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Exploring the Sustainability of the Cooperative Model in Dairy: The Case of the Netherlands

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Abstract: Dairy cooperatives have existed in the Netherlands for more than 130 years. They hold a joint market share of more than 80% since the 1950s. This suggests that cooperatives are durable organizations in the dairy industry of the Netherlands. However, the number of dairy cooperatives has declined tremendously, with only five processing cooperatives left in 2015. The paper explores the paradox of high cooperative market share over a long period of time with a steady decline in the number of cooperatives. This historical account of the Dutch dairy industry distinguishes four periods of cooperative evolution. Classical theoretical explanations for the existence of cooperatives, such as bargaining power and transaction costs economics, can explain the rise of dairy cooperatives. However, they cannot sufficiently explain the long term success of the cooperative model in the Dutch dairy industry. Additional explanations can be found in institutional theory, including the impact of an enabling institutional environment.

Keywords: cooperative; dairy; history; the Netherlands; transaction cost; countervailing power; strategy; mergers; institutional environment

1. Introduction

Dairy cooperatives have existed in the Netherlands since the second half of the 19th century. The rise of dairy cooperatives in Europe has been explained by both technological and institutional innovations [1–3]. The crucial technological innovation has been the mechanical cream separator, invented in 1878, which allowed butter to be produced more efficiently on a scale that exceeded the individual farm. While this technological breakthrough was an important incentive for establishing dairy factories, it was the introduction of cooperative legislation that allowed these factories to be cooperatives. Cooperative legislation was first introduced in the UK in 1852, followed by Germany and France in 1867, Belgium and Austria in 1873, and the Netherlands in 1876 [4].

The availability of dairy technology and the institutional support through cooperative legislation are, however, not sufficient explanations for the establishment and durability of cooperative dairies. Why would farmers not sell their milk to private factories? Economic historians have claimed that the rise and rapid growth of cooperatives in the dairy industry was a response to the need to reduce transaction costs and strengthen bargaining power [1–4]. Selling to private factories entailed high transaction cost due to the high risk of opportunistic behavior by those buyers. In addition, the spatial monopsony of the dairy factory led to low farmer bargaining power. While the latter could be solved by a bargaining association, the former implied that farmers had to own the factory themselves.

In this article we explore the development of dairy cooperatives in the Netherlands over the last 130 years, from 1886 until 2015. The first formal dairy cooperative was established in the Netherlands in 1886. During the 1890s and the first years of the 20th century, the number of cooperatives rapidly increased to a record high of 750 factories. After 1916, however, the number of cooperatives started to decline, mainly due to the switch from hand power to steam power, which required a larger scale

of processing, eventually leading to the low number of five dairy cooperatives remaining in 2015. At the same time, the market share of all cooperatives together steadily increased to around 80% in 1950, and to even a higher share over last 50 years. A high joint market share together with the continuous decline in number of cooperatives presents an interesting paradox. This article seeks to explore this paradox, by discussing the evolution of dairy cooperatives in four different time periods, each representing a different institutional and market environment for milk production, processing and marketing.

Scholarly information on the evolution of dairy cooperatives in the Netherlands is scant, especially in the English language. Zanden [1] describes the rise of dairy cooperatives, as part of a larger transformation process in Dutch agriculture in the 19th century. Fernández [3] presents some figures on cooperative production and export of dairy products in the period 1880 till 1930; these data are, however, rather incomplete. Rommes [4] (in Dutch) presents the best overview of the establishment and growth of agricultural cooperatives from 1876 until the 1930s, including many details on the rise of dairy cooperatives. Frenken [5] analyzed the relative performance of cooperative factories compared with privately owned factories in the Dutch dairy industry, over the period of 1871 to 2005. This author found that cooperative factories survived longer than private factories. A complete overview of the evolution of dairy cooperatives in the Netherlands over 130 years of existence is not available, despite the importance of dairy in the Netherlands and the importance of cooperatives in (Dutch) dairy. Neither does a scholarly discussion on the paradox of continuously high joint market share for cooperatives but a steady decline in the number of cooperatives exist. Studies on the life cycle of cooperatives (e.g., [6,7]) focus on the sustainability of individual cooperatives. No study has tried to explain the sustainability of the cooperative model in a changing institutional and market environment.

The Netherlands is not the only country in Europe with a large cooperative dairy sector. In 2015, about 64% of all European deliveries of cow's milk were handled by cooperatives [8]. Also in other European countries with a substantial dairy industry, cooperatives account for the major share of milk processing (Table 1). In the Netherlands, cooperatives accounted for 86% of all milk handling in 2015.

Table 1. Largest milk producing countries in the European Union (2015).

Ranking	Member State	Milk Production (Million Tons)	Market Share All Cooperatives
1	Germany	32.671	67
2	France	25.820	54
3	United Kingdom	15.447	27
4	Netherlands	13.522	86
5	Poland	13.236	75
6	Italy	11.426	68

Source: Market shares: [8]; milk production: Eurostat.

This article has two main objectives. The first goal is to describe the evolution of dairy cooperatives over the period 1886–2015. For reasons of data availability, we take 2015 as the last year. The second ambition of this article is to reflect on the evolution of the Dutch dairy cooperatives using a theoretical framework that could explain the paradox of steady high cooperative market share but low survival of individual cooperatives.

The article is structured as follows. In Section 2, we present our theoretical framework consisting of theories that explain the decision of farmers to set up cooperatives, as well as a theory about the institutionalization of cooperatives. In Section 3, we present the evolution of dairy cooperatives in the Netherlands, divided into four different time periods. Section 4 provides the discussion and conclusion.

2. Theoretical Framework

Over the years, several theoretical explanations have been proposed for the rise and sustainability of agricultural cooperatives. These theories range from pure economic theories to sociological and

political economy theories. Below, we will discuss the theoretical propositions put forward by two different streams of literature: economics (bargaining power, economies of scale, and transaction cost economics) and institutional theory. In Section 3 we will use this theoretical lens to discuss the evolution of dairy cooperatives in the Netherlands.

2.1. Bargaining Power/Economies of Scale

Farmers, as small enterprises, face adverse bargaining conditions when selling their products to processing companies. To solve their weak bargaining position, in other words to build up countervailing power, farmers all around the world have been organizing themselves in collective action organization.

Countervailing power [9] is not only about obtaining a higher price, but also about entering into credible contracts. A relationship between two parties that are on relatively equal footing is expected to be more stable. This is not only a private benefit, but also generates benefits for the economy as a whole, as it leads to more efficient transactions.

Next to giving farmers a better bargaining position, cooperatives can also generate benefits by organizing processing activities on behalf of the farmer. These processing activities are characterized by a minimum efficient scale that exceeds the size of an individual farm. Thus, processing of milk is done in (large) factories, jointly owned by a group of farmers. Next to processing, economies of scale can also be gained in research and development, and in marketing.

While cooperatives benefit from bargaining power and scale economies, farms have remained relatively small individual holdings. Bonus [10] and Valentinov [11] have argued that it is exactly the combination of economies of scale at the level of processing and marketing and diseconomies of scale at the level of farming that makes the cooperative an attractive economic organization for the agricultural sector.

Evidence of the bargaining power impact of cooperatives is hard to obtain, due to data constraints and the strategic response of noncooperative firms [12]. Still, a number of studies have shown that the existence of cooperatives has led to higher prices for farmers compared to the situation where no cooperatives existed. Studies on this procompetition effect are known under the name of competitive yardstick theory [13,14]. In a situation in which cooperatives and investor-owned firms (IOFs) regionally coexist, members of the cooperative can judge the fairness of IOF pricing by having information on the cost of milk processing and marketing from their own cooperative. As the price of the cooperative is known to all farmers, it functions as a yardstick (or benchmark) for all negotiations in the market, with other cooperatives and with IOFs. Cooperative prices then become disciplining factors for the prices IOFs offer, thereby contributing to a competitive market.

2.2. Transaction Cost Economics

Milk production in the 19th century had several characteristics that led to high transaction costs in selling the milk. First, milk was and is a very perishable product [10]. If not stored in a cool place, raw milk spoils within a day or two. Second, milk was and is being produced mostly on family farms [1]. Having dairy cows implies caring for the animals 365 days a year and milking the animal some 300 days a year. Knowledge of the cows and of the fields was crucial for efficient production, while such knowledge, built up over the years, could be easily shared in the farming family but was not easily transferred to hired labor. Thus, dairy farms were and are mainly family farms. Third, while farms continue to be relatively small, milk processing is characterized by substantial economies of scale, leading to regional monopsony in milk processing [5]. Fourth, milk is a voluminous product, making transport over large distances rather costly [3]. Finally, milk and dairy products could easily be adulterated, such as by adding water, adding other substances, or mixing different qualities [3]. Measuring the quality of milk requires equipment that was not available in the early years of dairy cooperatives. Farmers and buyers had to trust each other in delivering a proper product and performing a correct quality assessment.

The cooperative is often presented as an organizational solution in situations of high transaction costs. Transaction cost economics (TCE) explains the choice of a particular way of organizing a sales transaction [15,16]. The key explanatory variables are asset specificity and uncertainty. Asset specificity relates to investments of the farmer, when the farmer has only one sales option. This makes the farmer dependent on the one buyer, who may take advantage of that dependency. Due to the scale economies in processing and the high transport cost of raw milk, a dairy farmer usually has few sales options. In other words, the processing company has a spatial monopsony, and an opportunistic buyer may take advantage of this market structure. The lack of sales alternatives in combination with the uncertainty about the (future) behavior of the buyer has been a major reason for farmers to establish cooperative processing companies [1]. By owning the factory, farmers prevent becoming dependent on an unreliable processor.

In sum, investments in assets that are specialized for milk production, the high perishability of the milk, and the dependency on just one buyer that cannot be fully trusted have led many dairy farmers to prefer to set up their own processing company. As this company needs the milk of many farmers, and as many farmers are needed to finance the company, a cooperative is an efficient organizational solution.

2.3. Institutional Theory

Microeconomics theories are built on the assumption of rationality, and organizations like cooperatives are mechanisms to enhance the efficiency of economic activities, in this case the production, processing and marketing of milk. Institutional theorists, however, claim that economic behavior, of individuals and organizations, is (also) shaped by institutional forces.

Institutional theory explains the processes by which institutions—including schemes, rules, norms, and routines—become established as authoritative guidelines for social behavior. Two streams in institutional theory can be distinguished. In the field of sociology, Scott [17] defines institutions as the social structures that have attained a high degree of resilience. Institutions are composed of cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life. In the field of institutional economics, North [18] defines institutions as the rules of the game. More specifically, institutions are stable patterns of behavior that define, govern, and constrain economic action. By combining these two perspectives, Powell and DiMaggio [19] have shown that the significance of particular performance measures—whether on effectiveness or efficiency—is shaped by the cultural-cognitive, normative and regulatory aspects of the institutional environment.

For dairy cooperatives, this institutional theoretical perspective implies that their legitimacy, accountability and social fitness depends on how farmers and other stakeholders see them as appropriate organizations for addressing sectoral challenges. As farmers are small businesses and price takers, they do not consider themselves as competitors, which fosters collaboration and coordination. Moreover, both dairy farmers and policy makers have always been concerned about the lack of farmer bargaining power vis-a-vis milk processors. As we will show in the next section, depending on the type and intensity of sectoral challenges cooperatives may be considered more or less appropriate organizational structures.

This short review of the theories that seek to explain the rise and sustainable presence of agricultural cooperatives can be summarized by the following propositions:

1. The cooperative model is favored when farmers face high transaction costs in selling farm products.
2. The cooperative model is favored when there is a need among farmers to gain economies of scale and strengthen bargaining power.
3. The cooperative model is favored when farmers experience direct or indirect institutional support for this model.

While each of the theories provide a different explanation for the rise and sustainability of the agricultural cooperative, we propose that it is the combination of the three factors (in the three propositions) that makes the cooperative an appropriate organizational form in the dairy industry. The next section describes and discusses the evolution of dairy cooperatives in the Netherlands, using the above theoretical framework as the lens through which this evolution can be assessed.

3. The Evolution of Dairy Cooperatives in The Netherlands

3.1. The First Cooperative Ventures in Dairy

The Netherlands has a long history in milk production [1]. Until the second half of the 19th century, all milk was either directly sold to traders or processed on the farm into butter and cheese. In the second half of the 19th century, the combination of increasing dairy demand in domestic and foreign markets together with technical innovations led farmers to look at cooperation as a means of benefitting from emerging markets as well as of adapting themselves to increasing competition.

The first farmer-owned dairy factory was established in 1872 [4]. This was a small cheese factory, first registered as a limited company. The organization was structured like a cooperative (i.e., member-owned and democratically controlled), but as there was no cooperative legislation yet, it cannot be considered as a formal cooperative. During the 1870s and 1880s, several of these farmer-owned cheese factories were established in the province of North Holland.

Two major innovations—one technical and the other institutional—have led to the rise of dairy cooperatives in the second half of the 19th century. While for centuries processing of milk into durable products like cheese and butter had been done on the farm, the 1878 invention of the mechanical cream separator ushered in an era of industrial milk processing [20]. The centrifugal separator facilitated the processing of milk into higher quality, standardized butter in large-scale factories or creameries. Cream was separated from milk more rapidly, and a high volume of output was obtained. The adoption of the centrifugal separator increased the level of scale economies substantially. This technology made it possible to produce butter on a continuous basis and with a much higher return for each liter of milk compared to butter production at the farm [1].

Initially, many of these new dairy factories were limited companies, as private traders quickly realized the opportunities of the new technology. However, in places where no investors were able or willing to establish a factory, or where farmers did not trust the long-term commitment of the IOFs, farmers themselves invested in jointly owned milk processing factories. In the early days of cooperative development, farmers chose different legal models of collaboration, such as informal village groups, formal associations, and limited companies [4]. While the legal form differed, they all followed cooperative principles of democratic decision-making and joint ownership.

The second major innovation was the introduction of cooperative legislation. In most of the 19th century, the Netherlands' government followed a laissez-faire economic policy. Although many politicians were aware of the negative effects of unregulated capitalism, they were not in favor of introducing social legislation. Easing the negative effects of the free market, such as exploitation and poverty, had to be solved by self-organization. Inspired by the English philosopher John Stuart Mills, as well as by cooperative development in neighboring countries, leading politicians were supportive of the idea of the cooperative. This, eventually, led to the enactment of cooperative legislation in 1876.

It took another 10 years before the first formal dairy cooperative was established: the steam-powered cooperative butter factory of Warga (Friesland) in 1886. The evolution of dairy cooperatives in the Netherlands, since the birth of the first dairy cooperative, can be divided into four periods.

- 1886–1916→rapid growth
- 1916–1948→consolidation, crisis, and war
- 1948–1984→rationalization
- 1984–2015→consumer orientation

For each of these periods we will describe the development of dairy cooperatives, using the theoretical framework developed above to make sense of the dynamics.

3.2. Rapid Growth (1886–1916)

The industrial revolution in England provided an enormous opportunity for the export of Dutch dairy products. In the first half of the 19th century, three-quarters of all British butter imports came from the Netherlands [20]. However, the seemingly endless sales prospects that the British market offered also encouraged fraud and tampering with butter. Although this was not a new problem—complaints about fraud had been heard as early as the 17th century—it now became a real threat to the position of Dutch dairy exports [3]. Serious problems also arose from the competition of margarine and the mixing of this new product with farm butter. After the early 1880s, Dutch dairy rapidly lost its share of the British butter market, mainly to the Danish who were better in maintaining quality. Cheese exports followed a similar path [1,20].

Fraud by private traders has been one of the push factors for farmers to set up their own processing companies [4], while the expanding domestic economy could compensate for the loss of the British market. After 1895, industrializing Germany became the most important customer. In 1910, already half of all exported butter went to the eastern neighbor. A crucial factor that contributed to the increase of dairy exports in this period was the introduction of a statutory quality certificate for butter in 1904. In 1913, a similar state quality certificate was introduced for full-cream cheese, followed by three certificates on several kinds of non-full-cream cheese in 1918. International competition had encouraged Dutch producers and the Dutch government to apply stricter quality control.

In 1893, the Netherlands had at least 126 dairy cooperatives [4]. Around the turn of the century, the number of dairy cooperatives had rapidly increased. In 1900, the Netherlands counted 635 dairy cooperatives, and in 1906 this number had grown to 749. Friesland was the province where industrial dairy production and the establishment of cooperatives increased most rapidly. In 1906, 88% of all butter produced in Friesland was produced in creameries; about two-thirds of them were run on a cooperative basis [19].

Fernández [3] has shown that in the late 19th and early 20th century, dairy cooperatives appeared particularly in regions that produced for export or that had low population density. Because farmers in those regions could not sell their milk as fresh milk to traders and consumers, they focused on processing. For selling their cheese and butter, farmers were dependent on traders, but information on demand, for instance in the UK market, was asymmetrically distributed among dairy chain actors. Thus, high transaction costs in export market and low bargaining power of individual farmers are rational explanations for the switch that farmers made from selling to an IOF to setting up their own cooperative dairy factory.

Bonus [10] presented another transaction cost explanation. He has argued that milk transactions are characterized by bilateral dependency or two-sided transaction costs. Not only investments by the farmers but also investments by the factory owner are specific to the milk transaction; without continuous supply of milk from farmers, the factory would operate below its efficient scale. This may explain the reluctance, in the early days of factory processing, of traders to set up factories in regions with a low density of dairy production (like in the south and east of the Netherlands).

Initially, most farmer-owned factories were established as informal groups, formal associations, or limited companies. Two institutional explanations have been proposed for the initially slow adoption of the cooperative form [4]. First, the cooperative was an unfamiliar legal form. It took 10 years between enactment of cooperative legislation and the establishment of the first formal dairy cooperative, and it took almost another 10 years before the cooperative was fully institutionalized. Second, in the southern, Catholic part of the Netherlands community leaders—both religious and civil—initially considered the cooperative too much a business, only working for the economic benefit of the members, and too little a social organization, working for the benefit of the community as a whole [4].

3.3. Consolidation, Crisis, and War (1916–1948)

The expansion of the world economy between 1890 and 1930 was favorable for Dutch agriculture. While in neighboring countries the industrial sector rapidly expanded, leading to an increasing population of factory workers, the Netherlands remained a predominantly agricultural economy. For Dutch dairy, World War I was only a temporary deviation in the process of continuous growth, as agricultural production and food supply was regulated. The major change came with the economic crisis of the 1930s, when the Dutch government, later than neighboring countries, decided to implement a large scale intervention program to support domestic agriculture [21]. In World War II (WWII) under German occupation, state regulation was further increased, and it was not until several years after the war, at the end of the 1940s, that state control over production and distribution was gradually released.

Around 1916, the number of dairy cooperatives started to decline [22]. The introduction of steam power in the dairy industry required a larger scale of production, leading to the closure of small hand-power factories. Only factories with sufficient scale could afford the expensive steam-power machinery. Steam power also allowed for better creaming, thus leading to more butter of higher quality.

Another cause of the decline in the number factories was the introduction of quality regulation. The 1915 statutory requirement to pasteurize all milk before further processing was the final blow to the hand-powered dairy factories. The 1919 General Product Quality Act and the 1925 Fresh Milk Quality Act also led to the closure of many small milk handling companies. Cooperatives, focusing on efficiency and transparency, benefitted relatively more from this institutionalization of quality control than IOFs [23].

In the 1920s, Dutch dairy exports expanded rapidly, due to the favorable economic development in most of Europe. Cooperatives merged with other cooperatives, in order to benefit from economies of scale in new activities like milk powder production. The 1920s was also a period of large scale road construction, which allowed milk to be transported over larger distances, leading to further concentration in milk processing.

The economic crisis of the early 1930s also hit the Dutch dairy industry severely. The UK, one of the main export markets, had devaluated the pound, while the Netherlands remained the Gold Standard, the fixed relationship between guilder and gold. The result was a rapid decline of competitiveness for Dutch dairy products on the British market, mostly in favor of Danish competitors. Slowly the government realized that intervention was necessary to keep the agricultural sector alive. In 1932 a Crisis Dairy Act and in 1934 an overall Agriculture Crisis Act was implemented. Large scale income support was given to farmers, while production and trade became strictly regulated, and additional statutory quality controls were introduced to prevent illicit trade. For instance, to support fair payment to farmers, as of 1939 the weight and fat content of all milk deliveries had to be measured. While before the 1930s, Dutch agricultural policies had been mostly noninterventionist, the economic crisis was the start of a long period of government regulation of and support for agriculture [20].

Since 1916, the number of dairy cooperatives decreased every year, mainly due to mergers among cooperatives. Economies of scale, particularly in milk processing, was the main argument for cooperatives to merge into larger entities. Also government intervention in the crisis years induced concentration, as the amount of support per kg of milk was higher for larger factories [24]. The success of the merger strategy can be measured by the growing joint market share of all dairy cooperatives. While in 1930 about 60% of all milk was processed by cooperatives [25], their joint market share had grown to 75% in 1940 [26]. In 1948, 426 cooperatives accounted for 84% of all milk processed [27].

Next to mergers, cooperatives implemented other strategies to exploit economies of scale and bargaining power. By collaborating in federative organizations or joint ventures, dairy cooperatives were able to benefit from scale while retaining the advantages of local presence. Four different forms of cooperation among dairy cooperatives have been developed in the early years of cooperative evolution. First, local cooperatives became member of provincial dairy unions. Already in 1893, the first dairy union was established in the southeast of the Netherlands, soon followed by dairy unions in other parts of the country. The main tasks of the provincial unions were quality control and training about quality

to factory workers. In addition, the unions started to organize trade on behalf of their members [25]. Second, cooperatives delegated foreign sales to specialized export associations. For instance, in 1898 seven dairy cooperatives from the province of Friesland established the Frisian Cooperative Dairy Export Association (Frico). In 1937, half of all dairy cooperatives were member of one of the six national export associations [4].

Third, cooperatives set up cooperative dairy banks. The first one was established in the province of Friesland in 1913, with 40 members, later expanding to 77. In 1919, a cooperative dairy bank was established in the city of Alkmaar. After several decades of independence, these dairy banks became part of Rabobank. The fourth collaborative strategy was setting up joint ventures. In 1913 several cooperatives in Friesland established the Cooperative Condensed Milk Factory Friesland (CCF) for the processing of milk from participating cooperatives into condensed milk for export.

World War II again changed the landscape for the Dutch dairy industry. The number of dairy factories further declined. Trade and processing of milk was strictly regulated, and all processors required a permit that only large companies could afford [28]. Another cause of further concentration, particularly in the west of the Netherlands, was the Standardization Act of November 1940, which required all milk to be sold with 2.5% fat [24]. Small companies trading fresh milk—most of them IOFs—could not afford to invest in the equipment to guarantee this percentage, and closed their businesses. The number of dairy companies in the province of South Holland, the major production area for fresh milk, declined from 282 in 1940 to 135 in 1945 [24]. Overall, cooperatives fared better during the war than IOFs.

The period of consolidation, crisis, and war (1916–1948) can be characterized by two major developments in the dairy industry. First, a continuous process of mergers among small cooperatives into larger units, in order to benefit from economies of scale. These mergers led to a steady decline in the number of cooperatives, from 750 in 1916 to 426 in 1948. Second, the shift from a noninterventionist economic policy to strict regulation of milk production and trade, starting during the crisis of the 1930s and continued during the war years. Most of the measures taken by the government turned out to be favoring cooperatives over IOFs. After the war, market regulation was continued, first nationally and later at a European scale, as we will see in the next section.

3.4. Rationalization (1948–1984)

In the early years after WWII, the domestic dairy market was fully regulated. Farmers received a guaranteed price per kg of milk [29]. Because production increased more than consumption, the government put a maximum on the volume of milk for which the price was guaranteed. A distinction was made between fresh milk and ‘industrial’ milk (i.e., milk to be processed into butter, cheese or milk powder). As fresh milk earned a higher price in the market than industrial milk, companies producing fresh milk had to pay a levy that was then used to support the milk processors, who exported a large share of their production. The latter arrangement seems to have been more beneficial for cooperatives as they had a larger market share in processing of milk into ‘industrial’ products.

Postwar agricultural policy of the Netherlands was based on three pillars [20]. The first ambition was to guarantee sufficient food at reasonable consumer prices. The experiences of famine in the last winter of WWII had a great impact on setting policy goals. The second ambition was to increase exports in order to obtain a positive trade balance. In an almost nonindustrial country, agriculture was one of the few sectors that could earn foreign currency. The third ambition was to guarantee a reasonable standard of living for those working in agriculture. All of these ambitions had to be realized by the modernization of agriculture.

In 1950, the Netherlands was still a predominantly agricultural country. The number of farmers and farm workers was at an absolute high [20]. As the postwar economy expanded and industrialized, the situation in agriculture rapidly changed, particularly after 1960. Productivity increased due to mechanization and the use of agrochemicals, while the number of farm workers rapidly decreased. A part of these workers found employment in the expanding food industry,

including dairy cooperatives. Table 2 shows that in the 43 years between 1910 and 1953, the structure of dairy farming remained more or less the same, while the 47 years between 1953 and 2000 show major restructuring. In the latter period, the number of farms rapidly declined, while the number of dairy cows per farm steadily increased.

Table 2. Restructuring of dairy farming, 1910–2000 (Source: [20]).

1910			1953			2000		
Number of Dairy Cows	Number of Farms		Number of Dairy Cows	Number of Farms		Number of Dairy Cows	Number of Farms	
	Absolute	%		Absolute	%		Absolute	%
1–5	137,162	71	1–5	107,129	53	1–9	1932	7
6–10	30,767	16	6–9	46,629	23			
11–20	15,265	8	10–19	34,138	17	10–19	1929	7
21–50	9264	5	20–49	14,676	7	20–29	2994	10
						30–49	8572	29
51–100	132	0	≥50	215	0	50–99	12,208	41
≥100	10	0				≥100	1832	6
Total	192,600	100	Total	202,787	100	Total	29,467	100
Average number of dairy cows per farm		5.5	Average number of dairy cows per farm		7.4	Average number of dairy cows per farm		51.0

The government supported the modernization of agriculture with “unprecedented efforts in the fields of research, education and advisory services” [20]. In addition, structural policy to rationalize the agricultural production process as well as to improve rural infrastructure was introduced. Land consolidation projects led to better access to fields, larger plots of land and reduced water levels, allowing mechanization of farming activities, particularly cultivation and harvesting with larger, and thus more heavy, tractors and machines.

In the 1960s, the national policy of modernization was complemented with the Common Agricultural Policy of the European Economic Community (EEC) (In 1992 the EEC became the European Union (EU).) and the introduction of free trade for agricultural products within the EEC. In 1968, a common European market and price policy for dairy was introduced, with a European target price and minimum price. This EEC policy was clearly beneficial for the Dutch dairy sector. As efficient milk producers, Dutch dairy farmers could exploit the growing demand for dairy products in an expanding European economy [21].

For cooperatives the new European market situation offered good opportunities for further growth. While IOFs mostly targeted specific markets, and therefore had limited demand for milk, cooperatives were focusing on efficient processing of large quantities of milk. As technological advances allowed processing on large scale, mergers among cooperatives continued, even at a faster rate. While 1948 still counted 426 dairy cooperatives, jointly responsible for 84 percent of all milk processing, the number of cooperatives had declined to only 22 in 1985, and their joint market share remained more or less equal at 85%.

In sum, the period of rationalization (1948–1984), can be characterized by modernization of agriculture, milk collection and milk processing, and by further concentration among dairy cooperatives. Technological advances and expanding market opportunities were reason for farmers to let their cooperatives merge into larger units, in order to benefit from economies of scale. One of the results of the merger process was the abolition of the export associations and provincial dairy unions, as individual cooperatives became large enough to set up their own foreign sales activities. The favorable institutional environment can be summarized by state support for modernization of agriculture, leading to higher productivity and production, and by market protection at the European level, which implied a strong demand for Dutch dairy products.

3.5. Consumer Orientation (1984–2015)

For many decades, dairy cooperatives in the Netherlands focused on producing commodities for domestic and export markets. Besides fresh milk for direct consumption, many cooperatives focused on producing commodities like cheese, butter, and milk powder. The European dairy policy included intervention buying if market prices fell below a certain threshold. Most of the intervention stocks were subsequently sold on the world market with export subsidies. Cooperatives have benefitted from this policy more than IOFs because they had no fixed volume contracts with their member-suppliers. Bekkum [30] has shown that the strategy of continuously seeking economies of scale in operations worked particularly well in a situation of market protection, such as under the agricultural policies of the EU.

The unrestrained growth options for Dutch dairy came to a sudden end in 1984 when the EEC introduced the milk quota system. As a result, dairy cooperatives reconsidered their strategy of bulk production and started to invest more in innovation and to explore international business expansion.

The new market situation did not imply the end of the concentration among dairy cooperatives. However, the strategic arguments for mergers shifted from economies of scale in operations to countervailing power and economies of scope in product development and marketing. In other words, investments shifted from efficiency improvement towards R&D, product development and marketing, both for the domestic and the foreign market. The consolidation of supermarkets also required a different strategy. When four dairy cooperatives in the northern part of the Netherlands merged into Friesland Dairy Foods, in 1998, one of the main explanations given was the need to establish countervailing power against the large domestic retailers [31]. Also competition with IOF dairy companies, such as Nestlé and Danone, became more important as cooperatives started to invest in high-value products, which previously had been the domain of the IOFs.

Nilsson and Ollila [32] and Bijman [31] have shown that the new market situation after 1984 led to strategic reorientation among dairy cooperatives in the Netherlands as well as in other European countries. First, cooperatives started to seek merger partners beyond the national borders. For instance, Campina (one of the predecessors of FrieslandCampina) merged with several dairy cooperatives in Germany [33]. Second, some cooperatives started to find new sources of capital. While Irish dairy cooperatives became listed at the stock exchange [34], in the Netherlands Friesland Foods developed special ownership shares for members willing to make an additional investment in their cooperative. Third, cooperatives restructured their internal governance. By shifting decision rights from members to managers, the latter were encouraged to be put more emphasis on developing new products and markets [35]. One theoretical explanation for this shift can be derived from incomplete contracting theory, which claims that decision rights should be in the hands of the transaction party facing the highest transactional risk [36]. As the investments by the cooperative business, particular in establishing consumer brands, are more vulnerable to opportunistic behavior than investments by the farmers, the managers of the cooperative business should obtain relatively more decision rights than the farmers. In the 1990s, the two largest dairy cooperatives of the Netherlands, Friesland Foods and Campina, introduced new internal governance models that gave managers more decision rights.

By 2000, the continuing process of mergers had reduced the number of dairy cooperatives in the Netherlands to five. The joint market share of these cooperatives was 83% of all milk deliveries. In 2008, Friesland Foods and Campina, already the largest dairy cooperatives, merged into one new cooperative, under the name of FrieslandCampina. As part of the conditions the EU Competition Authority imposed before approving the merger, the new cooperative had to sell one cheese factory. This became the new dairy cooperative, DeltaMilk [37]. In 2015, the joint market share of the five Dutch dairy cooperatives had increased to 86% [8].

The period of consumer orientation (1984–2015) can be characterized by a major shift in the dominant strategy of the dairy cooperatives. Where in the past the focus had been on economies of scale in processing, the new strategy consisted of investments in product innovation and brand

building. For some cooperatives, the new strategy also implied expansion abroad, as domestic growth options were restricted by competition rules.

An important new element in this phase in the evolution of the Dutch dairy industry was the increasing market power of retail companies. As a result, cooperatives pursued growth in order to strengthening their bargaining power. For dairy farmers, this was a period of prosperity. An abundant feed supply and technical advances in cattle breeding and milking equipment allowed further productivity growth. Despite the strong concentration in the milk processing industry, most farms continued to have several sales options, also due to the reduction of milk collection costs. Thus, farmer transaction costs related to dependence on one specific buyer seem low in this period.

The institutional environment has also changed in the period of 1984–2015. With the introduction of the quota system and the gradual reduction of price support, agricultural policies became less favorable compared to earlier periods. As a result, cooperatives started to adopt new strategies of innovation, marketing, and growth. This has led to more diversity among cooperatives, both in strategy and performance. Of the five remaining cooperatives (see Table 3), CONO and Rouveen have focused on producing premium cheeses. Two other cooperatives—DeltaMilk and DOC Cheese—have chosen a strategy of low cost in producing private label cheese. Finally, FrieslandCampina, by far the largest dairy cooperative, has chosen a combined strategy of expansion in international markets and strong consumer brands in the domestic market. All cooperatives continue to produce commodities like butter and milk powder.

Table 3. Dairy cooperatives in the Netherlands, 2016 (source: [38]).

	Turnover (Million Euro)	Employees (fte)	Members
FrieslandCampina	11,001	21,927	13,300
CONO Cheesemakers	209	176	443
DeltaMilk	209	65	165
DOC Cheese	174	230	900
Rouveen Cheese Specialties	147	160	250

4. Discussion and Conclusions

The cooperative has been a successful organizational form in the Dutch dairy sector. Two innovations were conducive to the rise of the dairy cooperative in the Netherlands: the introduction of cooperative legislation in 1876, and the invention of the cream separator in 1878. While it took almost a decade before the cooperative became well institutionalized, after 1886 the number of dairy cooperatives rapidly increased towards an all-time high number of 749 cooperative factories in 1908. After 1916, the number of dairy cooperatives steadily declined, while their joint market share increased to around 85% in 1950 and remained at this high level. In 2015, only five cooperative processors were left, while their market share still was 86%.

Theories often used to explain the rise of cooperatives, such as transaction cost economics, bargaining power, and economies of scale, also apply in the case of dairy cooperatives in the Netherlands in 19th and early 20th century. In that period, market conditions were unfavorable for the many small farmers, and the state followed a strict nonintervention policy. However, these theories need to be complemented by institutional theory to fully explain the success of the dairy cooperative model in later decades.

4.1. Economies of Scale and Bargaining Power

In the evolution of the dairy cooperative in most of the 20th century, economies of scale have played a major role. Because the farmer members had a strong interest in optimal efficiency at the level of the cooperative factory, the latter pursued efficiency improvements through organic growth and particularly through mergers with other cooperative factories. The result was a continuous decline in the number of cooperatives. At the same time, the joint market share of all dairy cooperatives

increased, which is an indication of the competitive advantage of the cooperative model vis-a-vis the IOF. Another indication of the competitive advantage of the cooperative was its longevity compared to IOFs. Frenken [5] has shown that the average cooperative lasted longer than the average IOF.

The importance of countervailing power has shifted over time. The bargaining power of the individual farmer vis-a-vis the processor has greatly improved since the 19th century, as farms have become larger and have more sales options (also due to lower transportation costs). However, the issue of bargaining power has shifted towards the cooperative itself. Because food retail has become very concentrated, with only a few buyers left in the Netherlands as well as in the main destination countries for Dutch dairy exports, dairy processors have pursued mergers in order to strengthen their bargaining power vis-a-vis those retail companies.

As of 2018, a new situation in bargaining has appeared. Several farmers have chosen to not become a member of a processing cooperative but of a bargaining association. Examples are EkoHolland, a bargaining association of some 175 producers of organic milk, and Noorderlandmelk and Flevomelk, two regional bargaining associations. These associations negotiate favorable contract conditions for their members. Such negotiation can be done with IOFs, but also with cooperatives. With new EU policy promoting producer organizations [39], the number of bargaining associations is likely to grow in the near future. Also the expected increase in the number of specialty milk streams may lead to more bargaining associations.

4.2. Reduction of Transaction Costs

Most historical accounts of the early development of dairy cooperatives in Europe have emphasized that high transaction costs in selling milk, particularly in regions at large distance from population centers, and weak bargaining power, were the major reasons for dairy farmers to set up cooperatives [1–4,8,40]. Also in later periods, transaction costs remained important, as farmers increasingly specialized in dairy production, making them more vulnerable to opportunistic behavior by traders and IOF processors. After the 1940s, however, transaction costs became less important because milk markets were strictly regulated and milk quality was under control of state agencies.

An important question for the future of dairy cooperatives is whether transaction cost reduction is still a reason for farmers to become and remain member of a cooperative. Farmers nowadays have access to more and better information about consumer trends in dairy markets. In addition, buyers are less likely to cheat on farmers, as that would damage their own reputation. It is still possible, however, that an IOF stops buying milk due to strategic reorientation. Since price volatility in European dairy markets has increased, there is more entry and exit of milk traders. In sum, the market for milk is still an uncertain market, which is a sufficient reason for most farmers to remain member of a cooperative.

Next to uncertainty, asset specificity continues to be high, as milk production facilities cannot easily be used for other purposes. Whether farmers actually have choice among different buyers, depends on the size of the farm. For small farms, the choice is rather limited. For large farms, both cooperatives and IOFs are willing to haul the milk over large distances (covering most of the Netherlands). Although quality requirements are high, these do not lead to asset specificity, because quality requirements are mainly set at the level of the industry as a whole. In sum, there is currently limited asset specificity in milk delivery transactions.

Are transaction costs still high for buyers? For the buyers, transaction costs have gone down over the years, due to lower transport cost, more transparent markets, and more trade in raw milk. Only when a company has made large investments in new production facilities its needs to assure a sufficient supply of raw milk. This company often enters into contracting with individual (large) farmers or with a bargaining association.

One type of transaction costs may increase in the near future. When farmers produce under specific product and process requirements, such as under the Caring Dairy program of Ben & Jerry's ice-cream, their investments can only be earned back by continuing to deliver to the specific buyer. Also coordination costs are higher in specialized dairy chains, as production, processing and marketing

need to be closely aligned. Industry experts expect the number of specialty milk flows to rise in the near future.

4.3. Institutionalization and Institutional Support

The evolution of dairy cooperatives in the Netherlands cannot be fully explained by efficiency-based theories only. Additional explanations may be proposed by institutional theory. The early decades of cooperative development were characterized by low state involvement, as the state in the Netherlands up until the 1930s followed a strict noninterventionist approach. The situation changed quite dramatically with the economic crisis of the 1930s. Interventionist policies were introduced as a measure to support agriculture to make sure enough food was available. These interventionist policies were continued with even more strict regulation of production and trade during WWII, as well as in the period immediately following the war. While regulation was slowly decreased in the 1950s and 1960s, the Common Agricultural Policies of the EU introduced new market ordering. The latter turned out to be quite favorable for the efficient Dutch dairy farmers and their cooperatives. As we have described above, cooperatives were better able to benefit from interventionist measures compared to IOFs. Ever since the 1930s, cooperatives have received favorable treatment from the institutional environment.

State interference in dairy markets has been reduced in the last decade of the 20th century and the beginning of the 21st century. While the period of intervention has been favorable for efficiency-driven cooperatives, the new competitive market situation has forced the remaining Dutch dairy cooperatives to adjust, for instance by developing more consumer-oriented strategies. These cooperatives have also been flexible in adjusting their internal governance structures to the new institutional and market demands [35]. However, processing cooperatives are no longer self-evident. An increasing number of farmers are joining bargaining associations. New EU policies on producer organizations may help these farmers to institutionalize their choice.

This article has described and explained the evolution of the cooperative model in the Dutch dairy industry over a period of 130 years. The disappearance of almost all of the individual cooperatives, combined with the survival of the dairy cooperative as an institution that continues to be dominant in the Dutch dairy industry, poses an interesting paradox. One key conclusion from this evolution is that efficiency-oriented theories can explain the enormous decline in the number of cooperatives but cannot sufficiently explain the sustainability of the cooperative model. At several moments in history, institutional support has been crucial in strengthening cooperatives as opposed to IOFs. Quality regulation, milk market ordering, and state support for dairy farming have all been favorable to the cooperative model.

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