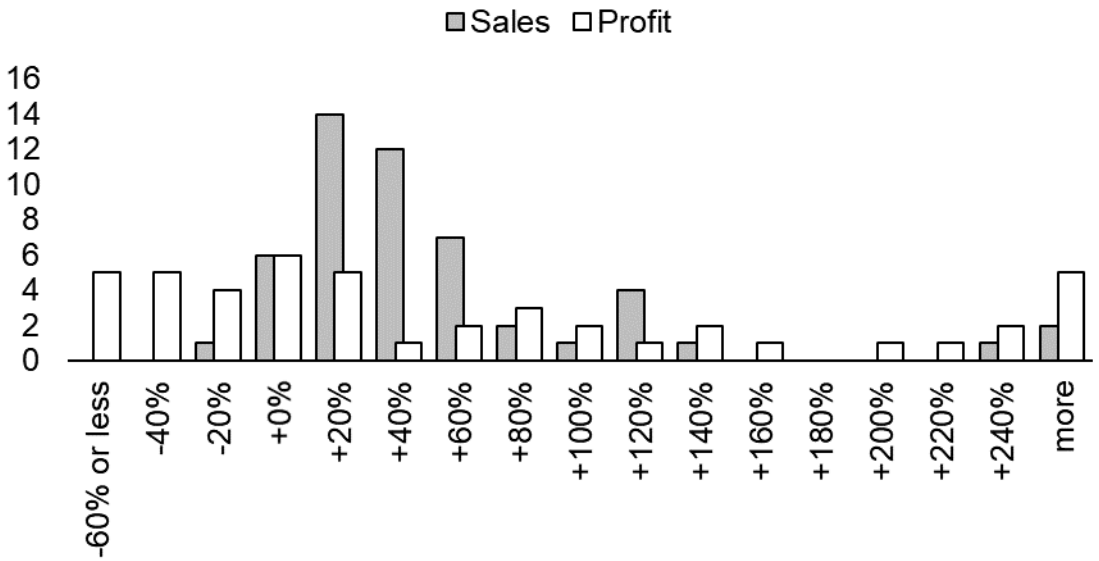

Figure 2. Distribution of change in sales (*n* = 51) and change in profit (*n* = 46)

The *value added* was calculated based on monetary input (production cost, staff, annual depreciation, energy cost, and other input data) and output variables (sales, change in inventories). The absolute numbers should therefore not be taken as a complete set of result indicators. Due to missing data, data access limitations, and our approach in data acquisition (face-to-face interviews), only a limited set of variables could be used to approximate the value added before and after the investment. Based on a limited set of complete input and output data (*n* = 44), the value added increased on average by +878,192 Euros (+27.4 %) from 3,210,207 to 4,088,398 Euros before and after the investment. *MD* amounted to +250,553 (from 483,766 to 734,319 Euros). Again, the range of the deviations was large.

Market share: It was almost impossible for the interviewees to quantify the effects of the investments in view of the deviation of market shares due to the investments. Therefore, we simplified data collection by using a simple Likert scale from 1 (significant reduction of market share) to 5 (significant increase of market share) and a midpoint of 3 (no change). Only 2 companies out of 61 that answered this question assumed a reduction in market share. Most of them assumed an increase (22; 36.1%) or even a significant increase (28; 45.9%). Nine

interviewees (14.8%) revealed no change. These qualitative estimations might be too optimistic. However, even if the effects were overestimated, the general picture was quite consistent compared to the other outcomes concerning sales, profit, and value added. Therefore, we assume that the overall competitiveness of most companies taking part in RDP increased significantly.

4.4 Correlation between result indicators

The core research goal of this study was to approximate the effectiveness of subsidies in view of higher competitiveness and profitability. Therefore, we identified the relations between the different result indicators by means of a simple correlation analysis. As this was only the second midterm evaluation, with a limited set of data (and other limitations that will be discussed later), this simplified analytical approach was sufficient to see whether there were any connections between the variables. The basic hypothesis was that *if companies/organizations are investing money to improve their profitability and competitiveness, thereby binding capital (partly supported by public organizations), this will result in higher sales, ROI, profits, etc*. If this hypothesis holds, public authorities should pursue the inducement of investments by offering public support. As mentioned above (Chapter 4.2), two-thirds of our sample would change their investments significantly or even refrain from investing at all without public support. Thus, without subsidies (and assuming that the hypothesis holds), the economic effects would be much lower.

The results of the correlation analysis can be taken from Table 7 (for a full matrix see Table 8 in the Annex). There are some quite interesting and feasible conclusions based on this explanatory correlation analysis. Of course, not all significant correlations are surprising. In particular, the correlations between capital, equity ratio, and ROI are obvious, as these variables are interdependent or were used for calculation purposes (like in the case of ROI). The negative relation between the change in production capacity and the degree of production capacity utilization is also not surprising (r = -0.430). Increasing capacities probably lead to free capacities. It is not likely that additional capacities can be used immediately without any delay. Further, companies are eager to dispose of buffer capacities to meet future demand. In particular, those companies that operated at full use of capacities in the past will benefit from that and gain higher flexibility. The most important effects of higher production capacities are the high correlation with value added (r = 0.702), and the positive influence on sales with r = 0.556 (there is also a slight correlation with total capital; r = 0.295). We found no significant relations between profits and all other economic indicators (Table 8 in the Annex).

Table 7.
Correlation analysis (reduced matrix)—significant correlation coefficients (r)

	Change in sales	Change in total capital	Change in equity ratio	Change in ROI	Change in production capacity	Change in storage capacity	Change in machine capacity	Change in degree of production capacity utilisation
Investment cost							0.479**	
Change in value added	0.479**				0.702**			
Change in sales		0.441**			0.556**	0.375**		
Change in total capital			-0.755**	-0.899**	0.295*			
Change in equity ratio				0.762**				
Change in production capacity								-0.430**

**highly significant below 0.01
* significant below 0.05

The size of the investment itself had more or less no significant influence on other variables (with the exception of a significant correlation between investment cost and machine capacities; r = 0.479). In particular, there was no influence on changes in sales, profits, etc. Changes in sales correlated with changes in total capital (r = 0.441), and with production (r = 0.556) and storage capacities (r = 0.375).

The assumption could be that investments in marketing by use of borrowed or equity capital positively influence sales. However, additional evidence would be necessary to confirm this hypothesis.

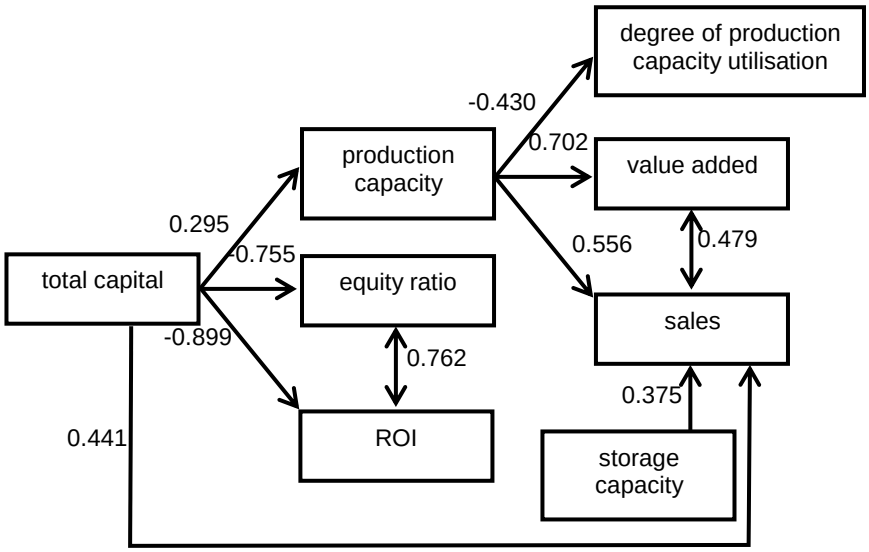

Figure 3. Relations between result indicators—correlation coefficients *r*

The correlation analysis can be visualized, as shown in Figure 3, containing all significant relations between the result indicators (despite the isolated correlation between investment cost and machine capacity). From this analysis it is clear that in particular investments in production capacity lead to higher output, resulting in higher sales and value added. However, the actual simplified correlation analysis is no more than a starting point for further research. In particular, we have to determine why changes in the capital structure have a negative influence on ROI (and less surprisingly, on equity ratio). More sophisticated methods like structuring equation modelling in connection with larger samples could deliver valuable insights here.

5 Discussion, limitations, and outlook

The evaluation of the effectiveness of RDP funding can be considered to be part of the research that is done in connection with evaluating the "efficacy of Structural Funds in delivering economic cohesion" (Charron, 2016, p. 641). Charron (2016) reported a number of studies, usually using mixed empirical approaches, that differed in many dimensions. As pointed out by Andersson et al. (2017, p. 306), "the methods applied to arrive at the recommendations may be questioned regarding their scientific foundation." We addressed the lack of a theoretical foundation by applying standard economic indicators to approximate the effects of investments. In this approach, we relied on typical economic parameters to assess the economic status and competitiveness of companies. This approach, of course, also has its weaknesses, as we had to focus on economic key characteristics only (based on our predefined core role as evaluators), leaving other effects untouched (like social coherence, prevention of rural depopulation, etc.).

The research question we tried to answer is this: *Is it possible to validly measure the effects of EU subsidies granted for investments intended to support positive economic effects (in view of competitiveness, efficient production, and profitability) for the Austrian agricultural sector and its position within the food supply chain?* Altogether, it seems to be possible to assess the effectiveness and suitability of subsidies and investments via our methodological approach. However, as we saw from the analysis above, there are some shortcomings and limitations that have to be considered:

(1) It is difficult to aggregate results. The variation of data was typically large. Heterogeneity of individual results complicated generalizations; the range of data was simply too wide for some indicators to make conclusions that are valid for the whole sector. More sophisticated analytical tools will be helpful here (e.g., cluster approaches, regression analysis, structuring equation modelling, etc.) and shall be used in future evaluations and analysis. This finding is comparable to other studies dealing with public funding and the heterogeneity of results (Villanueva et al., 2015).

(2) Taking all the information above and trying to aggregate these results leads to the following conclusion: One may expect that investments induce mostly positive effects. As we saw above, investments usually have a positive effect on important economic variables like sales, profitability, and value added. Other variables are either not affected or even reflect negative effects. In particular, capital structure and return on investment should be mentioned here. Here we encountered developments that are far more controversial compared to the general positive developments of sales and profits. ROI and equity capital ratio worsened for some of the evaluated companies (although no clear trend can be detected). This could be due to more long-term effects that were not assessed with our approach. However, this could also be due to negative developments in terms of the outcome of investments. More research would be beneficial here, for example by using long-term, in-depth, qualitative approaches in particular with those companies with less favorable developments in terms of ROI and capital structure.

(3) As we further argued (based on empirical evidence), one may induce companies to make investments by offering significant subsidies; we saw that most of the respondents would refrain from making investments (or at least from some types) without public financial support. However, this is only a very rough estimation of the effects of subsidization. We did not assess the respondents' affinity to subsidies, as done by Quiroga et al. (2019), for the forest sector by identifying drivers like management styles, regional differences, and forest land characteristics by means of a probit model. More empirical studies using adequate methodological approaches are necessary to improve the validity and reliability of our simplified approach and the resultant assumptions.

(4) Until now the sample size has remained rather low, even though we evaluated 38% (69 of 181) of all finished investments that belong to the relevant areas of the study (see codes in Table 1). The reliability of generalizations is therefore limited. In addition, there were a number of missing values, mainly due to nonavailability of economic data. As usual in the agricultural sector, this was expected. And as a result of the first evaluation period, a number of significant modifications were already introduced in the second midterm evaluation (in particular, qualitative evaluations and verbal descriptions instead of hard facts where appropriate). Additional changes will be included for the final evaluation period beyond 2020.

(5) To validly approximate the effects of subsidies, a comparable sample of nonsupported companies/organizations, representing a statistically valid control group, will be inevitable, as done by Espinosa-Goded et al. (2013). This will be done on the occasion of the final evaluation beyond 2020. Furthermore, effects can be assessed and characterized only for supported companies. Effects on companies that are up- or downstream in the supply chain (like subcontracting farmers) are not directly measurable. This is also an important field for future research.

Altogether, the second midterm evaluation study showed that public support (EU subsidies within the framework of the RDP) induces investments, at least in the part of the agricultural and food sector that was analyzed within this study. Based on our empirical results, competitiveness is assumed to increase, and profitability and sales as well. Therefore, the answer to our research question is positive: *It is possible to validly measure* the effects of EU subsidies; however, to approximate the true proportion of effects that are due to the RDP support, a comparison with non-supported companies will be necessary in the future (and will follow at the end of the evaluation of the RDP program beyond 2020). The intention to induce investments supporting positive economic effects, in view of competitiveness, efficient production, and profitability, seems to work. As these effects are in general positive, it is plausible to assume that the market power of the agricultural sector within the food supply chain is strengthened. However, more research will be necessary here, in particular to assess the impacts of subsidies on companies that are up- or downstream within the supply chain.

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Annex

Table 8.
Correlation analysis (full matrix)

	Investment cost	Change in value added	Change in sales	Change in profit	Change in total capital	Change in equity ratio	Change in ROI	Change in production capacity	Change in storage capacity	Change in machine capacity	Change in degree of production capacity utilisation
Investment cost	1									0.479**	
Sig.										0.001	
N	69									45	
... value added	-0.076	1	0.479**					0.702**			
Sig.	0.625		0.001					0.000			
N	44	44	44					43			
... sales	-0.174	0.479**	1		0.441**			0.556**	0.375**		
Sig.	0.222	0.001			0.003			0.000	0.009		
N	51	44	51		44			50	48		
... profit	-0.113	0.198	0.141	1							
Sig.	0.456	0.222	0.361								
N	46	40	44	46							
... total capital	-0.093	0.085	0.441**	0.048	1	-0.755**	-0.899**	0.295*			
Sig.	0.537	0.601	0.003	0.77		0.000	0.000	0.049			
N	46	40	44	40	46	46	39	45			
... equity ratio	0.094	0.023	-0.294	0.145	-0.755**	1	0.762**				
Sig.	0.534	0.89	0.053	0.373	0.000		0.000				
N	46	40	44	40	46	46	39				
... ROI	0.025	-0.032	-0.280	0.098	-0.899**	0.762**	1				
Sig.	0.882	0.855	0.089	0.559	0.000	0.000					
N	39	35	38	38	39	39	39				
... production capacity	-0.051	0.702**	0.556**	0.132	0.295*	-0.089	-0.212	1			-0.430**
Sig.	0.722	0.000	0.000	0.392	0.049	0.561	0.201				0.002
N	52	43	50	44	45	45	38	52			51
... storage capacity	0.141	0.076	0.375**	-0.279	-0.074	0.054	0.090	0.156	1		
Sig.	0.333	0.632	0.009	0.073	0.643	0.735	0.600	0.291			
N	49	42	48	42	42	42	36	48	49		
... machine capacity	0.479**	0.090	-0.025	0.149	0.059	-0.076	-0.158	0.162	-0.038	1	
Sig.	0.001	0.592	0.871	0.366	0.717	0.640	0.372	0.294	0.813		
N	45	38	43	39	40	40	34	44	42	45	
... prod. cap. utilisation	-0.211	-0.191	-0.070	0.023	-0.267	0.231	0.244	-0.430**	-0.052	-0.264	1
Sig.	0.137	0.220	0.633	0.88	0.08	0.131	0.145	0.002	0.727	0.088	
N	51	43	49	44	44	44	37	51	47	43	51

** highly significant $p \leq 0.01$

* significant $p \leq 0.05$

Note: In the correlation matrix in Table 8, the lower diagonal part and the upper are equal. In order to visualise significant correlations, in the upper diagonal part all non-significant relations were erased. Only significant correlations are listed in the upper diagonal part.