

Empirical Paper

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The role of state aid for the food industry – Based on the example of dairies in Poland

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Abstract: There is lack of research on the evaluation of state aid provided to food industry enterprises in Poland, within the framework of general principles of the European Union competition policy, taking into account structure of the industry. The aim of the study is to assess the scale of general public aid for dairies, taking into account the type of enterprises, their size and location. The statistical analysis is based on SUDOP data. The amount of aid granted in 2015–2021 increased as well as the number of beneficiaries of the aid. The highest value share involved subsidies for R&D projects. The share of large dairies in funds is similar to their market share. We witness a significant concentration of aid regionally and among the beneficiaries. Dairy cooperatives accounted for a greater share of the employment of disabled persons and prisoners than other entities, which may be due to their bimodal nature.

Keywords: dairy, food industry, EU competition policy, state aid, Poland

JEL classification code: H89, L66, O25

1 Introduction

The basis for the functioning of the European Union (EU) single market, enabling the free movement of goods, persons, services, and capital (Art. 26 of the Treaty on the Functioning of the European Union, TFEU), is the notion of free competition. These four freedoms are also important for the future of the EU [Barnard, 2019]. The existence of the single market brings substantial gains in terms of trade flows, output, and real income [Mayer et al., 2019; Poutvaara, 2019]. A strong and healthy EU single market is crucial to revitalising the EU in the aftermath of the severe COVID-19 pandemic crisis and contributing to the long-term global competitiveness of EU businesses. Healthy competition encourages companies to innovate, enter new markets, and improve their productivity [EC, 2021]. One of the actions aimed at building a stronger single market that is embedded in the context of the reference to the Lisbon Treaty and enables a highly competitive social market economy is the possibility of implementing an active industrial policy based on a policy of healthy competition and state aid [Monti, 2010].

In order to stimulate positive economic processes or prevent negative phenomena, the state may grant aid to entrepreneurs [Sobiecki and Kowalczyk, 2019; Ambroziak, 2021]. Each EU member state, within the framework of its regulations, operates its own public aid policy, pursuing its own objectives. A good example in the case of Poland is the mining sector. As it was (and remains so) very important in the economy, the Polish government granted it huge restructuring aid in the pre-accession period (more than half of the total public aid), taking advantage of the “last chance” before it would be covered by EU rules [UOKiK, 2006]. After Poland’s EU accession, the rationality of spending public funds improved, and the adverse effects of aid in the sphere of competition were limited [Kubera, 2010]. In 2020, the value of state aid (without

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crisis aid related to COVID-19 pandemic and without state aid in agriculture and *de minimis* aid) in Poland amounted to almost EUR 8.22 billion, that is, >4 times the 2000 aid, and the share of aid in Gross Domestic Product (GDP) amounted to 1.57% [UOKiK, 2021].

One of the most important sectors in the industry of each country is the food industry because, together with the agricultural sector, it ensures food security – which constitutes a part of national security [Falcon and Naylor, 2005]. The significance of food self-sufficiency is growing in crisis situations such as the COVID-19 pandemic, which has disrupted the global food chain system [Bakalis et al., 2020], and its negative effects on the food industry, and thus on the general public, will continue to be experienced for a long time [Chowdhury et al., 2020]. The food sector was one of the few sectors where particular changes were observed in the day-to-day operations of companies [Alon, 2020]. In addition, the measures introduced by governments to combat the pandemic also led to the closure of food industry plants [Cai and Luo, 2020]. This has particularly affected small- and medium-sized enterprises (SMEs) in the food industry (FSMEs), which account for >70% of the total food industry [Ali et al., 2021]. The Polish food industry, among others, due to its intensive adaptation to market economy and entering the common EU market has become an effective, export-supporting branch of the national economy, with a significant share in domestic production. Indeed, currently, the food industry, including agriculture, is able to meet domestic demand for most of the agricultural products. One of the most important sectors of the food industry is the dairy industry. It not only has one of the highest shares in the value of production sold in Poland but also stands as one of the main dairy producers in the EU [Szczepaniak and Tereszczuk, 2017; Zuba-Ciszewska, 2020a].

The research on state aid in Poland emphasizes the importance of public intervention at the regional level, both when it comes to aid from national funds and that from European funds, which is able to improve the investment attractiveness of regions, impaired due to their weak development [Ambroziak, 2015]. Public aid for the SME sector is important, and it is analyzed in the terms of, among others, aid instruments, conditions, and effects [Marquardt, 2007; Matejun and Woźniak, 2020; Piątkowski, 2020; Szuper, 2021]. What is also emphasized is the relationship between the value of state aid and the size of investments of enterprises [Woźniak and Lisowski, 2016]. The importance of state aid in sensitive sectors, such as coal mining, is emphasized, not only during the closure of mines but also during their modernization toward, e.g. improving environmental protection [Kowalska, 2015; Pełowska and Gawlik, 2019]. In the case of the food economy sector, the significance of aid for the primary food link, i.e. agriculture, is also especially indicated in its modernization, which was extremely important in the context of EU accession [Wieliczko and Kurdyś-Kujawska, 2015; Kusz, 2018; Czyżewski et al., 2019; Zalewski et al., 2022]. Similarly, it is important to support the food industry, including the dairy industry, in making investments adapting it to EU requirements and in subsequent years improving its efficiency and competitiveness [Wigier, 2015; Adamski et al., 2021]. However, research in this sector concerns measures (both EU and national) from aid programs (e.g. SAPARD, RDP 2007–2013, RDP 2014–2020) implemented under the common agricultural policy (CAP).

We can note the research gap concerning the state aid granted to Polish food industry enterprises on general principles, as part of the framework of competition policy. The solutions used and the changes in the mechanism of state interference in the economy can be considered from different points of view [Czyżewski and Kułyk, 2013]. According to the modern public choice theory, it is worth analyzing such state expenditure [Landreth and Colander, 2012] in terms of the theory of industrial structure by A. Marshall, which assumes that the industry groups companies producing the same products with the same technical characteristics [Gorynia et al., 2000; Raffaelli, 2004]. Does the aid reach these entities in the same way or is there a pattern, e.g., one that corresponds to the structure of the industry? Therefore, the aim of the present paper is to assess the scale of general public financial aid for enterprises in the case of one of the sectors of the food industry, i.e., dairy industry. The assessment shall be made over a longer period of time, taking into account the structure of the dairy sector, number of beneficiaries in the sector, the size of the entities, the geographical location of the dairies, types of aid, and the degree of concentration of the aid.

2 Literature review

The public choice theory is the most important trend of the new institutional economics dealing with the analysis of the state. The state is important for the effective functioning of the market. According to E. Furubotn and R. Richter, the operation of the invisible hand of the market can be accelerated by appropriate institutions, including state institutions. The invisible hand of the market, if not guided by supporting institutions, tends to act in a slow and costly way [Wilkin, 2016, p. 230]. It is the duty of the state to ensure a stable and well-functioning legal and organizational framework for the activity of business entities. Related to this is an increase in government spending. Therefore, according to A. Wagner's law, the share of public expenditure in GDP is growing. This phenomenon, especially in highly developed democratic countries [Siwińska-Gorzela, 2012, p. 36], is the result of public choice. The society agrees to incur high costs of functioning of the state in exchange for providing public goods and ensuring appropriate institutional framework for the activity of the economy and society [Wilkin, 2016, p. 223].

The public choice theory is otherwise known as public choice, rational choice theory, political economy, or economic theory of politics. According to D.C. Mueller, one of the main contemporary representatives of this trend, this theory explains the most general rules for the distribution of goods by the public sector and its efficiency. It is important to define the role of the state in terms of resource allocation and redistribution. According to J. Cullis and P. Jones, rules are needed to decide what goods and services should be secured by the state and what taxes should be imposed to achieve this, bearing in mind the consequences of these decisions for individual well-being [Kulawik, 2019, p. 207]. According to J. M. Buchanan, it is necessary to have both a protective state, ensuring security, and a productive state, enabling entities to use public goods and having the means to achieve goals serving citizens [Miklaszewska, 2001, p. 39; Metelska-Szaniawska, 2012, p. 115]. An important place in the theory of public choice is occupied by the concept of government (state) failure, which is a type of economic inefficiency caused by public intervention, even in the absence of market failure. Failure can lead to the effect of crowding out private investment by public spending. According to F. Fritsch, government failure may result from ineffective and incompatible characteristics with social goals functioning of the state administration or be caused by politics when it results in undesirable results for the whole society [Kulawik, 2019, p. 210–211].

In addition to classic cases of market failure, state intervention in the form of regulations is justified in the case of limited rationality of market participants, which often leads to ineffective solutions, as demonstrated by the financial crisis of the early 21st century. Another justification is the issue of income redistribution. Even if the mechanism of the “invisible hand of the market” leads to effective solutions, it does not necessarily mean that they are socially just. Market failure is one of the reasons for making regulations [Metelska-Szaniawska and Olender-Skorek, 2012, p. 247–248]. In the regulatory process concerning a market, the asymmetry of forces in the market is determined, i.e., significant market power distorting competition. For this purpose, it examines market structure using various indicators, e.g., the level of market concentration. Regulatory tools can be both community (e.g. EU) and national. General regulations ensure that the competition of enterprises on the market ensures optimal allocation of resources. On the other hand, sectoral regulations are adapted to the specifics of the market [Metelska-Szaniawska and Olender-Skorek, 2012, p. 255–260].

In economies characterized by a wide range of state intervention in economic processes, there is a phenomenon of political rent-seeking. The precursor in describing the phenomenon of artificially created rent, which arises as a result of political decisions, was G. Tullock, one of the leading representatives of the public choice theory. An example of the mechanism of artificial rents is agricultural policy in highly developed countries, where the farmer's income is largely influenced by political decisions [Wilkin, 2012, p. 223, 229]. Since political rents in agriculture differ from the essence of the rent-seeking phenomenon, it is necessary to introduce the so-called pure political rent [Czyżewski and Matuszczak, 2016, p. 680]. Research indicates that pure political rents obtained by agriculture are varied between EU countries

[Matuszczak, 2016, p. 244] and also between farms because flow of payments to large farms increased, benefiting primarily from advantages of the scale [Czyżewski and Matuszczak, 2016, p. 698; Kułyk and Czyżewski, 2016, p. 115].

In order to improve the efficiency of the public sector, various public selection criteria are presented, including the criterion of justice. When discussing the principles of allocating funds into a given sector, e.g., in agriculture in Poland, the need to take into account its regional diversity is pointed out. Therefore, the regional budgeting algorithm for rural development funds is based on rural development indicators [Kiryłuk-Dryjska and Beba, 2018].

The state aid is the interference of state institutions in the economic system. Granting aid in any form to an entity or a group of economic entities is aimed at achieving the objectives set by the legislator (economic, social, environmental, etc.) [Wigier, 2015]. The reasons why governments pursue industrial policy are very different and include but are not limited to market failure, market imperfection, national security, economic security, negative consequences of industrialization (insufficient development of SMEs), and the need to catch up with more developed countries [Noga, 2011, p. 228]. In the case of food industry enterprises, the purpose of state aid may be, among others, stimulating the growth of competitiveness, improving food security [Wigier, 2015]. In pursuing an active industrial policy, it is important not only to provide public aid but also to base it on the policy of healthy competition, which builds a stronger single market [Monti, 2010; EC, 2021]. Therefore, in the case of aid for a specific industry, it is important that all companies that make up the industry have equal access to funds. The companies forming the industry produce the same type of product, products with the same technical characteristics; so, this is a supply-side approach to the industry, in accordance with A. Marshall's postulate [Jankowska, 2002]. Research indicates the diversification of public aid depending on the types of enterprise form, its size, or territorial location [Matuszak et al., 2020]. Therefore, it may be important for the food industry in Poland because individual branches of the food industry in Poland are characterized by numerical dominance of micro-sized enterprises and SMEs, which, however, have a smaller share in generating revenues of the industry than large entities [Zuba-Ciszewska, 2020a]. In addition, mainly in one industry, i.e. dairy, there are two types of enterprises, dairy cooperatives and other dairies, profit-maximizing enterprises. Agricultural cooperatives, which are owned by their members, exist to serve them and pursue various goals [Suchoń and Zuba-Ciszewska, 2020].

The EU had to define the rules for the state's presence in the economy of its member states in such a way as to be in line with the common competition policy, focusing attention on public aid, i.e. through fiscal policy instruments. The assistance provided by individual states is controlled and monitored by the European Commission. The active competences of member states in the field of state aid mainly consist in establishing aid measures (aid programs and individual aid), including the selection of specific instruments to support enterprises using public funds [Alińska and Woźniak, 2018]. The development of state aid control since the Treaties of Rome has been a long and difficult process [Lavdas and Mendrinou, 1999], and public aid in the EU is considered quite restrictive [OECD, 2010]. The European Commission is increasingly influencing the objectives of national state aid policy [Blauberger, 2009]. Pursuant to Article 107 section 1 TFEU, it is possible to indicate the conditions which distinguish state aid from other intervention measures. Therefore, aid granted by a member state or from state resources, with a selective character, confers an advantage on the beneficiaries, affects competition, and affects trade between member states. What followed after 2000 was a general reorientation of EU state aid policy, in line with the Commission's State Aid Action Plan (SAAP), from sectoral aid to horizontal objectives including support for SMEs, promotion of employment, environmental protection, and research and development. These are areas with convincing economic justification – a correction of externalities [Kassim and Lyons, 2013]. Since May 2012, the Commission has been enacting a major reform package, the State Aid Modernisation (SAM). Due to the implementation of the new set of state aid rules, granting authorities in member states have been given a much wider scope in designing and initiating aid measures. At the same time, the Commission still plays its role as a guardian of fair competition within the single market [EC, 2021].

EU state aid expenditure has kept increasing in 2019, and member states spent EUR 134.6 billion (i.e. 0.81% of GDP), an increase of about 3.6% as compared with that in 2018. Poland ranks in the middle among EU countries in terms of the amount of expenditure on state aid and its relation to GDP. In the EU,

in 2019, about 51% of total spending (EUR 69.1 billion), excluding aid to agriculture, fisheries, and railways, was attributed to state aid to environmental and energy savings. Research and development including innovation represents 10% (EUR 13.9 billion) of total spending, while regional development represents 8.5% (11.5 billion EUR) of total spending. Among the EU countries, Poland had the largest employment aid program (for disabled persons) (EUR 724.1 million) and numerous regional development programs; the sum of which put it at the forefront of the EU countries (EUR 1149.5 million) and ranked 4th (EUR 981.8 million) due to the support of the R&D sector, including innovation [EC, 2021]. In the EU, direct subsidies are still the preferred public aid instrument, accounting for 62.8% of total expenditure, and their role has increased considerably in recent years. Tax exemptions/reductions/deferrals accounted for a smaller share of total expenditure (30.7% of total expenditure) than they did in the past. Similarly, grants (over 80%) and tax advantage or tax exemption (6.3%) account for the largest share in Poland [EC, 2021].

2020 proved to be an exceptional year for public aid. In order to mitigate the socio-economic impact of COVID-19, due to limitations of EU budget, EC ruled that most of the financial support for enterprises was supposed to come from member states [Buendía and Dovalo, 2020]. The EC acted swiftly, together with member states, to ensure that national public support enhances the resilience of the EU economy as a whole and does not jeopardize the internal market [Ferri, 2021]. The first support communications were issued in March 2020 [CE, 2020]. This was based on the experience of the European Commission in coping with the 2008 financial crisis [Nicolaidis, 2020]. The classic policy objectives of state aid measures such as environmental protection, regional aid, and R&D and innovation have lost priority in helping companies facing difficulties during the pandemic [Agnolucci, 2022]. The main objective of the aid schemes proposed by the Polish government for enterprises was to ensure the stability of both the enterprises and the economy. It concerned preventing the risk of mass bankruptcy of enterprises, in particular of SMEs, and dismissals of their employees in the result of significant disruptions in the functioning of the economy due to the COVID-19 pandemic [Dziembała and Kłos, 2021; Ambroziak, 2022]. Since March 2020, the government has adopted several aid packages to combat the pandemic, the total cost of which is estimated at over EUR 70 billion, half of which has been allocated to enterprises. Aid to enterprises covered a wide range of aid targeted at all entrepreneurs, or in some schemes, at selected entities (such as micro-enterprises) or industries. These included, among others, co-financing employees' salaries, co-financing part of the costs of conducting business activity in the event of a decrease in business turnover, a loan to cover the current costs of conducting a micro-entrepreneur's business activity, idle time benefit, and exemption from social security contributions [Kubiczek and Derej, 2021; Anti-crisis shield, 2022].

The food industry has a particular place in the Polish industry. In 2020, the value of sold food products amounted to EUR 53.7 billion, i.e., 15.4% of the industry in the country. There were over 18,000 companies operating in the sector, employing over 420,000 people. Its characteristic is the dominance of micro and small enterprises [Eurostat, 2022]. The food industry is noted for high business risk connected with the fluctuations in the supply of raw materials, the short shelf life of raw materials and products, the need to maintain spare capacity, and price risk. Consolidation of processing companies in the country is progressive, including with the participation of transnational corporations and similar changes can be observed in retail chains [Chechelski, 2017]. In the post-accession period, innovations, both technological and non-technological, have become a factor increasing the competitiveness of food industry enterprises in Poland [Firlej et al., 2017].

In 2019, the dairy industry accounted for 15% of the value of products sold and 10% of employment in the food industry. Among the 1,016 enterprises in the dairy industry, almost 80% are micro-enterprises, employing up to nine people. Despite the fact that large enterprises, i.e. those employing >250 people, are least numerous with only 38 of them, their production is worth EUR 6.34 billion, i.e. 79% of the entire industry and employ 69% of all employees (29,000 people). The share of large dairies is growing rapidly [Eurostat, 2022]. It is therefore an industry with a high degree of concentration. In the dairy industry, the most important type of enterprises, accounting for almost 93% of the production value, are dairies that are involved in milk processing and cheese production (NACE Rev. 2 Class 10.51). In 2019, there were 163 such dairies employing >10 people, demonstrating profitability and maintained financial liquidity. Almost 1/5 of their sales value comes from exports and its role increased after Poland's accession to the EU [Szajner,

2021]. Poland's accession to the EU has accelerated the process of dairy restructuring and modernizing. Investments have contributed to improving the quality of products, which has become an important factor of competitiveness both on the domestic and on international market. The financial support for the dairy industry from EU aid programs for agriculture and rural areas in the years 2002–2019 amounted to PLN 1.42 billion, which accounted for 9.6% of the value of all investment expenditures incurred in this industry. Poland's dairy plants are considered to be one of the most modern in the EU, and the Polish dairy industry has become one of the main producers of milk and dairy products in the EU [Szczepaniak and Tereszczuk, 2017; Adamski et al., 2021]. In 2019, when we consider dairies employing >10 people, >57% were cooperatives with a total share in milk purchases at the level of >70% [Ziętek-Kwaśniewska et al., 2022]. Dairy cooperatives are currently the main entities delivering dairy products, including basic items, to the domestic market [Zuba-Ciszewska, 2020b]. Despite their centuries-old tradition in Poland, their economic objective that distinguishes them from other forms of enterprise remains unvaried, i.e. improving the profitability of agricultural production and improving the market position of milk producers and members of cooperatives [Suchoń and Zuba-Ciszewska, 2020].

3 Research methodology

The study used the analysis of the state aid and dairy industry literature. The data were used from the Public Aid Data Sharing System (SUDOP) database to perform the research. The information made available through the SUDOP system comes from reports on the assistance provided, prepared with use of the SHRIMP application, by the entities providing assistance pursuant to Art. 32 of the Act of 30 April 2004 on proceedings in matters related to state aid (Journal of Laws No. 123, item 1291, as amended). This act states that the authority monitoring public aid in Poland is the President of the Office of Competition and Consumer Protection (UOKiK), and in the field of public aid in agriculture or fisheries – it is the minister competent for agriculture. The SUDOP database does not contain information on aid measures that expired before 2016; therefore, the analysis period in the article covers the years 2015–2021. The data presented in the article do not include *de minimis* aid granted to beneficiaries, as it is a specific type of aid that does not fulfill all the criteria for public aid declared incompatible with the common market [Commission Regulation, 2013]. The data were collected for enterprises involved in the processing of milk and cheese production (NACE Rev. 2 Class 10.51). The analysis takes into account the structure of the dairy industry, i.e. the participation of dairy cooperatives and other entities therein, the size of dairies, as well as their geographical location. Data were analyzed both descriptively with frequency distribution analysis and correlation analysis. The calculations were performed using Excel and SPSS Statistics. A *p* value <0.01 was considered statistically significant.

4 Research results

In 2015–2021, dairies in Poland were supported over 2,500 times, with a total amount of EUR 78.6 million (Table 1). Despite the fact that dairy cooperatives were supported more often than other entities (1,293 compared to 1,211 times), the value of aid granted was significantly lower (EUR 29.4 million compared to EUR 49.2 million). The greater share of non-cooperative entities in the value of aid in the respective year has been maintained since 2018. The amount of aid granted to the dairy industry in the years 2015–2021 increased significantly from EUR 0.48 to 32.28 million. The value of aid provided to cooperatives in 2021 amounted to over EUR 14 million and was 51 times higher than that in 2015. However, in each of the years studied, the value of unit aid varied greatly, as indicated by the coefficient of its variation. While the average value of aid in the cooperative sector increased from EUR 76.88 to EUR 79.18 thousand, in the case of half of the aid events, the increase was low, i.e. only by EUR 0.73–1.67 thousand. On the other hand, the range of aid granted increased dynamically from EUR 16,000 to EUR 7.5 million among cooperatives, which was mainly due to a large increase in the maximum value. In 2021, EUR 18.19 million were directed to non-cooperative entities, i.e. 91 times more than that in 2015. The value of this aid varied greatly in each of the years studied. In half of the cases, the value of this aid decreased from EUR 1.73 to EUR 1.71 thousand, with

Table 1. Level of aid granted to cooperatives and other milk processors under the aid measures implemented in Poland

Years	Aid recipient	Frequency of aid	Value of aid (EUR in thousand)					
			Sum	Average	Median	Min	Max	Vs (%)
2015	Coop	120	276.65	2.31	0.94	0.15	16.15	181.24
	Other	70	200.26	2.86	1.73	0.27	7.46	82.76
2016	Coop	125	295.73	2.37	0.90	0.11	15.87	171.58
	Other	71	190.48	2.68	1.40	0.38	7.98	88.09
2017	Coop	174	813.52	4.68	1.32	0.10	411.28	665.05
	Other	84	405.62	4.83	1.36	0.11	220.61	492.26
2018	Coop	209	773.22	3.70	1.12	0.10	189.76	370.88
	Other	100	7,338.52	73.39	1.33	0.10	2,378.16	473.85
2019	Coop	202	748.54	3.71	1.27	0.06	153.85	319.24
	Other	100	7,248.78	72.49	1.92	0.26	1,854.87	377.22
2020	Coop	285	12,422.96	43.59	1.72	0.03	2,259.25	320.24
	Other	671	15,632.22	23.30	1.12	0.08	6,044.90	1,046.05
2021	Coop	178	14,094.30	79.18	1.67	0.23	7,541.11	801.51
	Other	115	18,186.07	158.14	1.71	0.20	7,257.29	493.82

Vs: coefficient of variation

Source: own work based on <https://sudop.uokik.gov.pl>.

a simultaneous increase in the mean value from EUR 2.31 to EUR 158.14 thousand. The dynamic increase in the maximum value resulted in an increase in the interval from EUR 7.2 thousand to EUR 7.3 million.

While in 2015, 18 dairies, including 11 cooperatives, benefited from the aid, in 2021, there were already 47 dairies participating, including predominantly non-cooperative entities. In the years 2015–2019, more cooperatives, mainly the medium-sized enterprises, benefited from public aid than other entities (Table 2). In 2020, 4 times more non-cooperative entities received financial assistance than cooperatives, among which as many as 151 were micro-enterprises. On average, each of these micro-entities received such assistance three times. In 2021, the number of beneficiaries decreased to 21 cooperatives, including 17 medium-sized and large ones, and 26 non-cooperatives, including 11 medium-sized and large ones.

Despite the fact that every year the aid was more often received by medium-sized enterprises (except for the year 2020 and non-cooperative entities) and the beneficiaries were not dominated by the participation

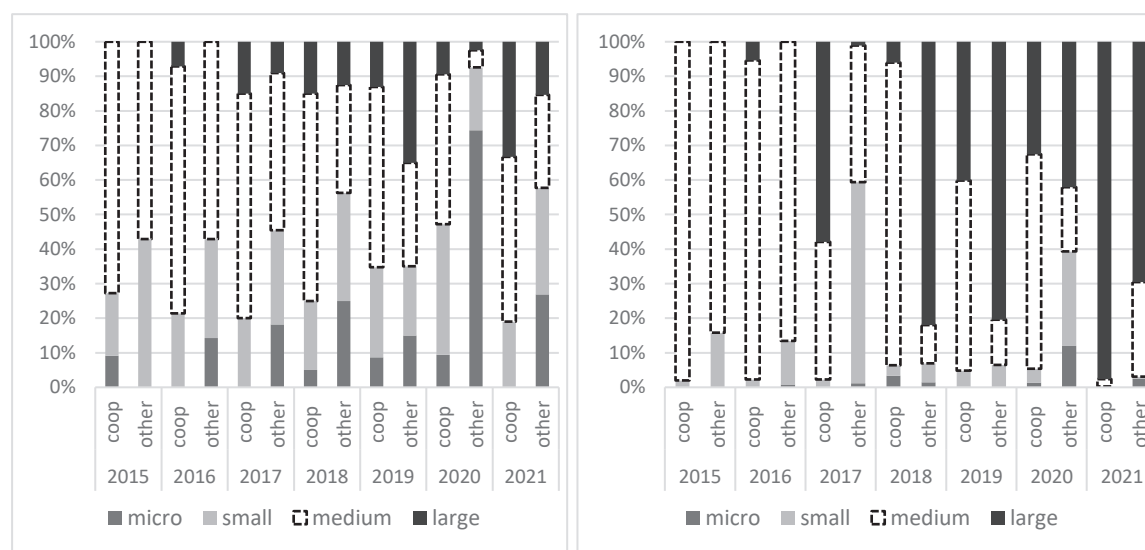
**Figure 1.** Structure of beneficiaries in function of the size of the entity (left) and structure of the value of aid received by them (right).Source: own work based on <https://sudop.uokik.gov.pl>.

Table 2. Level of aid granted to micro, small, medium-sized and large milk processors under the aid measures implemented in Poland

Years	Aid recipient	Number of entities					Frequency of aid			Value of aid (EUR in thousand)				
		Total	Micro	Small	Medium	Large	Micro	Small	Medium	Large	Micro	Small	Medium	Large
2015	Coop	11	1	2	8	0	1	24	95	0	0.32	5.10	271.23	0
	Other	7	0	3	4	0	0	24	46	0	0	31.74	168.52	0
2016	Coop	14	0	3	10	1	0	28	96	1	0	6.65	273.21	15.87
	Other	7	1	2	4	0	4	14	53	0	1.53	24.02	164.92	0.00
2017	Coop	20	0	4	13	3	0	42	117	15	0	18.48	323.96	471.09
	Other	11	2	3	5	1	13	12	58	1	4.63	236.29	160.20	4.50
2018	Coop	20	1	4	12	3	1	47	147	14	25.78	23.28	677.28	46.88
	Other	16	4	5	5	2	23	22	51	4	108.71	397.48	812.46	6,019.88
2019	Coop	23	2	6	12	3	8	47	135	12	1.10	34.93	411.93	300.59
	Other	20	3	4	6	7	8	29	53	10	7.24	463.16	948.06	5,830.31
2020	Coop	53	5	20	23	5	25	97	142	21	173.49	498.71	7,699.31	4,051.45
	Other	203	151	37	10	5	455	147	63	6	1,868.79	4,273.69	2,913.44	6,576.30
2021	Coop	21	0	4	10	7	0	42	100	36	0.00	42.17	296.36	13,755.78
	Other	26	7	8	7	4	9	39	55	12	467.75	88.44	4,981.30	12,648.58

Source: own work based on <https://sudop.uokik.gov.pl>.

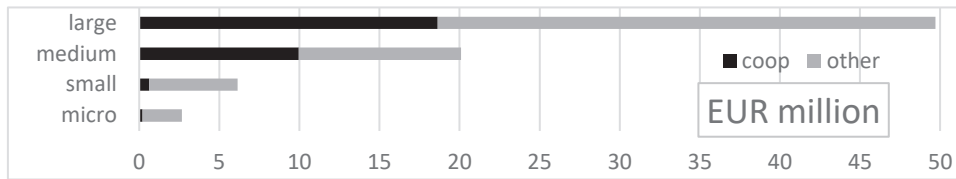


Figure 2. Value of aid granted in 2015–2021 to entities of different size scales.

Source: own work based on <https://sudop.uokik.gov.pl>.

of large entities (Figure 1), the largest entities had a high or dominant share in the value of aid received since 2019 and, additionally, the large cooperatives also in 2017 and large non-cooperatives in 2018.

In total, in the years 2015–2021, the largest aid was received by large entities, i.e. EUR 49.7 million (Figure 2) and medium ones (EUR 20.1 million), and most of it went to non-cooperative entities. Micro and small entities received, respectively, 3.4% and 7.8% of the value of the aid granted in the period under review. However, it is worth noting that the value of the aid steadily increased only in the case of large enterprises.

With each subsequent year, the form and objectives of the aid were more diverse. The most aid measure that was most frequently granted to cooperatives (1,145 times in 7 years), in each year, was the refund in the form of subsidizing wages for the recruitment of disabled workers (Table 3). It amounted to EUR 2.6 million and accounted for 8.8% of the aid granted to cooperatives during this period. Another EUR 0.41 million was spent for other social policy purposes, i.e. employing prisoners – in 38 projects in 18 cooperatives. Almost EUR 2.1 million in subsidies, i.e. 7.1% of all funds were allocated to eight projects for six cooperatives for investments in renewable energy or in high-efficiency cogeneration, with an energy-saving objective. The value of grants from the National Centre of Research and Development (NCBiR) for R&D projects in industrial research or experimental development works for three cooperatives and five projects amounted to EUR 14.3 million. Together with the regional investment aid (e.g., in the form of real estate tax exemptions), which amounted to just EUR 0.39 million, the investment objective constituted almost half of the funds transferred to dairy cooperatives. Almost EUR 10 million, or almost 1/3 of all funds in 2020 and 2021, was the aid compensating for the negative economic impact of COVID-19. These were mostly nationally sourced programs, i.e., the financial shield for SMEs, public guarantees to support economy, subsidies or refundable aid as part of operational programs, salary subsidies, reductions of due tax and social insurance contributions, and factoring guarantees. This type of aid was granted 93 times.

Table 3. Aid granted to milk processors by type of aid measure in 2015–2021

Purpose of aid	Aid recipient	Frequency of aid	Number of entities	Value of aid (EUR in million)	Share in value (%)
For the disabled	Coop	1,145	120	2.60	8.83
	Other	556	62	1.24	2.53
Employment of prisoners	Coop	38	18	0.41	1.39
	Other	14	9	0.10	0.20
Energy	Coop	8	6	2.08	7.08
	Other	9	9	3.88	7.89
Research and development projects	Coop	5	3	14.30	48.61
	Other	17	10	23.15	47.05
Regional investment	Coop	3	3	0.39	1.33
	Other	17	16	11.35	23.07
Crisis aid	Coop	93	50	9.64	32.75
	Other	597	233	9.42	19.15
For participation in fairs	Coop	1	1	0.01	0.02
	Other	1	1	0.05	0.11

Source: own work based on <https://sudop.uokik.gov.pl>.

In 2015–2021, non-cooperative dairies were most often (556 times) granted aid in the form of subsidizing wages for the recruitment of disabled workers with a value of 1.24 million euros (Table 3). EUR 0.1 million has been allocated to the employment of prisoners. The value of aid for social policy purposes accounted for 2.7% of total aid. Almost EUR 3.8 million in subsidies, i.e., 7.9% of all funds, were allocated to nine projects for nine enterprises for investments in renewable energy or in high-efficiency cogeneration, with an energy-saving objective. Mainly through the NCBiR, another EUR 23.2 million was allocated to 17 research and development projects, i.e. over 47% of the total aid. An additional EUR 11.4 million was spent for 17 projects for other investment purposes under regional investment aid. It consisted of support in the form of a loan for technological innovation, in special economic zones, real estate tax exemption and an exemption on tax on means of transport, as part of regional operational programs, aid from the Bank Gospodarstwa Krajowego (BGK) in the form of loan repayment guarantees, and aid granted by Polish Agency for Enterprise Development (PARP). Crisis aid was used 597 times in 2 years, to the total amount of EUR 9.4 million (factoring guarantees, grants or repayable assistance under operational programs, financial shield for SMEs, wage subsidies, tax and social security credits, and loans and financial guarantees from EU funds).

Summing up the allocation of funds received by the entities of the dairy sector in the years 2015–2021, we should emphasize the highest share of research and development projects therein (Figure 3), which covered industrial research and experimental development works, and were supported through the NCBiR. It is clear that cooperatives participate, to a much lesser extent than other entities, in research related to energy saving and, in particular, in regional investment aid. On the other hand, the cooperatives held a greater share in the employment of people with disabilities and prisoners.

The largest part of crisis assistance, i.e., EUR 7.2 million for cooperatives and EUR 7 million for other dairies, was granted by the Polish Development Fund in the form of a financial subsidy for micro enterprises and SMEs. Their part (up to 75% of funding) was non-refundable after meeting the conditions set out in this government program [Polish Development Fund, 2020]. These funds were intended to cover the costs of the company's economic activities. Guarantees (granted to cooperatives in the amount of EUR 1.9 million and to other entities in the amount of EUR 1.5 million) were the second form of support for the dairy sector. BGK granted sureties and guarantees for the repayment of loans or other liabilities incurred by entrepreneurs (up to 80% of the outstanding amount of the loan or other liability covered by the surety or guarantee). Other forms of support for the dairy industry (subsidies or other non-refundable benefits, exemption from fees) accounted for 5% of the value of the aid in the case of cooperatives and 10% in the case of other dairies.

Since some entities have benefited from state aid for several years during the period under review, it is appropriate to examine the level of concentration of the aid granted. In total, 56 dairy cooperatives and 219 other entities received aid between 2015 and 2021. There is a very high concentration of funds because three large dairies received nearly 38 million euros, i.e., over 48% of all the funds for the entire industry for just 18 projects (Table 4). These funds were for investment objectives. One dairy cooperative made full use of the funds (EUR 12 million) granted for four research and development projects. The second dairy received more than EUR 14.1 million for five research and energy-related projects. The third dairy spent EUR 11.8 million on research, energy, and other regional investments. Another 24 dairies, which received between EUR 0.5 and 3.1 million, received EUR 27.8 million in total. Thus, 27 dairies received EUR 65.8 million in aid, i.e., almost

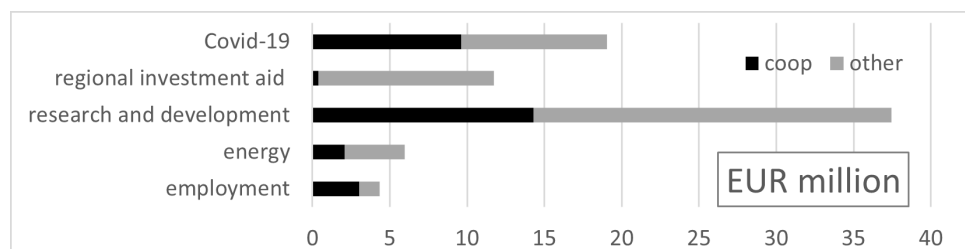


Figure 3. Value of aid granted in 2015–2021 to entities for different purposes.

Source: own work based on <https://sudop.uokik.gov.pl>.

Table 4. Degree of concentration of the value of aid to milk processors in the years 2015–2021

Value of aid for one entity (EUR)	Number of entities	Frequency of aid	Value of aid (EUR in million)	Share in value (%)
(0–1,000)	22	56	0.01	0.01
<1,000–2,000)	66	130	0.08	0.11
<2,000–5,000)	37	140	0.11	0.14
<5,000–10,000)	22	108	0.17	0.21
<10,000–20,000)	19	131	0.29	0.37
<20,000–50,000)	22	321	0.66	0.84
<50,000–100,000)	20	369	1.48	1.88
<100,000–150,000)	12	403	1.46	1.85
<150,000–200,000)	4	93	0.66	0.84
<200,000–300,000)	9	203	2.27	2.88
<300,000–500,000)	15	152	5.64	7.18
<500,000–1,000,000)	14	236	10.21	12.99
<1,000,000–2,000,000>*	8	134	11.88	15.10
<2,700,000–3,100,000>*	2	8	5.74	7.30
<11,800,000–14,100,000>*	3	18	37.96	48.28

*In the ranges, the upper and lower limits do not coincide because some aid values did not occur.

Source: own work based on <https://sudop.uokik.gov.pl>.

84% of all funds allocated to the sector. This group of entities included 12 dairy cooperatives, for which the total value of aid amounted to EUR 24.3 million, which is much less than what was allocated to other entities (EUR 41.5 million).

This concentration also exists in territorial terms. The largest number of entities (45.1% of the total) that received public aid was located in the Małopolskie, Mazowieckie, and Wielkopolskie voivodeships (Table 5). In >300 cases, the aid was granted to entities from the Małopolskie and Wielkopolskie voivodeships, as well as to Świętokrzyskie Voivodeship, although there were only 11 entities covered by state support. The largest part of the aid was granted to four regions, i.e., Mazowieckie (EUR 21.7 million), Kujawsko-Pomorskie (EUR 17.3 million), Podlaskie (EUR 14.4 million), and Wielkopolskie (EUR 8.38 million). This amounted to nearly 79% of the total value of aid during this period. At the same time, these regions had the highest average value of aid per entity (between EUR 0.3 and 0.9 million).

Table 5. Aid granted to milk processors by region in 2015–2021

Voivodeship	Number of entities	Frequency of aid	Value of aid (EUR in million)	Average aid for the entity (EUR in thousand)
Dolnośląskie	9	118	0.16	18.17
Kujawsko-pomorskie	19	153	17.28	909.33
Lubelskie	13	137	3.98	306.25
Lubuskie	3	8	0.06	20.27
Łódzkie	14	86	3.14	224.16
Małopolskie	50	313	1.48	29.69
Mazowieckie	42	209	21.71	516.94
Opolskie	8	20	0.52	65.39
Podkarpackie	12	189	0.78	64.63
Podlaskie	18	225	14.40	799.92
Pomorskie	7	19	0.03	4.25
Śląskie	18	267	3.19	176.96

(Continued)

Table 5. Continued

Voivodeship	Number of entities	Frequency of aid	Value of aid (EUR in million)	Average aid for the entity (EUR in thousand)
Świętokrzyskie	11	321	2.24	203.75
Warmińsko- mazurskie	10	35	1.21	120.89
Wielkopolskie	32	384	8.38	261.87
Zachodniopomorskie	9	18	0.07	7.31

Source: own work based on <https://sudop.uokik.gov.pl>.

Table 6. The level of correlation between the level of state aid received and the form of the dairy, its size, and geographical location

Variables	Dairy form	Size of dairy	Geographical location of dairy*
Value of state aid	0.006	0.492**	0.082**

*Assigned dairies to distinguished groups of provinces according to their location (dairies located in a region of low, medium, or high milk production capacity) based on Ziętek-Kwaśniewska, K., Zuba-Ciszewska, M., Nucińska, J. (2022), Technical efficiency of cooperative and non-cooperative dairies in Poland: toward the first link of the supply chain, *Agriculture*, Vol. 12, No. 1.

**Correlation is significant at the 0.01 level (2-tailed).

Source: own work based on <https://sudop.uokik.gov.pl>.

To sum up the results of the research carried out above and in order to answer the question posed in the introduction of the work, an analysis of dependencies was also made using the Spearman's rank correlation coefficient (Table 6). The results of the correlation analysis showed a significant, moderately strong relationship between the level of support and the size of the dairy, i.e., the larger the enterprise, the bigger the granted state aid. The relationship between the value of aid and the type of dairy (cooperative or other form) as well as the territorial location is at a very weak level, although statistically significant in the case of the second factor.

5 Conclusions

The value of aid granted to the dairy industry in Poland in the years 2015–2021 increased significantly from EUR 0.48 to 32.28 million, which was in line with the increase in public aid granted to all enterprises in the country. When we consider the fact that this industry provides national food security in the dairy dimension, state aid can help achieve objectives of a common interest. It is emphasized that state aid in the EU helps promote social and regional cohesion and sustainable development [Kassim and Lyons, 2013]. The balanced development of this sector is further emphasized by the number of beneficiaries of the aid received, which increased from 18 in 2015 to 47 in 2021 – amounting to 2.8% and 4.6% of all entities in the industry, respectively. Poland, like most of the new member states, has made progress in adapting its state aid policy to the objectives of the Lisbon Strategy, where industrial subsidies are increasingly directed to horizontal activities, e.g., research and development [Hölscher et al., 2017]. That is why the highest share (47.6%) in the value of aid granted to the dairy industry in the analyzed period was subsidies for research and development projects in industrial research or experimental development works. These are supported through the NCBiR. The NCBiR Fund, similarly to those operating in other countries, e.g., UK Research and Innovation (UKRI), aims to intensify the commercialization of the research community and constitutes an element of industrial policy [Berry, 2022]. In the new industrial policy, the state plays a leading, entrepreneurial role in achieving innovation-driven growth, the benefits of which are collective

[Mazzucato, 2011]. Given the particularly large and rapid changes in the food sector, this is particularly important for SMEs that do not have abundant funds for innovation [Batterink et al., 2010].

The largest part of the state aid for the dairy industry in the years 2015–2021 was directed to large dairies. In total, the largest entities, although the least numerous, received >63% of the total funds during the entire period subject to review. In addition, the value of the aid has only increased steadily in the case of large enterprises. This corresponds to the sales value structure of this industry, in which the largest and still growing share is held by large entities (79%). A high degree of concentration of the industry can also be seen in the high concentration of aid because three large dairies received nearly EUR 38 million in 18 investment projects (research and development, energy), i.e., >48% of the funds allocated for the entire industry. However, it seems that this aid did not affect the structure of the market, which can sometimes be witnessed when the aided entities increase their market share [Buts et al., 2011]. These funds represent a small part (from 1% to 5%) of the value of investments made by these dairies in the years they have received public aid [EMIS, 2022]. The concentration of resources also occurs in the spatial system. Almost 79% of the total value of national aid was allocated to four regions of the country. These were regions that specialize in milk production and processing [Ziętek-Kwaśniewska et al., 2022].

In the analyzed years, despite the fact that dairy cooperatives were supported more often than other entities (1,293 compared to 1,211 times), the majority of public aid (62.6% of its value) went to non-cooperative entities. More of these entities benefited from the aid (219, in comparison to 56 cooperatives). However, cooperatives still have a greater share in the purchase of milk in the country and dominate among enterprises employing >10 people [Ziętek-Kwaśniewska et al., 2022]. The share of cooperatives in the research funds related to energy saving and related to regional investment aid was significantly lower than that of other entities. But the cooperatives accounted for a greater share of the employment of disabled persons and prisoners, which may be due to their bimodal nature. They perform not only economic but also social tasks [Suchoń and Zuba-Ciszewska, 2020].

The form and objectives of aid to dairies in each subsequent year were increasingly diverse. Although the most frequently granted aid measure in each year was the reimbursement in the form of wage subsidies for the recruitment of disabled workers, aid measures fulfilling other tasks appeared in the subsequent years. Examples are subsidies and preferential loans for investments in renewable energy sources or in high-efficiency cogeneration aimed at saving energy. It seems that due to the tightening of climate policy, the weight of the energy saving target may increase in the following years (in the period under review, these measures constituted only 7.6% of the aid value), which is also indicated in relation to the entire state aid [Ambroziak, 2021]. In addition, as research demonstrates, the availability of government financial incentives is the reason for the introduction of ecological innovations by enterprises [Kijek and Kasztelan, 2013]. In 2020 and 2021, state aid was also aimed at preventing negative phenomena related to the COVID-19 pandemic. More than EUR 19 million, or almost 1/3 of all funds in these 2 years, constituted aid compensating for its negative economic impact. These were mainly nationally sourced programs, among others, such as financial shield for SMEs, public guarantees, wage subsidies, tax and social security contributions reliefs, and factoring guarantees.

The article has its limitations, e.g., there are no specific effects of this aid indicated, such as the number of employed people with disabilities or prisoners or the number of implemented research and development projects in industrial research or experimental development works. Further work should try to present the specific effects of state aid at least on a selected sample of enterprises in the dairy industry. In addition, a comparative analysis could be made with other branches of the food industry in Poland that have a similar organizational structure and revenue share of the industry [Zuba-Ciszewska, 2020a]. Another aspect of further work could be the analysis of the criteria for granting state aid or its refusal by various authorized bodies. Important dimension of the issues raised would be an international analysis – if it were possible to compare expenditures and effects of specific types of aid, e.g., in the field of R&D or energy (investments in renewable energy or in high-efficiency cogeneration, with an energy-saving objective).

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