Dairy farmers' support of horizontal cooperation among dairy processors: conceptual model and empirical test

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Abstract

Small dairy cooperatives can improve their economic performance through horizontal cooperation, e.g., in joint milk collection. The approval of such a strategy by cooperative members, however, is at risk given an increasing erosion of collective action commitment documented in the literature. This paper strives to explain members' decision to approve or disapprove of dairy cooperatives' joint milk collection. We draw not only on economic theory, but also include psychological and sociological logics. Farmers' decision is modeled by means of a discrete choice experiment. Relevant attitudes and relationship quality are measured using extant scales. The model is then tested on data collected from members of two dairy cooperatives. A multinomial logit regression is performed to explain farmers answering patterns, where we distinguish between Always Supporters, Selective Deciders, and Never Supporters. The multinomial logit regression to explain farmers' specific response behavior to the proposed alternative optimization models in the discrete choice experiment reveals that especially the never- and always-supporters can be meaningfully distinguished by their levels of social interaction with other members, Supplier Relationship Quality with the cooperative, and attitude towards the project. Frequent Coop Member Interaction and Supplier Relationship Quality are both associated with an increase in the relative-risk ratios of belonging to the group of Never Supporters, whereas Attitude towards Project and Attitude towards Climate Change are associated with a decrease in the relative-risk ratios of belonging to that group. Overall, the study hints at the necessity to take into account farmers' attitudes towards proposed strategies, but also their relationship with the cooperative, in order to predict and probably influence their decisions. For the latter, this study provides insights as to the relevance of social interaction among members, which could be exploited in member management.

Key words: Trust, Social Interaction, Spatial Dispersion, Member Relationships, Cooperatives

1 Introduction

The European dairy sector is under pressure. Recent developments, such as changes in policies, high price volatility in global markets, new regulations, altering consumers' preferences and an increasing demand for animal feed – left European dairy farmers in a more competitive market with more volatile returns and increasing costs. To cope with this financial stress, dairy farmers need efficient and well-performing partners in the dairy processing industry easing their situation (Soboh, Lansink, & van Dijk, 2011).

However, the dairy supply chain often is characterized by power imbalances (Jansik, Irz, & Kuosmanen, 2014). This holds especially for Germany. With a highly concentrated retail sector exerting bargaining power on the upstream suppliers, cost pressure is high, resulting in ongoing structural change at the processing and farm level (Jansik et al., 2014). Geographically, there are huge differences in the German dairy industry, with regard to the structure and overall strategy of processing companies. While the South is characterized by mainly privately owned processors producing higher priced goods in smaller factories, dairy companies in the North-Western region are for the most part cooperative enterprises, often with a focus on larger processing quantities and bulk commodities such as milk powder, butter, or low-priced consumer goods such as UHT milk (Jansik et al., 2014). However, in the Federal State of Schleswig-Holstein, with about 5,000 dairy farmers, there are still about 16 dairy processors, of which most have between 100 and 150 suppliers only. As shown by Zieseniß (2014) in an analysis of dairy companies' earning indicators, cooperatives often have disadvantages as compared to investor-owned firms. Although this can be explained with the specificities of the legal form, it poses a general threat to cooperative enterprises that have difficulties to finance long-term investments (Nilsson, 2001). Since large cooperatives are able to realize economies of scale and scope, smaller cooperatives may face additional disadvantages compared to their large competitors. Cooperation among smaller cooperatives could remedy these drawbacks (Pesämaa & Hair Jr, 2007). However, such strategies must normally be approved by the cooperative members, who may neither be homogeneous in their individual interests, nor agree with the managements' positions. Recent research has shown that there are increasing difficulties in aligning members' and boards interests (Cook, 1994; Osterberg & Nilsson, 2009). These strains between processing cooperatives and their member bases have strongly increased in Germany in the past decade. A milk strike (delivery boycott) in 2008 underlines the tense situation. There is also empirical evidence from many countries, including Germany, for the overall heterogeneity of farmers' perceptions of their buyers' strategies (Hellberg-Bahr, Steffen, & Spiller, 2011; Kalogeras, Pennings, van der Lans, Garcia, & van Dijk, 2009). This may thus be a crucial barrier for horizontal cooperation of dairy processors, and namely cooperatives, despite anticipated cost-reductions.

The aim of this paper therefore is to gain a better understanding of determinants of farmers' approval or disapproval of their cooperatives' strategy. To this end, a theoretical model is developed which combines various research streams, including economics, psychology, and sociology. The model is tested in an exploratory empirical survey among dairy cooperative members in Northern Germany.

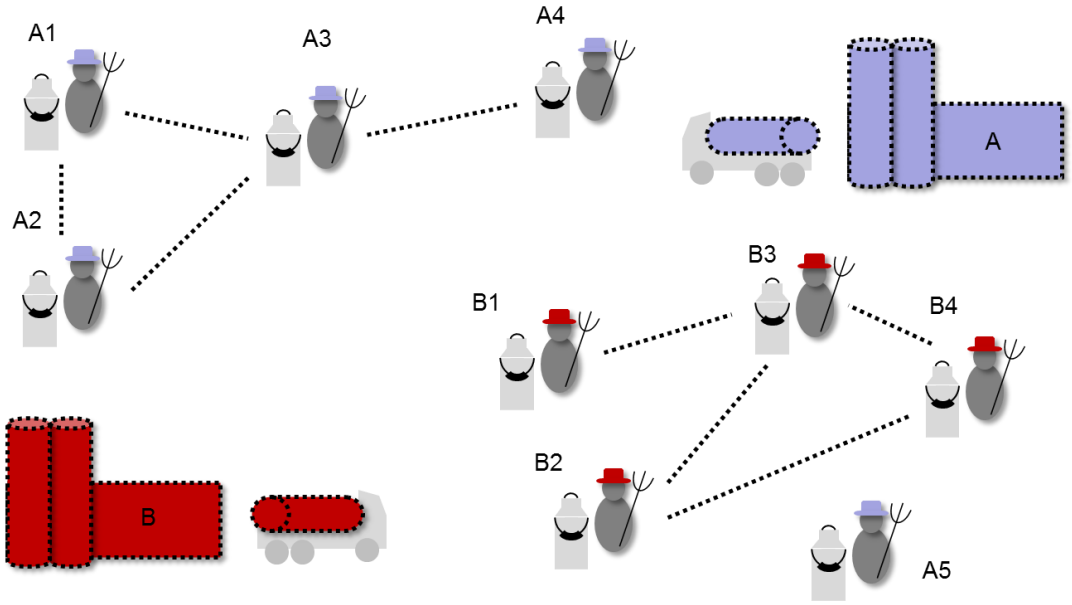
Our approach is innovative both in the inclusion of measures of social interaction and spatial proximity, as well as in the methodological approach, employing discrete choice analysis to elicit farmers' willingness to support their cooperatives' strategy. We furthermore use an innovative

empirical example, i.e., a project aiming at a joint optimization of dairies' milk collection logistics, where economic and ecological benefits are achieved simultaneously, but farmers may have to accept that their milk is collected and processed by another dairy company of which they are not member. In the next section, the project will be described in more detail, before we develop the research model, describe material, methods, and results and end with a discussion and conclusions on theoretical and managerial implications.

2 Cost reduction through collaboration in milk collection

The food processing industry often faces high transportation costs in sourcing, due to the fact that suppliers are spatially dispersed, and raw agricultural products often are bulky and/or perishable (Sexton, 1990). This holds especially for the dairy market with the perishable milk being collected with a relatively high collection frequency (in most cases every other day), resulting in catchment-areas, i.e., spatially limited areas that allow an economically reasonable acquisition of the raw milk (BKA, 2012). Boysen and Schröder (2006) even state that the importance of transportation costs relative to other cost factors will increase in the future, because of developments such as increasing fuel costs, road charges or environmental policy regulations. Since farmers in Germany mostly receive the same price irrespective of their spatial location and thus irrespective of the relative costs of milk acquisition, processors bear the total costs of transporting the raw product from the location of the farmer to the processing site (BKA, 2012). Thus, cost reduction in milk acquisition is desirable and could be achieved by cooperation among processors (BKA, 2012). Boysen and Schröder (2006) describe relevant returns to scale with regard to growing processors. The specific potential for smaller cooperatives located in the same area lies in joint milk collection such that each farmer's milk is transported to the closest dairy, instead of the dairy to which the farmer is associated as a member. As exemplified in Figure 1 for the case of two dairies A and B and their suppliers A1-5 and B1-4, this would mean that the milk of farmers A2 and A5 would likely be more efficiently collected by the milk truck of dairy B, while B3 and B4's milk would be processed in dairy A. Membership and payment would not be affected by this logistics optimization, since the processors would settle the transfer between them without notice to the farmers. Cost savings would be shared according to the contributions of each dairy.

Figure 1: Exemplary case of dispersed member structures and individual milk collection



Source: Own representation

Besides the organizational requirements, there is an additional challenge to the implementation of such cooperation, since the support of the members cannot be taken for granted, as we will explain in the following section.

3 Farmers support for cooperative management strategies: Development of the research model

The cooperative model implies the role of farmers not only being patrons but also owners. With the democratic principle of one man-one vote, this demands farmers' involvement in decision making. Several studies have pointed at increasing difficulties of cooperative enterprises to make their members engage in active participation (Nilsson, 2001; Nilsson, Kihlen, & Norell, 2009; Nilsson, Svendsen, & Svendsen, 2012; Osterberg & Nilsson, 2009). Furthermore, there is evidence for a gap between managers, board of directors, and members with respect to the evaluation of strategies (Hellberg-Bahr et al., 2011). Consequently, members' support of the cooperatives' strategies as developed by the CEOs, can be at stake. In this section, we first elucidate the approach to assess farmers' overall propensity to support management strategies and thereby set the theoretical framework. Then we explore the state of knowledge in the field of farmer participation in cooperative decision making, and develop our research model to explain farmers' acceptance of a stronger collaboration among their cooperative enterprises. Hypothesized determinants include the evaluation of the strategy, or project, the quality of the farmer-cooperative relationship, and the local and social interaction among members, i.e., the farmer-farmer relationship.

3.1 Assessment of farmers' propensity to accept management proposals

Assuming farmers to be rational, utility maximizing actors, it should be expected, that farmers support those strategies which they assume to lead to the best possible outcome. Since utility is a latent construct that cannot be measured directly, we make use of the Discrete Choice Approach, based on Lancaster's characteristics theory of value (Lancaster, 1966), which allows us to assume that farmers' acceptance of a proposed strategy depends on the evaluation of the "bundle" of measures and their consequences.

From a set of mutually exclusive and finite optimization schemes, farmer n choose the most preferred one $(j*)$ yielding the highest utility (U_{jn}). Following the random utility theory (McFadden, 1974), the farmers' decision process is not observable to the researcher and therefore the utility function is understood to comprise two parts

(1) $U_{jn} = V(x_{jn}, z_n) + \varepsilon_{jn}$

with V being the deterministic part defined by a vector of attribute levels x, a vector z defined by the farmers' personal characteristics, and ε being the unobservable stochastic part accounting for information that is not captured by the model. The deterministic part gives us the framework for the research design.

There are to date a number of studies employing discrete choice experiments (DCE) to explain farmers' preferences. Examples include contract acceptance (Broch & Vedel, 2012; Roe, Sporleder, & Belleville, 2004), acceptance of changes in production practices like the adoption of GM seeds (Breustedt, Latacz-Lohmann, & Müller-Scheeßel, 2009) or the effect of abandoning the use of bovine growth hormones in milk production (Olynk, Wolf, & Tonsor, 2012). Previous studies have shown the use of DCE as a tool to investigate drivers for contract acceptance. For example Roe et al. (2004) investigated hog producers' preferences for marketing contract attributes affecting the distribution of profits. Besides the effect of contract elements on the likelihood of acceptance they revealed strong preferences for a cooperative organizational form, in particular for producers who attach importance to a trustful relationship with their contractors. In their study on participation in agri-environmental schemes Ruto & Garrod (2009) identified a large group of farmers who require a lower incentive payment for acceptance of contracts that offer less flexibility and a higher administrative burden compared to a group of highly resistant adopters. In a study on afforestation contracts Broch and Vedel (2012) investigated farmers' preferences for attributes composed of the purpose of afforestation, a cancelling option and monitoring of implementation as well as a compensation payment. They emphasized the importance to account for heterogeneity among the target population to design contracts efficiently. Overall, these studies highlight that information on farmers' valuation of contract elements is key to achieve a higher level of acceptance.

In the cooperative literature, however, we are not aware of any study employing discrete choice experiments to investigate farmers' support for their cooperatives' strategy conditional on the level of expected outcomes. For the logistics optimization presented above, we suggest that a DCE can be employed to measure farmers' approval of the optimization scheme conditional on the expected savings, redistributed to the farmers as a mark-up to the milk price, a reduction in carbon emissions due to a reorganization of milk supply (Quinlan, Keane, O' Connor, & Shalloo, 2012), and the need for a farmer to accept that his milk be collected and processed by another dairy. The following hypotheses are related to these attributes (x):

H1: The higher the economic benefit derived from the measure, the more likely a farmer will choose to approve the scheme.

H2: The higher the reduction in carbon emission associated with the optimization, the more likely a farmer will choose to approve the scheme.

H3: If the optimization scheme requires the farmer to accept his milk being processed in another dairy plant, he will be less likely to approve of the scheme.

In the following, we explore the personal characteristics (z), which we assume to additionally shape farmers' preferences.

3.2 Evaluation of the strategy

Hellberg-Bahr et al. (2011) use a psychometric approach to measure farmers' evaluation of particular cooperative strategies. They find, based on attitudinal measures, that there are basically two groups of farmers: those who are rather short-term oriented, and those who support investments of their dairy cooperative which will pay-off in the longer term. Although a link to the actual decision making of the farmer is not made, one can assume, following the Theory of Planned Behavior (Ajzen, 1991), that such attitudes are strongly related to intentions to act. We therefore hypothesize that

H4: The more positive a farmer evaluates the proposed strategy of cooperatives' managers, the more likely he will support it with his vote.

Additional to the economic benefits which can be derived from the cooperation, in the specific case of logistics optimization, there are further positive effects relating to a reduction in CO2-emissions (Sheane et al, 2011, Thoma, et al., 2010). We therefore hypothesize that

H5: The more a farmer fears the consequences of climate change, the more he will be willing to support the logistics optimization.

3.3 Quality of the farmer-cooperative relationship

Reasons for the differences in perceptions, expectations, attitudes and actions among members as well as between members and management, or board of directors, respectively, have been extensively described in the literature under the notions of common ownership (free-rider), horizon, portfolio, follow up, and decision making problems, which are fundamentally based in member heterogeneity and diluted property rights (Cechin, Bijman, Pascucci, & Omta, 2013; Nilsson, 2001). Large cooperatives often also suffer from an increasing social alienation from their members, when personal relationships become difficult to maintain with a growing member base. This might cause additional problems in the relationship between members and their cooperatives given the assumptions and overwhelming empirical evidence in relationship management literature, that specifically trust and commitment have a positive impact on, among others, willingness to cooperate (Cechin et al., 2013; Kleinaltenkamp, Ehret, Hunt, Arnett, & Madhavaram, 2006; Morgan & Hunt, 1994; Wilson, 2000). Such effects have been proven in many empirical studies also in the dairy sector (Schulze-Ehlers, Steffen, Busch, & Spiller, 2014; Schulze, Wocken, & Spiller, 2006).

Relationship quality generally is understood to comprise satisfaction, trust, and commitment, although many studies also include other variables such as communication (Athanasopoulou, 2009). Some studies exclude satisfaction (Leonidou, Samiee, Aykol, & Talias, 2014; Obadia & Vida, 2011), while others only retain satisfaction out of the three core variables and include other measures instead (Lages, Lages, & Lages, 2005). Hellberg-Bahr et al. (2011) find that relationship quality plays an important role in explaining farmers being in the cluster of “Investment supporters” in a cooperative context. Osterberg and Nilsson (2009) as well as Hansen, Morrow Jr, and Batista (2002) and Cechin et al. (2013) also provide evidence for the positive effects of trusting member-cooperative relationships on loyalty.

In the specific case of the milk collection optimization, where the actual savings occur at the processor level and may strongly differ based on the regional conditions (Quinlan et al., 2012), farmers have to trust in their cooperative to honestly reveal the benefits and redistribute it to them as members. Put differently, the lack of transparency of the monetary effects and consequently the lack of means to fully appropriate the savings requires members to either trust their dairy or disapprove of the measure (Schulze-Ehlers et al., 2014). On the other hand, however, the strategy might imply that a member is required to accept his milk being processed in another dairy. For this case it can be assumed that a very trusting and committed member also would disapprove. It could thus be anticipated that

H6: There is an inverse U-shaped effect of relationship quality on farmers' propensity to support the milk collection optimization, with very high and very low relationship quality leading to disapproval of the optimization project.

3.4 Local social interaction as a determinant of group cohesion and cooperation orientation

It is straightforward to assume that factors such as communication between member and coop, or the behavior of the management and the board of directors can have a direct effect on relationship quality (Hansen et al., 2002; Wilson, 2000). Another, more sociological perspective, lets us introduce also member-member-interaction into the model. Hansen et al. (2002) explored the effect of trust among members of two agricultural marketing cooperatives on their perceived cohesion, and consequently willingness to stay with the group, i.e., the cooperative. A major finding is that trust varies depending on the complexity of services offered and the geographical dispersion of the cooperative members. They hypothesize that the latter might be an indicator for the infrequency of social interactions among members and between members and management, which results in lower levels of affective trust as compared to cognitive trust (Hansen et al., 2002). The main justification is that geographical dispersion leads to less frequent interactions and thus fewer personal relationships among members or between members and management, which are a prerequisite for the formation of affective trust. The cooperative therefore cannot represent a means to fulfill social goals, if its membership is strongly dispersed (Hansen et al., 2002), and cognitive parameters determine loyalty or switching, cooperation or defection.

Theoretically, besides these empirical findings, justification for the inclusion of social interaction is straight forward. In general, economic agents and their interactions is the core of economics. The actions of one agent potentially affect the preferences, expectations and constraints of other agents (Manski, 2000). Therefore, social interaction may shape farmers' preferences, expectations and constraints with regard to the experiment.

The inclusion of social interaction seems even more reasonable in a cooperative setting, because the cooperative is a network organization by design (Hong & Sporleder, 2007), comprising social interaction and clan-like structures (Ouchi, 1980). Whereas the outcomes of social interaction, such as Social Capital in cooperatives, are commonly considered (e.g. Nilsson et al., 2012), direct inclusion of social interaction in agricultural research is scarce. Exceptions include the examination of social effects influencing the learning and adoption of new technologies and practices (Conley & Udry, 2010; Foster & Rosenzweig, 1995; Yu, Hailu, & Cao, 2014). Doing so, however, requires defining the group of people (peers) somebody is influenced by with regard to a certain issue. In a cooperative setting, this may be rather complex, since one may consider social interaction with different groups, e.g. cooperative members, non-cooperative members, the cooperative management and others.

Taking up the consideration that frequent social interaction between cooperative members results in higher levels of affective trust, leading to higher levels of group cohesion (Hansen et al., 2002), one may assume that members interacting mostly with other members will be more reluctant to approve cooperative measures they fear to threaten that structure. On the other hand, if someone is characterized by high levels of interaction with the members of other cooperatives, his social network is less associated with the cooperative, leading to less perceived dependence of the cooperative as a mean to fulfill social goals. This leaves one with the next hypothesis:

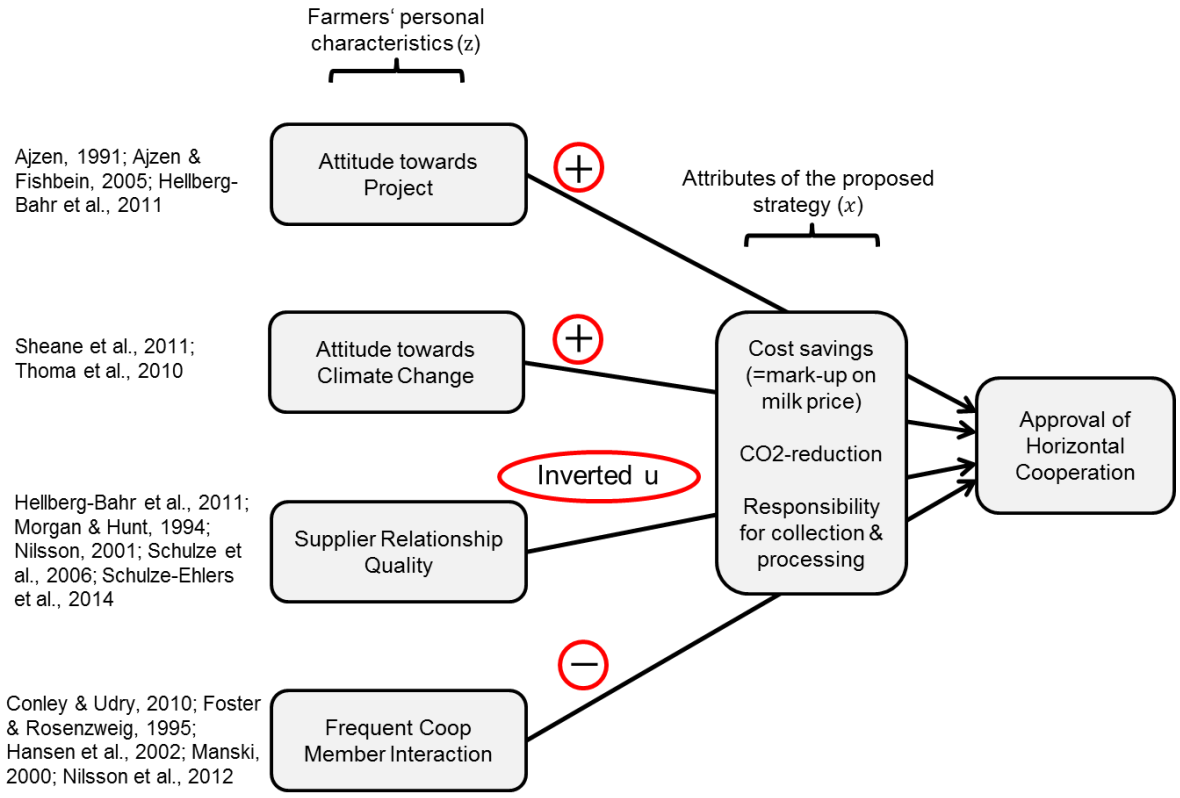
H7: Frequent interactions with coop members result in a lower willingness to support the cooperatives' measure.

Furthermore, the conclusions by Hansen et al. (2002) are based on the assumption of spatial proximity as an indicator for the frequency of social interaction. This link has been empirically tested in various networks and contexts (Sohn, Christopoulos, & Koskinen, 2013), but, to our knowledge, not in the framework of agricultural cooperatives. The last hypothesis therefore is:

H8: Social interaction is associated with spatial proximity in an agricultural cooperative context.

Figure 2 summarizes the theoretically evaluated determinants of the approval of horizontal cooperation.

Figure 2: Proposed Research Model



Source: own representation

The next section describes the data collection, employed measures, and explains how a Discrete Choice Experiment is used to elicit farmers' willingness to support cooperative policies.

4 Material and Methods

4.1 Data Collection

The distribution of the written questionnaire was managed by two dairy cooperatives end of October 2014. 53 questionnaires were returned sufficiently completed; accounting for 19 % and 21 % of the respective cooperatives' members, respectively. 50 out of 53 respondents indicated being the head of the farm operation. 36 % of the farmers stated there was another dairy closer to their farm. 54 % of the participants have been members of the respective coop for more than 20 years, 34 % have been members for less than 10 years. The majority (58 %) has a milk quota endowment between 300.000 and 700.000 kg, 23 % have more, and 19 % have less than that.

4.2 Measures

The attitude towards the proposed optimization was measured with four items asking whether farmers deemed the measure as sense making, the cooperation to be realistic, the opinion of peers with respect to the optimization, and the extent to which the measure actually is relevant to achieve the expected goals, in this case, the contribution of transportation to the carbon footprint of milk. The measures of Relationship Quality are based on the Supplier Relationship Quality (SRQ) items from Schulze, Wocken, and Spiller (2006), Hansen et al. (2002), and Bijman and Verhees (2011). To measure Supply Chain Orientation, two items were taken from Schulze et al. (2014), reflecting vertical cooperation orientation, and common goal orientation. For the empirical case study, attention was also paid to studies dealing with concern for climate change. Arbuckle et al. (2013) recently provided evidence of the heterogeneous attitudes of farmers with respect to climate change. We therefore expect that a farmer will be more willing to support the proposed logistics optimization, the more he is concerned about climate change. Four items reflecting concern about climate change and willingness to contribute to climate change mitigation were taken from Arbuckle et al. (2013). The attitudinal and the SRQ items were all measured on 7-point scales.

To reduce the complexity and test for the unidimensionality of the included constructs, a Principal Component Analysis (PCA) with an orthogonal (varimax) rotation was employed, with an Eigenvalue of 1 as cut-off criterion. Beforehand, a substitution of missing values by the mean was performed. A maximum of four values per variable were substituted, indicating a maximum share of substituted values per variable of 7.5 %. Table 1 presents an overview of the results The Cronbach's Alpha values of above .7 for the factors indicate a sufficient reliability of the factors.

Table 1: Results of the Principal Component Analysis

Construct/ item	Mean	SD	Factor Loading
Supplier Relationship Quality (Cronbach's Alpha=0.95 ; contribution to variance explained= 36.4%)			
How much do you trust the dairies' management?[1]	6.06	1.18	.922
There is no factual reason to doubt the managements' abilities.[1]	6.21	1.03	.887
My dairy is economically well positioned.[1]	6.10	1.10	.865
How much do you trust the cooperatives' board?[2]	5.90	1.11	.845
I feel well represented by the board.[1]	5.92	1.11	.829
The dairy respect their commitments.[1]	6.15	1.06	.787
My sense of intuition tells me that the cooperative's management can be trusted.[1]	6.02	1.22	.754
If I could choose a new buyer, I would choose the same again.[1]	6.13	1.02	.695
I feel committed to my dairy.[1]	6.09	1.15	.677
The prices paid by my dairy are reasonable considering the different market situations.[1]	5.75	1.19	.670
In case of problems my dairy and I come to an accommodation.[1]	6.10	0.99	.654
Attitude towards Project (Cronbach's Alpha= 0.85; contribution to variance explained = 14.7%)			
An optimization of milk collection in Schleswig-Holstein is useful.[1]	5.23	1.98	.904
The cooperation of farms in Schleswig-Holstein is reasonable.[1]	4.55	1.59	.852
The majority of my peers believe that an optimization of milk collection in Schleswig-Holstein is useful.[1]	4.31	1.92	.833
Transportation has an impact on the carbon footprint of milk.	4.72	1.78	.684
Satisfaction with Dairy (Cronbach's Alpha= 0.87; contribution to variance explained =14.1%)			
I am … with the milk collection of my dairy.[2]	5.71	1.50	.830
I am … with the collaboration with my dairy.[2]	6.09	1.35	.757
Compared to other dairies I am … with my dairies' milk price.[2]	5.87	1.36	.748
Attitude towards Climate Change (Cronbach's Alpha= 0.72; Variance explained = 8.6%)			
The possible influence of climate change on our local agriculture worries me.[1]	4.21	1.88	0.877
I believe that extreme weather events will occur in the future.[1]	4.92	1.73	0.850

1 Scale from 1= Not at all to 7= Entirely

2 Scale from 1 Absolutely dissatisfied to 7= Absolutely satisfied

n= 53

The overall perceived Supplier Relationship Quality includes ten items covering the sub-dimensions: commitment and cognitive as well as affective trust. The employed items for this construct were adapted from Schulze et al. (2006), Hansen et al. (2002) and Bijman & Verhees (2011). The satisfaction with the relationship however was found to form a separate factor comprising three items relating to the collaboration in general, the milk price and milk collection, as proposed by Schulze et al. (2008). Trust includes both a cognitive and an affective dimension. In the cooperative context, trust in the managers as well as in the board of directors and representatives has to be distinguished. Farmers' attitude towards the proposed project was measured with four items asking whether farmers deemed the measure as sense making, the cooperation to be realistic, the positive opinion of peers with respect to the optimization, and the extent to which the measure actually is relevant to achieve the expected goals, in this case, the contribution of transportation to the carbon footprint of milk. Two items reflecting farmers' concern about climate change were adapted from Arbuckle et al. (2013). All utilized attitudinal and SRQ items were measured on 7 point scales.

As show the reported means and standard deviations, the perceived relationship quality and satisfaction are quite high in this sample. Also the evaluation of the project is overall positive, but farmers are rather neutral as to the impacts of future climate change. The 7-point scale is fully exploited by the participants only in the case of project evaluation and climate change perceptions. For satisfaction, the items on overall satisfaction and price satisfaction exhibit a minimum value of 2, thus the most negative answer has not been selected by any of the participants, and most of the relationship quality items have a minimum value of 3 (exemption: for trust in management the minimum is 2).

Spatial dispersion is measured by the share of neighbors being members of the same cooperative. Measures for social interaction with respect to dairy farming are based on Conley and Udry (2010), Yu et al. (2014) and Bijman and Verhees (2011), distinguishing neighbourhood and cooperative membership, respectively. Descriptive statistics of these Likert type items are reported in Table 2.

Table 2: Results for spatial and social interaction

Items for spatial and social interaction	Mean	SD	Min	Max
How many peers (dairy producers) you discuss issues regarding milk production and marketing at least once in a month live in your or a neighboring municipality? (n=47)[1]	4.28	1.56	1	7
How many peers (dairy producers) you discuss issues regarding milk production and marketing at least once in a month are members of your cooperative? (n=48)[1]	4.10	1.57	1	7

1 Scale from 1= None to 7= All

Those two variables show no tendency, since the mean is close to 4 and the full scale is exploited. The third variable was measured as a binary variable and the respondents had to indicate, whether

most of their neighboring dairy producers are a member of their cooperative. It thus indicates the spatial proximity to other cooperative members. 29 respondents indicated that most of their neighboring dairy producers are a member of their cooperative, whereas 19 respondents negated this question. Table 3 shows the distribution of this binary variable in relation to the variable indicating the share of peers being members of the same cooperative.

Table 3: Cross table of spatial membership structure and social interaction

"Most neighboring dairy producers are members of the same cooperative."	***"How many peers (dairy producers) you discuss issues regarding milk production and marketing at least once in a month are members of your cooperative?"***							
	None						All	Total
No	3	2	7	5	0	0	2	19
Yes	0	1	3	11	7	4	3	29
Total	3	3	10	16	7	4	5	48

Source: own calculation

The cross table suggests that farmers that are mostly surrounded by other cooperative members seem to have more social interaction with cooperative members. Given that a Shapiro-Wilk test fails to reject normality and a Bartlett's test for equal variances fails to reject homogeneity of variances we carry out a t-test. This indeed supports H8, i.e., we find significant differences in the central tendency (mean: 4.66 vs. 3.26; t-value: -3.295).

Since we hypothesized that frequent interaction with cooperative members has an impact on the willingness to support the cooperative measure, we dichotomized the variable measuring the share of peers being members of the same cooperative. Respondents that quoted higher values than the neutral position (4) are thus grouped by the dummy variable. In doing so, we are cautious of incorporating single-item measures with regard to complex constructs and assume that by means of the dichotomization, the true scale of social interaction is measured with more validity. This new variable indicates a more frequent interaction with cooperative members compared to non-cooperative members and was labeled as Frequent Coop Member Interaction.

4.3 Discrete Choice Experiment

To investigate the acceptance behavior and to identify determinants of the decision process ex-ante to the project implementation, we employed a Discrete Choice Experiment. The assumptions underlying this model have already been detailed in section 3.1. The experiment to elicit the implicit utility of single measures combined in the optimization strategy was set up in close cooperation with two dairy managers. The relevant issues regarding the optimization of milk collection and consequences that might affect the approval by the farmer were carefully discussed. Primarily, the cooperation serves the purpose of efficiently planning the milk collection routes. To achieve cost

savings, the collection might be done by a forwarding service or by the cooperating firm depending on the distances between farm and processor. The decision parameters relevant for farmers' approval or disapproval of a joint logistics optimization were defined to relate to (1) the potential increase in milk prices due to cost savings, which range between 1 and 10 Eurocent/100kg of milk, (2) the consequence for the individual farmer, which could be that a farmer's milk would be collected by an external shipping company or and processed by another firm, and (3) the potential reduction of CO2-Emissions, which were estimated to be between 1 and 3 %.

In the DCE framework, different versions of a logistic optimization model are presented to members of the cooperatives. Each choice set comprised two possible optimization models and an "opt-out" alternative if the farmer is not approving the cooperation at all. Due to the voluntary character of approval the inclusion of the status quo option is deemed realistic. The D-efficiency of the orthogonal design after exclusion of three unrealistic combinations is still high 98.6 with regard to a value of 90 indicating a satisfactory design (Kuhfeld, Tobias, & Garratt, 1994). The alternatives were divided into six blocks with four choice sets each.

Table 4: Example for a choice set

Attributes	**Model 1**	**Model 2**	**Status Quo ("opt-out")**
Milk collection and processing	The milk collection is done by a forwarding service and the milk is processed by cooperating firm.	The milk collection and the processing are done by the cooperating firm.	None of the models is attractive to me.
Reduction of emission	2%	1%	
Compensation (eurocent per 100 kg milk)	1.0	2.0	
I agree to:	□	□	□

Source: own representation

Unfortunately, the number of questionnaires per block was not returned equally distributed, implying an unbalanced distribution of choice options in the sample. A first overview on the returned questionnaires gave hint to a specific response pattern distinguishing three different groups: "Never Supporters (1)", comprising ten farmers who never chose one of the proposed models presented in the four choice-sets in their version of the questionnaire, ten "Selective Deciders (2)", who supported some, but not all models, choosing at least once to opt out, and 33 highly supportive farmers classified as "Always Supporters (3)" who always chose one of the proposed models. Following the rationale of Lancasters' characteristics theory, we can assume that for the Always Supporters, even the lowest attribute level would suffice to convince them of the project. For the Never Supporters, on the other hand, even the highest mark-up proposed in the experiment would have not been

enough to compensate them for the introduction of the new milk collection scheme. Given that there is no actual cost incurred for the farmers with respect to the project implementation, we assume that the decision behavior be driven by other than economic incentives. For the Selective Deciders, finally, we can assume that there is a threshold in economic and environmental, or social attributes. Given the small sample size, a further investigation seems not reasonable, however.

Instead, we will explore potential mechanisms of the data generating process in the following. To further investigate this particular response behavior, we employ a multinomial logit regression to explain farmers' likelihood of belonging to one of the three above described groups.

4.4 Multinomial Logit Estimation

The three groups can be assumed as three dichotomous variables, taking the value 1 when a farmer belongs to this group and 0 otherwise. Following Greene (2008) the model for the probability that a decision maker $\boldsymbol{i}$ with characteristics $\boldsymbol{x_i}$ belongs to one of those groups is:

$$Prob\ (y_i = j) = \frac{e^{\beta_j x_i}}{\sum_{k=1}^{J} e^{\beta_k x_i}}\ , for\ j = 1,..,J\ with\ J = 3$$

The probabilities sum to one, therefore only $J - 1$ can be specified. To obtain model identification a convenient normalization has to be done by setting $\beta_3 = 0$. This means that the remaining coefficients β_j measure the change relative to a reference group, or base category. In this case, we define the largest group, $y = 3$ (Always Supporters)[1] as the reference group. Hence, the coefficients of the multinomial model are interpreted in comparison to this base category. The parameters are not directly interpretable, thus the relative risk ratio has to be computed instead. The exponential value of a coefficient is the relative-risk ratio for a change in the regressor x_i. In this specific case, the regressors relate to the above derived hypotheses on determinants of farmers' approval of cooperative logistics optimization models, i.e., evaluation of the optimization idea, relationship quality, social interaction and attitudes towards climate change. Results are presented in the next section.

5 Results

Despite the small sample size, we find significant differences between the three groups of Never Supporters, Selective Deciders, and Always Supporters. Nevertheless, the findings have to be treated cautiously, due to the relatively small sample size. Note that due to missing values in the variable for social interaction, five observations were excluded from the analysis. Table 3 displays the results of

[1] The codes for the outcomes 1 to 3 are arbitrary, i.e. no value is placed on a specific category.

the multinomial logit estimation with the group declared as Always Supporters embodying the base category.

Table 5: Results of the multinomial logit estimation: relative-risk ratios

Variables	Never Supporters	Selective Deciders
Attitude towards Project (H4)	0.0609***	0.373*
	(0.978)	(0.576)
Attitude towards Climate Change (H5)	0.163*	0.966
	(1.045)	(0.460)
Supplier Relationship Quality (H6)	25.47*	0.984
	(1.764)	(0.374)
Satisfaction with Dairy (H6)	1.176	1.990
	(0.606)	(0.510)
Frequent Coop Member Interaction (H7)	13.28*	2.932
	(1.515)	(0.892)
Constant	0.0141**	0.228***
	(1.869)	(0.555)

Base category: Always Supporters
Pseudo R^2: 0.33
Observations: 48
Standard errors of log coefficients in parentheses
Levels of significance: *** p<0.01, ** p<0.05, * p<0.1

For the propensity of belonging to the group of Never Supporters, four variables have a statistically significant impact. First, the relative-risk ratio estimators for Attitude towards Project and Attitude towards Climate Change are both statistically significant and below one. This indicates that an increase of either constructs is related to a decline of the relative odds for the group of Never Supporters compared to the group of Always Supporters. These findings are consistent with hypotheses 4 and 5. For the group of selective supporters only the attitude towards the project is significant in distinguishing the group from Always Supporters. With a value below one, it indicates, c. p., a decrease in the likelihood to belong to the group of Selective Deciders compared to the group of Always Supporters. The significance of this factor in both groups underlines the importance of the attitude towards the project for the approval of cooperation among dairy processors.

Second, Supplier Relationship Quality is positively associated with an increase of the relative probability of belonging to the group of never supporters relative to the base category. We thus do not find the hypothesized inverse U-shape relationship, but a negative relationship between SRQ and project support.

Finally, we find Frequent Coop Member Interaction being associated with an increase in the relative probability of belonging to the group of Never Supporters. Thus, the relative probability of belonging to the group of Never Supporters as compared to the group of Always Supporters ceteris paribus is higher for farmers characterized by frequent interaction with other members of the same

cooperative than for farmers frequently interacting with dairy producers not being members of the cooperative. This is in line with hypothesis 7.

6 Discussion

The empirical findings revealed in the multinomial logit estimation support our proposed framework of factors influencing farmers' decisions to a large extent. Despite the necessary change in the empirical strategy due to unbalanced distribution of choice set blocks, we obtain meaningful results for the remaining hypotheses 4-8. The multinomial logit regression to explain farmers' specific response behavior to the proposed alternative optimization models in the DCE reveals that especially the never- and always-supporters can be meaningfully distinguished by their levels of social interaction with other members, SRQ with the cooperative, and Attitude towards Project. Frequent Coop Member Interaction and SRQ are both associated with an increase in the relative-risk ratios of belonging to the group of Never Supporters, whereas Attitude towards Project and Attitude towards Climate Change are associated with a decrease in the relative-risk ratios of belonging to that group. Hypotheses 4, 5 and 7 thus are supported by this study, while for H6, we do not find a u-shape, but a negative link between member-cooperative relationship and strategy approval. We argue that his latter finding, which may seem contradictory to current literature in relationship marketing, is due to the specific strategy analyzed in this study.

Theoretically, we contribute to the cooperative literature in presenting experimental evidence for the relevance of horizontal and vertical relationships in cooperative member decision making. Given the specific logistics focus, the results with respect to the negative impact of SRQ may not be generalizable. Studies focusing on other cooperative strategies should therefore take into account the specific implications a measure has for the relationship between a farmer and the other members as well as the cooperative, and put their hypotheses respectively. The directions of influence indicate that Never Supporters are more strongly driven by relational factors in their decision making than Always Supporters. The better the relationship with the own cooperative, the less ready a farmer is to accept models which might lead to an erosion of this relationship. The same holds for social interaction with cooperative members.

Furthermore, we add to the literature by examining the spatial embeddedness of social interaction in a cooperative setting. At first appearance, the results in the descriptive section did not directly support hypothesis 8, since the variable measuring the interaction with other cooperative members on the community, or neighboring community, level showed no tendency, what may be due to the fact that the spatial distribution of peers may have a wider radius than indicated by communities or neighboring communities on average. Nevertheless, the distribution of the share of cooperative

social interaction conditional on the extent of cooperative members surrounding the farmer supports this hypothesis.

The practical implications for the preparation of decisions in a cooperative context are twofold. First, a selective strategy for the communication of new management measures seems reasonable. Social interaction among cooperative members may be associated with spatial dispersion of cooperative members. A selective, regionalized strategy, with a special emphasis on those regions with high member density, can thus be appropriate. Second, the relevance of the attitude towards the project indicates that communication of the advantages and means of a project is crucial. Communication of environmental effects may be an additional argument for farmers to support the program, as shows the significance of the coefficient in the group of Never Supporters.

7 Conclusion

All in all, the paper proposes a theoretical model and obtains first evidence for factors shaping farmers' approval or disapproval of horizontal cooperation among cooperative processing firms. Awareness of that may ease the implementation of such measures and may give a competitive advantage for small and medium-sized cooperatives. However, despite the response rate of about 20 %, one may criticize the results being biased due to the small sample size and we strictly advise to treat the empirical evidence cautiously. A larger sample size and balanced distribution of choice sets would give the opportunity to understand the relevance of the different attributes describing the choices of optimization schemes, i.e., to estimate the marginal effects each attribute has on the likelihood of support. On the other hand, since this research focused on small and medium-sized cooperatives, it may be difficult to obtain much larger samples.

The heterogeneity in farmers' decision making could be analyzed in more detail with more degrees of freedom. Some omitted variables might challenge our results and should be included in future studies. These include the financial situation of a farmer and the perceived impact of the strategy on the own situation, and the evaluation of the other dairy which is expected to collect the milk. For farmers with low liquidity, it might simply be unaffordable to reject a proposal which delivers even the slightest mark-up. Questions on the financial situation, however, are difficult to include in such surveys. Further, while the personal concern is already covered by the evaluation of the strategy, there could be some other measures to capture the full picture, such as the expectation of being personally affected or not. The evaluation of the other dairy is useful to control for barriers residing in a negative reputation of this company as compared to the current cooperative. Nevertheless, the scenario for the choice experiment is quite realistic, creating unique favorable conditions for the observation of behavior in that context.

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