Member Commitment and Switching Decisions in Dairy Cooperatives – A Factorial Survey

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ABSTRACT

The membership base of dairy cooperatives has become increasingly unstable in the past decades. Understanding the factors influencing dairy farmers' rescinding of such memberships is crucial for preventing supplier losses, which may threaten the cooperatives' competitiveness. Since the dairy sector is characterised by substantial complexity and uncertainty, the broader context in which such decisions take place must be considered. To this end, a factorial survey experiment is developed. The experiment contains descriptions of realistic scenarios that have to be evaluated by the respondents in terms of the incentives to switch. The factors and processes described in the scenarios result from an extensive literature review and a qualitative pre-study with sector experts. Implemented by means of an online survey, the survey experiment was distributed by Northern German dairy cooperatives among their member suppliers. The obtained results provide evidence for the relevance of the prices paid by the cooperative, the current performance of the cooperative, as well as the importance of the farmer orientation of a dairy and the state of the relationship quality. Moreover, findings provide statistical evidence for the influence of other farmers' switching decisions and neighbouring farmers delivering to a competitor.

Keywords: Membership Dynamics; Loyalty; Switching Intentions; Decision-making; Peer Effects

1   Introduction

The dairy sector is characterised by a complex coordination of problems between farmers and processors. High investment specificity and uncertainty, as well as complex delivery requirements (due to the perishability of the raw product), lead to strong interdependence between the farming and the processing sector, which often becomes manifest in the institutional form of cooperatives (Bonus, 1986; Lehmann et al., 2013). Even though cooperatives play a crucial role in the dairy sector in western countries (Bijman et al., 2012; Ling, 2014), the cooperative model is increasingly questioned, since the relationship between members and cooperatives is often distorted. Similar to other sectors, dairy cooperatives have grown substantially in recent decades, which

has led to large membership bases and complex business processes (Harte & O'Connell, 2007). As a consequence, social cohesion, which is a key feature of cooperatives (Cechin et al., 2013; Hansen et al., 2002), and, thus, member commitment, has often declined (Bonus, 1986; Feng et al., 2016; Fulton, 1999; Fulton & Giannakas, 2001; Nilsson et al., 2012). With increased alienation on the one hand, and increased economic pressure on the other, dairy farmers increasingly seek to deliver their raw milk to alternative buyers. Consequently, farmers' long-term membership in dairy cooperatives is no longer self-evident, threatening the dairy cooperatives' competitiveness due to potential supplier losses. However, the actual factors leading to switching decisions are often unknown, because of the high complexity associated with the characteristics of agricultural cooperatives as well as the dairy sector. Identifying the factors and processes influencing switching decisions in the dairy sector may help cooperative managers to retain members and, consequently, to improve cooperatives' competitiveness.

Agricultural cooperatives are associations of farmers that emerged due to market failures (Novkovic, 2008; Ortmann & King, 2007). Theoretically, the collective action in purchasing, processing and/or marketing can be seen as a means to create a countervailing power and to achieve more competitive prices (Fulton, 1999; Hansmann, 1996). Assuming rational profit-maximising agents, farmers would switch to another dairy (referred to as switching decision in the following) if the prospects of the other dairy's payouts exceeded the prospects of staying with their current dairy cooperative. Consequently, the emergence of switching decisions indicates that the abandoned dairy cooperative is perceived to be outperformed by a competitor. However, a purely economic perspective on switching decisions in agricultural cooperatives most likely underestimates the complexity and variety of the underlying decision-processes: the network structure (Cechin et al., 2013), the ownership (Cook & Chaddad, 2004), the democratic governance and social objectives (Ortmann & King, 2007) - just to name a few reasons - require a broader perspective, which has, in turn, been analysed by various researchers (e.g. Fürstenberg, 2014; Hogeland, 2006). Following this mode of thinking, analyses solely taking market prices and potentially observable economic indicators into account most likely fall short of identifying all the relevant determinants of switching decisions. Several scholars emphasise the importance of latent factors, such as trust and commitment, in agricultural cooperatives generally (Fulton, 1999; Hansen et al., 2002; Lang, 2004; Nilsson et al., 2012), and dairy cooperatives specifically (Gerlach et al., 2006; Gyau et al., 2011; Schulze et al., 2006), which are difficult to observe and, consequently, increase the complexity of the relationship between members and their dairies. Moreover, price signals function rather poorly when it comes to analysing switching decisions in the raw milk market, because prices in the dairy sector are increasingly volatile and usually settled posterior to the delivery of the raw milk (Lehmann et al., 2013; Van Bekkum, 2001). Hence, dairy farmers face decision-problems characterised by tremendous uncertainty and complexity. Given these characteristics, it can be assumed that the actual context in which a switching decision takes place plays a crucial role (Fantino & Stolarz-Fantino, 2005; Gigerenzer, 2000). However, such contextual factors are often neglected in extant research. For example, the importance of farmers' horizontal relationships within cooperatives has been widely neglected in the literature, with only a few empirical studies explicitly incorporating this factor into their research (Hansen et al., 2002).

This article seeks to address this research gap and investigates the factors actually influencing dairy farmers' switching decisions in context by means of a factorial survey (vignette study). This method, which has only recently stirred the interest of agricultural economists (Ellison & Lusk, 2016), allows for framing decision-making contexts which reflect real-world situations. The potential influencing factors are derived from the literature, as well as from insights obtained from interviews with sector experts, and tested by means of an online survey conducted among German dairy cooperative members in order to shed light on farmers' decision-making under such complex conditions. The German cooperative dairy sector is characterised by full delivery/intake obligations, price settlement posterior to delivery, the absence of minimum pricing-schemes

and substantially long notice periods, which last, on average, for 24 months (BKA, 2012; Lehmann et al., 2013). Given these characteristics, as well as the high economic uncertainty and complexity associated with the very traditional coordination between farmers and their cooperative dairies, it seems ideal to use German dairy farmers in order to analyse the contextual factors influencing switching decisions. Moreover, the phenomenon of dairy farmers' switching decisions is prevalent in Germany and other countries, as underlined by various reports in the media (Dermody, 2015; Koch, 2017; Wills & Robins, 2016).

The paper proceeds as follows: First, we derive the factors that shape a farmer's decision-space (i.e., the context in which the decision takes place) and develop testable hypotheses accordingly. Subsequently, and before we implement the potential factors into an experimental setting and design the experiment itself, factorial survey experiments are described. In the empirical section, the data and the econometric methods are described before the results are presented. Finally, the results are discussed, and the article closes with recommendations for cooperative managers and future research.

2   Deriving the farmer's decision-space

We define a farmer's switching decision as a farmer's defection from their cooperative and, thus, the decision to trade with another business partner in a more or less distant future point in time. Hence, a switching decision is directly related to the switching opportunities a farmer is facing, i.e., the relative prospects of dealing with one or another dairy processor. Generally speaking, and assuming the farmer is capable of rational decision-making, a farmer would defect from their dairy cooperative if the prospects of trading with another dairy (cooperative or investor-owned) exceeds the prospects of staying with the cooperative. This decision problem, however, is embedded in a particular context, i.e., the specific situation in which the decision takes place.

While there is an extensive body of literature on the relationships between agricultural cooperatives and their members in general (Nilsson et al., 2012), dairy cooperatives have not received any particular attention, and, despite the increasing practical relevance of switching decisions, there is little empirical work on farmers' switching decisions in the dairy sector. The exceptions refer to the work of Morfi et al. (2014) and (2015) on Finnish cooperatives from several sectors, as well as literature on the choice or change of milk handlers in the US by Jensen (1990), Misra et al. (1993), Zeuli and Bentancor (2005) and Sayers et al. (1996), and the switching intentions of German dairy farmers by Schulze et al. (2006).

A wide spectrum of theories have been used for analysing factors considered as influencing both farmers' satisfaction and relationships with their cooperatives (Nilsson et al., 2012). We suggest that the potential factors that stem from the various theories can be roughly divided into three categories, i.e., economic, relational, and strategic factors. These are briefly described in the following, complemented by empirical findings from the literature. Additionally, to ensure the practical relevance of the testable attributes, the selection of hypotheses is based not only on the literature, but also on insights obtained from qualitative interviews with two sector experts in November 2016, as well as an extensive pretesting of situations with German dairy farmers (as representative of the target population) in January 2017.

Economic factors

In neoclassical economics, it is widely assumed that rational agents operating in perfect marketplaces seek to maximise their utility or profit on the basis of full information. From this perspective, it can be assumed that members of agricultural marketing cooperatives are interested in maximising the monetary revenue generated through their business relationship with the cooperative (Tennbakk, 2002). Hence cooperatives, which are widely assumed to function as a means to the creation of a countervailing power amongst farmers (Hagedorn, 2013), could be considered as a simple means to increase farming members' profits. In contrast to investor-

owned firms, a cooperative's main objective is the maximisation of its members' returns (Royer, 2014; Vercammen et al., 1996), which is determined by the prices attained for the products supplied, as well as potential bonus payments for patronage at the end of the economic year (LeVay, 1983; Ortmann & King, 2007). In the decision-making context, dairy farmers most likely form their prospects of a relatively better/worse economic return (compared to the own cooperative) depending on a potential business relationship with a competitor to the cooperative. Hence, the neoclassical assumption of full information does not hold for farmers' decision-space. Since the switching decision is a decision conducted under conditions of uncertainty and in accord with factors such as prices, which are not usually fixed in contracts or the like (BKA, 2012), a farmer's prospects can only be formed by the information a farmer has to hand. Here, price comparisons are supposed to be frequently used tools to assess the economic performance and advantageousness of business relationships in the German dairy sector (Lehmann et al., 2013). Such comparisons only provide information on past prices. However, based on this information, farmers form their expectations of future prices. In the German dairy market, the raw milk price received by cooperative members usually depends on the cooperatives' business results. Members mostly receive a monthly settlement in the form of progress payments. Depending on the annual closures, there may be boni – or, rarely, back-payments (BKA, 2009). Consequently, dairy farmers face both short-term (monthly) and long-term (annual) price signals, which are published by practitioner magazines or on associations' websites (BKA, 2012). Whereas the dairies' monthly payouts may provide information on the current performance of the cooperative, annual price comparisons include all potential payments and may consequently allow for a comparison of the true extent of the economic return of business relationships.

It is widely accepted that the competitiveness of the prices paid by the cooperative is of crucial importance to farmers' satisfaction with, and commitment to their cooperative. Sayers et al. (1996) reported that the prices farmers in the Southern US received from their milk handlers had a great effect in terms of raising farmers' satisfaction with their milk handlers. By means of a survey conducted amongst Tennessee dairy farmers, Jensen (1990) found that the price paid by milk handlers is considered by farmers to an important reason for choosing a milk handler. Schulze et al. (2006) introduced the distinction of short-term and long-term price satisfaction, as well as comparative price satisfaction, finding that current (short-term) prices did not have an impact on farmers' perceived relationship quality, whereas long-term and comparative prices (compared with competitors) did have a significant impact. However, with this having been a cross-sectional study, the particularly low prices at the time of the survey may have contributed to a low variance, as an overall high dissatisfaction of farmers with their dairies' payout was identified. Thus, timing effects may have caused a bias here with respect to the relevance of short term prices. Again, however, the farmer's switching decision would particularly depend on the assessment of the relative performance, i.e., the relative favourability of switching to another dairy.

According to a sector expert interviewed in autumn 2016, dairy farmers in Germany start to complain about prices if the prices paid by competing dairies outperform the prices they receive from their own dairy for three months in a row. Hence, we hypothesize that:

H1: In relation to the prices paid by a farmer's own dairy cooperative over the last three months, the higher the difference in the prices paid by a competitor, the higher a farmer's willingness to switch to that competitor.

Given the rather long notice-periods of 24 months in the German dairy cooperative sector (BKA, 2012), it seems reasonable to assume that a farmer's assessment of the relative economic prospects of dealing with a competitor depends on the continuity of its economic superiority. The long-term economic advantage of a potential competitor over that of the farmer's own cooperative may be reflected in the number of years a competitor's prices outperformed the prices paid by the farmer's own dairy. We thus hypothesize:

H2: The longer the annual prices paid by a competitor outperform the prices paid by a farmer's own dairy cooperative, the higher a farmer's willingness to switch to that competitor.

In the absence of full information, the farmers' decision-space is characterised by uncertainty, which marks a violation of the assumptions of neoclassical economics. Transaction costs economics (TCE), however, involves specific assumptions of humans nature, i.e., opportunistic behaviour and bounded rationality, as well as environmental factors, i.e., uncertainty and specificity (Williamson, 1975). Hence, in terms of farmers' decision-space, TCE acknowledges the uncertainty associated with economic returns, often describing the uncertainty of future outcomes as that of transaction uncertainty (Williamson, 1979). In general, transaction costs theory is concerned with the study of economic organization, determining the boundaries of a firm and taking into account the specific costs incurred through economic exchange (Coase, 1937; Williamson, 1981). According to TCE, the organizational forms that become dominant are those which are the most successful at minimising production and transaction costs in a given environment (Williamson, 1981). The approach of TCE to the emergence of agricultural cooperatives highlights the importance of asset specificity in farming, which (together with limited regional competition) allows the trading partner to act opportunistically (Staatz, 1987). The dairy sector is characterised by a combination of high asset specificity at the level of the dairy farm, such as milking machinery, which has little value outside of milk production (Lehmann et al., 2013), and a restricted number of alternative dairy processors, due to high transportation costs of the perishable nature of the product (Bonus, 1986; Graubner et al., 2011). In such situations, farmers are incentivised to protect their investments through forward integration, e.g., through cooperatives or producer associations. The underlying rationale for farmers is, consequently, to build a countervailing power, as well as to guarantee market access (Staatz, 1987).

While the countervailing argument may explain farmers' motivation to maximise their profit through the dairy, the need for market access has not yet been introduced into farmers' decision-space in empirical studies. Jensen (1990) reported that dairy cooperative members indicated an "assured market and payment" as the most important reason for choosing milk handlers and, consequently, provided empirical evidence for this factor. For cooperative members, this factor would imply that if members perceive their own cooperative as performing poorly in the competitive environment, they may fear the loss of the assured market actually granted by the cooperative. Hence, we hypothesise:

H3: When subject to the low performance of their own dairy cooperative, dairy farmers are more willing to switch to a competitor.

Relational factors

From a TCE perspective, cooperatives emerged due to the lower transaction costs offered in comparison to investor-owned firms (Bonus, 1986; Staatz, 1987). The organizational form, however, does not necessarily guarantee low transaction costs. A cooperation of farmers which inter alia is characterised by a mentality of deceit, and consequently expectations of opportunistic behaviour, may imply high transaction costs. Cooperatives indeed have a high potential for transaction costs, since members are naturally heterogeneous and pursue different goals (Nilsson, 1996). But despite this potential, cooperatives still play a crucial role in agriculture nowadays and, consequently, seem to overcome the risk of high transaction costs. In the literature, social factors, e.g. social cohesion, are often held responsible for the fostering of cooperatives' competitiveness and the reduction of transaction costs (Nilsson et al., 2012). In fact, social factors such as trust or commitment (Spiller & Wocken, 2006), relationship quality (Schulze et al., 2006) or "friendly personnel" (Jensen, 1990) have been widely reported as influencing business relationships in the dairy sector. Overall, the social factors influencing farmers' decision-making seem to be crucial to the competitiveness of agricultural cooperatives and, specifically, their membership relationships (Nilsson et al., 2012). A member's trust and commitment towards their agricultural cooperative is often assumed to influence their intention to stay with that

cooperative and thus remain loyal (Fulton & Adamowicz, 1993; Fulton, 1999; Schulze et al., 2006). Hence, since social factors play a role in potential switching decisions, we hypothesise:

H4: The higher the members' trust and commitment towards their cooperative, the lower their overall willingness to switch to another business partner.

The relationships between members and their cooperatives (or cooperatives' management) are often seen as agency relationships. In agency theory, agency relationships occur if one or more individuals (principals) engage another individual (agent) to act on the principal's behalf (Jensen & Meckling, 1976). The agent's actions have consequences for both the principal(s) and the agent. However, as objectives are often not the same, the so-called principal-agent problems arise. Hence, the agent might not act in the best interest of the principal, which raises the question of whether the principal has chosen the right agent (McCue & Prier, 2008; Sykuta & Chaddad, 1999). In agricultural cooperatives, farmers are generally considered as the principals (the owners) of the cooperative and the cooperatives' management as the agents (Van Bekkum, 2001). Since cooperatives are supposed to operate on the farmers' behalf, the farming members may ask whether the cooperative's management actually align with this goal. Empirically, Schulze et al. (2006) confirmed the importance of a dairy's farmer orientation for the relationship quality. Hence, as the farmer orientation of a dairy plays a crucial role in a farmer's decisions space, we hypothesise:

H5: In comparison to a situation where farmers expect a low farmer-orientation in a competing dairy, farmers' expectations of farmer-oriented decision-making in a competing dairy are associated with an increased willingness to switch to that competitor.

Besides the vertical relational dimension, horizontal relationships are of particular relevance to the success of the cooperative model (Bonus, 1986). While the influence of constructs like trust or commitment is increasingly recognised in the literature on cooperatives, social interaction and influence among members is rather frequently neglected (Hansen et al., 2002). As it is well-known that economic decision-makers are influenced by other decision-makers (Manski, 2000), and that whole groups of farmers switching or even bank-run like defections of cooperatives are frequently reported (Dermody, 2015; Nilsson et al., 2012), such social processes, i.e. peer-behaviour, should be taken into account. On the one hand, a farmer's observation of other cooperative members' switching can be understood as being perceived as an indication of better prospects with another dairy. On the other hand, if a large number of members switch, this further negatively affects the future profitability of the cooperative and, hence, the payout, providing another important reason to switch.

H6: The more cooperative members that switch to a competitor, the higher the willingness of a dairy farmer to switch to that competitor as well.

Another factor describing social influence in the literature is the so-called "neighbourhood effect", which presumes the either direct or indirect effect of (geographical) neighbours on a decision maker. The neighbourhood effect is often discussed in studies of diffusion of innovation (e.g., Conley & Udry, 2001). According to the sector experts interviewed for this study, whether a neighbouring farmer who supplies raw milk to another dairy receives better prices is crucial for a farmer. Consequently, the sector experts described a phenomenon, which may be caused by enviousness. According to Manski (2000), enviousness results from preference interaction and, thus, social interaction. Besides envy, however, there is also a clear economic argument for looking at the prices received by neighbouring farmers: with increased competition for land, a neighbour who receives higher milk prices may also win bids for land and, thereby, gains an absolute competitive advantage.

H7: If the price a neighbour receives from a competitor increases in comparison to the price paid by a farmer's own cooperative, the farmer is more willing to switch to that competitor.

Institutional factors

Since cooperatives are supposed to create a countervailing power and serve their members' interests, farmers may consider that through the cooperatives' presence they possess an overall advantage (Novkovic, 2008) and therefore cherish their membership. For example, Hanisch et al. (2013) found a positive effect of cooperative market share on farm gate milk prices, based on panel data in the EU. Additionally, rooted in incomplete contract considerations, farmers' ownership of a cooperative's assets reduces the hold-up problem (Hendrikse & Bijman, 2002), which implies a potential strategic advantage. Farmers' preference for dealing with cooperatives has been reported in different sectors, including dairy (Zeuli & Bentancor, 2005), pork (Roe et al., 2004), as well as soy and corn (James Jr. & Sykuta, 2006). We thus hypothesise:

H8: If the competitor to a farmer's own dairy cooperative is a cooperative, farmers are more willing to switch to that competitor.

3   The survey setup

The derived hypothesis should be tested by means of a factorial survey experiment. In this section, we provide a brief introduction to factorial surveys before implementing the testable factors into a factorial survey experiment.

3.1   Factorial surveys

Factorial surveys, first introduced by Rossi et al. (1974), integrate experimental methods into surveys. This approach complements the advantages of experimental research and survey research, i.e., the high internal validity of experiments, due to the random assignment of systematically manipulated stimuli to participants, in combination with the high external validity and generalisability of surveys, because of the claim of representativeness and multivariate analysis techniques (Atzmüller & Steiner, 2010; Auspurg & Hinz, 2014; Mutz, 2011). In factorial surveys, experiments refer to standardised vignettes, i.e. fictive descriptions, which have to be judged by the respondents (Rossi & Anderson, 1982). The vignettes are mainly short and carefully constructed texts describing persons, objects, or situations (Atzmüller & Steiner, 2010; Auspurg & Hinz, 2014). The judgement task often refers to the normative evaluation of the vignette (usually answering a question about the vignette by assigning a value on a Likert-type scale), but the factorial survey approach has also been used, e.g., to elicit preferences, beliefs and/or a person's own (intended) actions, feelings and thoughts (Louviere et al., 2000; Wallander, 2009). The characteristics of the fictive descriptions in the vignette, also called factors or dimensions, are simultaneously manipulated. Hence, factorial surveys allow for the experiment-like variation of factors that are believed to influence a respondent's judgement (Wallander, 2009) and, consequently, create the opportunity to overcome the problems of factors that are highly correlated in reality (Auspurg & Hinz, 2014). The varying factor levels are combined as stimuli into vignette texts, which can be randomly assigned to the survey respondents and, consequently, reflect the random assignment of experimental conditions to which participants would be subjected in conventional experimental research (Auspurg & Hinz, 2014; Rossi & Anderson, 1982).

Similar to the prominent choice-based methods used in economic research, the respondent's one-dimensional evaluation of the (multi-dimensional) vignette forces the respondent to make trade-offs between the different factors in the vignette. This enables a precise determination of the underlying principles or factors leading to the formation of such judgements, since the respondent's reaction can be causally related to the manipulated stimuli (Auspurg & Hinz, 2014). A main advantage of factorial surveys over choice-based methods for the analysis of switching decisions, however, results from the detailed descriptions of e.g. hypothetical situations, that resemble real-world scenarios. These scenarios can, amongst others, include descriptions of latent factors and circumstances, which allow the respondent to imagine themselves in the situation described in the vignettes. Hence, factorial surveys facilitate the analysis of contexts and conditions (Wallander, 2009) by

accounting for various kinds of variables and, thus, allowing for the examination of complex situations (Wason et al., 2002). Moreover, since respondents are often not fully aware of the manipulation in the vignettes, the approach may be less prone than conventional direct questioning to effects such as the social desirability bias (Alexander & Becker, 1978), which enables the analysis of sensitive topics (Wallander, 2009). Given the complexity and uncertainty faced by dairy farmers, a factorial survey serves as the most appropriate choice for the identification of factors actually influencing switching decisions.

3.2   Hypothetical situation

A switching decision is directly related to the switching opportunities a farmer is facing, i.e., the relative prospects of dealing with one or another dairy processor. Hence, for the intended study, a switching opportunity needs to be meaningfully described to the respondent in the hypothetical situation in the vignette text.

Since distance plays a crucial role in agriculture (Graubner et al., 2011), e.g., due to transportation costs, even the members of one particular cooperative may face different switching opportunities. To provide uniform incentives and to prevent the potential influence of associations and experience with extant alternative buyers, it seems reasonable to present a hypothetical "new" competitor of the cooperative to the farming members. This competitor can then have different levels of the characteristics/dimensions that potentially moderate the prospects associated with a switching decision to that competitor attributed to it. In this context, some of these characteristics should be described in relation to the farmer's current cooperative in order to create comparable switching incentives across the respondents without knowing the actual individual status quo. Additionally, contextual factors describing the decision-space can be utilised, such as the behaviour of peers or social factors. The respondents are then asked to indicate the likelihood of their switching with regard to the hypothetical situation, which is a common procedure in factorial surveys (Wallander, 2009). Since the farmers and cooperatives are often heterogeneous, we assume that the switching decision in the hypothetical situation does not require the alteration of production processes. Hence, participants shall assume that there are no further hidden costs associated with supplying the hypothetical competitor.

Table 1 presents the implementation of the potential factors into the hypothetical situation described in the vignette experiment. The implementation, as well as the respective operationalisation, was obtained by means of the sector experts' statements and an extensive pretesting phase.

Table 1: Hypotheses and operationalisation of the factorial survey

Hypotheses	Operationalisation / Dimension	Levels	Variables
Vignette dimensions: The context the hypothetical switching decision takes place in			
Economic factors			
Hypothesis 1	Short-term competitor's economic performance in comparison to a farmer's own dairy cooperative.	Competitor paid on average (1.5, 1, 0.5) cents more per kg / similar prices per kg over the past three months (4 levels)	*St_price*
Hypothesis 2	Long-term competitor's economic performance in comparison to a farmer's own dairy cooperative.	Competitor paid, on average, better prices (over the last year, over the last two years, over the last three years) than the cooperative/similar prices over the last years (4 levels)	*Lt_price*
Hypothesis 3	The cooperative's financial situation and capacity utilisation.	Your dairy cooperative is in a difficult financial situation and highly depends on future milk deliveries from its members / Your dairy Cooperative is in stable financial situation and the plants of your dairy are working to full capacity. (2 levels)	*Coop_perform_low*
Relational factors			
Hypothesis 5	Expected farmer-orientation in the competing dairy.	A competing dairy is known for farmer oriented decision-making / is known to prioritise its own profits over the interests of its dairy farmers. (2 levels)	*Farm_orient*
Hypothesis 6	Stability of cooperative membership base.	None / Around [10, 20, 30] per cent of all members of your dairy cooperative in your region have terminated their business relationship since the beginning of the year in order trade with a new dairy. (4 levels)	*Switch_Other*
Hypothesis 7	Interaction of the existence of a neighbouring dairy farmer, who trades with the new competitor and a short-term competitor's economic performance.	None of your / Even one of your neighbouring farmers has started delivering to the new dairy since the beginning of the year. (2 levels)	*St_price* *Neighbour*

Institutional factors

Hypothesis 8	The legal form of the competing dairy.	Competing dairy is a coop / IOF. (2 levels)	*Coop*
Survey dimensions: Respondents' characteristics			
Relational factors			
Hypothesis 4	Relationship-quality with the current cooperative.	Obtained by means of standard survey items: See appendix.	*Relationship_quality*

3.3 Experimental and survey design

The seven dimensions, introduced in the previous section, characterise the hypothetical situations. To complete the vignette design, the dimensions need to be varied across the different vignettes, which requires the specification of levels for each dimension respectively. The level specification aims at small and balanced numbers of levels, because this generally leads to more efficient designs (Auspurg & Hinz, 2014). The seven created dimensions, with three times four and four times two levels, result in a total set of $4^3 \times 2^4 = 1024$ different vignettes. Since the total set of all possible combinations is too large to be fully administered in the survey, one may employ only a fraction of the full set, which requires a sampling procedure (Auspurg & Hinz, 2014).

To minimise the loss of information and confounded estimated terms, we use a sample algorithm based on the d-efficiency measure (Kuhfeld et al., 1994). However, one first needs to determine the sample size and the parameters one wants to estimate in the final model, i.e. the hypotheses that will be tested. The choice of the sample size is usually a trade-off between the efficiency of the sample of the vignette universe and the number of respondents (Auspurg & Hinz, 2014). Farmers are known to be complicated respondents in terms of fatigue effects and the like. Thus, we limited the number of vignettes per respondents to 4. Sampling from the vignette universe was conducted by means of the mktex macro (Kuhfeld, 2010) and implemented in the SAS software suite, resulting in a fractional design of 128 vignettes (32 blocks times 4 vignettes) with a *D*-efficiency of 94.4451. According to Auspurg and Hinz (2014), designs with a *D*-efficiency above 90 are sufficient to identify the parameters of interest.

The different vignettes (hypothetical situations) were implemented into an online survey with a random assignment of blocks to each participating respondent. For each situation, the respondents were asked to separately evaluate the intention to switch to a competitor (SI) and the likelihood that other cooperative members intend to switch to that competitor too (SIO). Whereas the SI is supposed to give an indication of the relevance of the factors directly influencing their own switching intention, the SIO is supposed to indicate which factors influence the perceived stability of the cooperative membership base. The evaluations were measured on an 11-point rating scale, which is a commonly used scale for evaluation in factorial survey experiments (see, e.g., Abraham et al., 2013). Figure 1 depicts a vignette example.

Figure 1: Vignette example

Imagine that it is already early December 2017. Recently, a reliable source told you that **your dairy cooperative is in a difficult financial situation**. Even though the dairy's survival does not seem to be at risk, your cooperative **highly depends on future milk deliveries** from its members to operate the plants at efficient capacity utilisation.

At the same time, a **new competitor** to your dairy cooperative is competing for raw milk in your region. The new dairy offers the same services as your current dairy cooperative. Delivering to this dairy would not require you to change production processes and business processes.

The competitor to your dairy cooperative **is a cooperative** and trades with just as many dairy producers as your current dairy. Even one of your **neighbouring farmers** has started delivering to the new dairy since the beginning of the year.

You happen to know that the new dairy **paid 1.5 Euro cents more** for the raw milk than your current dairy cooperative over the past three months. Additionally, you have read that the new **dairy on average paid better prices** than your cooperative over the course of the **last three years**. Moreover, the new dairy is known **to prioritise its own profits over the interests of the dairy farmers**.

Last week, a friend of yours, who is a well-connected farmer, told you that around **10 per cent of all members of your dairy cooperative in your region** have terminated their business relationship since the beginning of the year in order trade with the new dairy.

Given this situation, what is the likelihood that you would terminate your membership in order to trade with the new dairy?

I would definitely not quit my membership. (-5)	-5 o	-4 o	-3 o	-2 o	-1 o	0 o	+1 o	+2 o	+3 o	+4 o	+5 o	I would definitely quit my membership. (+5)

Given this situation, what is the likelihood that other cooperative members in your area would terminate their membership in order to trade with the new dairy?

Definitely, none of the other farmers in my area would quit their membership. (-5)	-5 o	-4 o	-3 o	-2 o	-1 o	0 o	+1 o	+2 o	+3 o	+4 o	+5 o	All other farmers in my area would definitely quit their membership. (+5)

In addition to the factorial survey experiments, standard items were implemented to gather data on farmers' relationship quality with their dairy cooperative, their perception of the competitiveness of the environment,

as well as other standard items for farmers' characteristics. Since the focus of the paper lies on the survey experiment, we provide more detail on the items in the following section.

4   Data and methods

This section introduces the sampling strategy before describing the obtained data. Prior to presenting the results in the next section, the relevant econometric methods for the analysis of data are outlined.

4.1   Data

The online survey was distributed by means of a three-stage procedure in order to assure the possibility of identifying members of the same cooperative whilst, on the side of the researchers, maintaining the anonymity of the cooperatives. In the first stage, a list of URLs to the online survey, comprising a unique identifier for each URL, was sent to the Association of Cooperatives in Northern Germany (Genossenschaftsverband Norddeutschland). The latter then randomly selected URLs from the list and sent one specific URL to each of the dairy cooperatives, together with an invitation letter, by the end of March 2017. The dairy cooperatives were asked to distribute their respective URLs to the survey amongst their members. The distribution of the URLs to cooperative members by the dairy cooperatives constitutes the third stage. The Genossenschaftsverband sent out a reminder in May 2017 and the survey was closed in September 2017.

64 respondents completed the questionnaire in total. The majority of these respondents (55 respondents) completed the questionnaire in July 2017. The completion rate for the survey is 42.11%. 8 respondents in the sample are female and 56 are male. All respondents are above the age of 40, with 4 dairy farmers even exceeding the age of 80. For the majority of respondents (59), farming is their main source of income and all respondents indicated that they farm conventionally. The median quantity of dairy cows in the sample is 100. 13 respondents indicated that they have 50 dairy cows or less, 18 indicated 51 to 100 dairy cows, and 32 more than 101 cows.

Since every respondent had to evaluate four vignette scenarios, a total of 256 (64×4) vignettes were collected. The distribution of the evaluation variables SI and SIO (see table 2) shows that the respondents used all values on the scale. However, the distribution for variable SI shows three peaks, i.e. at the values -5 (I would definitely not quit my membership), 0 (the neutral point) and +5 (I would definitely quit my membership). Whereas the distribution of the SI is balanced, the distribution for variable SIO reveals a leftward skew. 64.84 % of evaluations fall in the range between +1 and +5. Hence, overall, respondents evaluated the switching intentions of other farmers as relatively more likely than their own.

Table 2: Descriptive statistics of the evaluation variables SI and SIO*

Variable		Mean	Std. Dev.	Min	Max	Observations
SI	overall	.102	3.613	-5	5	N = 256
	between		2.990	-5	5	n = 64
	within**		2.054	-6.148	6.852	T = 4
SIO	overall	1.262	2.528	-5	5	N = 256
	between		1.782	-3.5	5	n = 64
	Within**		1.803	-4.989	5.512	T = 4

*Farmer switching intention (SI) and their evaluation of other farmers' switching intentions (SIO) in the respective hypothetical situation are measured according to an 11 point scale (-5 to +5)

** Here, Min and Max within can result in values lower than -5 and larger than +5, because these values refer to the Max and Min values (over i and t) of $x_{it} - \bar{x}_i + \bar{x}^-$; see: Cameron and Trivedi (2010, p. 245).

4.2   Data analysis

A straightforward approach when analysing data obtained from a factorial survey experiment is to employ multivariate regression models. Since factorial surveys mainly aim to analyse the impact of various factors on respondent's evaluations of vignettes, the respective vignette levels (and respondents' characteristics) serve as the independent variables to predict the dependent variable, i.e., respondents' evaluation of the vignettes. However, the unique design of factorial surveys produces a particular data structure, since in most applications respondents evaluate multiple vignettes, e.g., a whole deck of randomly assigned vignettes. Consequently, the data structure has two levels by design, i.e., a lower level (the vignette level) and an upper level (the respondent level). Such an hierarchical data structure requires that adequate analysis techniques be employed (Luke, 2004; Rabe-Hesketh & Skrondal, 2012). Standard multivariate regression models are not appropriate for the analysis of hierarchical data, since the standard assumption of independent and identically distributed observations does not hold by design. Ignoring this violation of regression assumptions, the estimation of standard regression models would lead to unbiased but inefficient parameter estimates, as well as biased standard errors (Rabe-Hesketh & Skrondal, 2012; Wooldridge, 2010).

A model that explicitly focusses on the multilevel structure of hierarchical data (Rabe-Hesketh & Skrondal, 2012), which is very appropriate for the analysis of data obtained by factorial surveys (Auspurg & Hinz, 2014), is the linear random-intercept model. Equation 1 formalises a linear-random intercept model with two levels:

$$y_{ij} = \beta_0 + \beta_1 x_{ij1} + \cdots + \beta_p x_{ijp} + \gamma_1 z_{j1} + \cdots + \gamma_q z_{jq} + \xi_{ij} \qquad (1a)$$

$$\xi_{ij} \equiv \zeta_j + \epsilon_{ij} \qquad (1b)$$

$$\text{with } i = 1, \ldots., n_d; j = 1, \ldots., n_r \qquad (1c)$$

The dependent variable y_{ij} denotes the evaluation of vignette i by respondent j. Since y_{ij} is continuous, it is assumed that the measurement of the evaluation is on a metric scale (Auspurg & Hinz, 2014). The independent variables are subdivided into two types reflecting the hierarchical structure of the data, i.e. the vignette level (p vignette-variables) and the respondent level (q respondent-variables) with the regression coefficients β_1 to β_p and γ_1 to γ_q respectively.

ξ_{ij} is the total residual or error, which consists of two components, i.e. a respondent-specific ζ_j and an observation-specific ϵ_{ij} error term. ϵ_{ij} varies across observations/vignettes as well as respondents, whereas ζ_j varies across respondents, but is constant between all observations/vignettes from the same respondent. Hence, ζ_j represents the combined effect of both an unobserved heterogeneity and omitted characteristics at the respondent level and induces within-respondent dependence among the total errors ξ_{ij} (Rabe-Hesketh & Skrondal, 2012). In contrast to fixed effects models, the respondent-specific intercept is considered to be a random parameter, which assumes that ζ_j represents a random selection from a sample of effects. In factorial surveys, assuming that the randomisation of vignettes as applied to a random sample of respondents is successful, the crucial assumption for the use of random respondent-specific effects, i.e. there being no correlation of explanatory variables with the error terms (Wooldridge, 2010), is at least fulfilled for the vignette-treatments by their design (Auspurg & Hinz, 2014).

Given the unique design of factorial surveys and the higher statistical power of random effects over fixed effects models, linear random-intercept models are most likely appropriate for the analysis of data obtained in the scope of factorial survey experiments.

5   Results

To test the hypotheses introduced in section 2, linear random intercept models are used to test the influence of the respective variables on the dependent variables SI and SIO. For each dependent variable, two models are employed, the first with the vignette variables only and the second comprising respondents' characteristics as well.

To take into account all the relevant effects and factors potentially influencing the dependent variables, additional variables are introduced into the model-specifications. On the vignette-level, an interaction between short term and long term economic incentives seems likely, because the effect of current low prices may be moderated by relatively high past prices, and vice versa. Hence an interaction term (*St_price* *Lt_price*) is added to the model as a control for these effects. On the respondent level, a factor variable (Switching_cost_readiness) describing the actual willingness and perceived ease of farmers' switching to another dairy is introduced to control for potential lock-in effects as well as the potential for an envisaged switching in reality. Furthermore, a factor variable measuring the satisfaction with prices paid by the respondent's dairy cooperative (*Satisfaction_prices*), a variable indicating the age of the respondent (*Age_farmer)* and a variable capturing the number of dairy cows (*Herd_size*) are added to the model. Finally, dummy variables based on the unique URL identifiers are introduced to control for cooperative specific effects.

Table 3 presents the results for the four linear random-intercept models, with M1 indicating the results for the estimation of the vignette variables only on the SI, and M2 indicating the effects of the vignette variables on the SI as complemented by the respondents' characteristics. M3 and M4 represent the respective model-specifications on the SIO.

Likelihood ratio tests (LR) based on the X^2 distribution indicated for all four models that a random intercept model fits the data significantly better (p<0.001) than ignoring the hierarchical data structure. The correlation of ζ_j with the vignette predictor variables is with -0.0006 for M1 and M2 and -0.0103 for M3 and M4 close to zero, which indicates the successful randomisation of vignette-treatments as allocated to respondents. The intra-class correlation ρ indicates the fraction of the variance due to ζ_j and ranges from 0.278 (M4) to 0.672 (M1). Hence, 27.8% to 67.2% of the variation of the evaluation of the vignettes can be explained by the variation in respondents.

Table 3: Results of the factorial survey experiment

	(M1)	(M2)	(M3)	(M4)
VARIABLES	SI	SI	SIO	SIO
St_price	1.441***	1.487***	1.471***	1.448***
	(0.484)	(0.472)	(0.428)	(0.421)
Lt_price	0.486**	0.507**	0.587***	0.612***
	(0.232)	(0.226)	(0.204)	(0.201)
Coop_perform_low	0.974***	0.970***	0.406*	0.403*
	(0.249)	(0.249)	(0.228)	(0.228)
Farm_orient	1.627***	1.602***	0.851***	0.838***
	(0.252)	(0.251)	(0.230)	(0.229)
Switch_Other	0.910	0.961	1.752*	1.821*
	(1.147)	(1.146)	(1.048)	(1.048)
Neighbour	0.953**	0.942**	0.868**	0.775*
	(0.462)	(0.454)	(0.413)	(0.410)
Coop	0.286	0.280	0.281	0.271

	(0.253)	(0.253)	(0.231)	(0.231)
St_price Neighbour*	-0.689	-0.697	-0.437	-0.322
	(0.525)	(0.514)	(0.467)	(0.462)
St_price Lt_price*	-0.173	-0.195	-0.235	-0.260
	(0.267)	(0.258)	(0.232)	(0.227)
Switching_cost_readiness		0.848***		0.134
		(0.309)		(0.225)
Relationship_quality		-1.749***		-0.584***
		(0.303)		(0.221)
Satisfaction_prices		-0.975**		-0.512*
		(0.387)		(0.283)
Age_farmer		0.0327		0.0256
		(0.0243)		(0.0177)
Herd_size		-0.00272		-0.00233*
		(0.00176)		(0.00128)
Constant	-3.376***	-5.669**	-1.806***	-1.691
	(0.619)	(2.680)	(0.498)	(1.966)
Number of vignettes	256	256	256	256
Number of respondents	64	64	64	64
Log likelihood	-605.434	-579.104	-555.326	-541.722
BIC	1277.41	1280.20	1177.19	1205.44
AIC	1234.87	1202.21	1134.65	1127.44
Std Dev ζ_j	2.792	1.699	1.523	1.110
Std Dev ϵ_{ij}	1.952	1.952	1.786	1.787
Intraclass corr. ρ	0.672	0.431	0.421	0.278

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Control variables not shown here: Dummy variables for the cooperatives

Starting with M1, Table 3 shows a positive significant result for the variable *St_price* of 1.441. Hence, an increase of 0.5 cents per kg paid by the competitor in relation to the farmer's own cooperative is associated with an higher average intention to switch to that competitor by 1.441 on the rating scale. As hypothesized in H1, the results show a significant influence of current price differences on the willingness to switch to a competitor. The second economic indicator (*Lt_price*) has a positive significant effect on the intention to switch to the competitor as well. Hence, not surprisingly, the results provide evidence for the relevance of the long-term performance of a competitor in relation to a farmer's own cooperative. Consequently, H2 cannot be rejected. The variable *Coop_perform_low* has a positive significant influence on SI as well. In M1, the average evaluation of the intention to switch to that competitor increases by 0.974 on the rating scale if the business of the farmer's own cooperative was described as running poorly. Hence, when facing the risk of losing the assured market indicated by *Coop_perform_low*, respondents seem more likely to switch to a competitor, which provides empirical evidence for H3. Additionally, the positive significant effect of *Farm_orient* gives an indication of the relevance of relational aspects to the decision to switch. Given a farmer oriented competitor, the respondents ceteris paribus show a higher intention to switch to that competitor, compared to a situation where the competitor is characterised by a low farmer orientation, which supports H5.

The results for M1, however, do not show significant results for the variables *Switch_Other, Coop* and *St_price** *Neighbour*. Consequently, the results do not provide empirical evidence for the influence of other cooperative members switching to the hypothetical competitor (H6), for the influence of a neighbouring farmer who delivers to the hypothetical competitor receiving increasingly better prices than the respondents (H7), or for the organizational form of the competitor in question (H8). Surprisingly, the main effect *Neighbour* shows a positive significant influence on SI. Consequently, in the case of situations in which the competitor has paid similar prices over the last three months (*St_price* == 0), the presence of a neighbouring farmer delivering to that competitor increases the average intention to switch to that competitor by 0.953 points on the rating scale.

Including the respondents' characteristics in M2 does not affect the results for the vignette-variables in a substantial way. The intraclass correlation ρ, however, drops from 0.672 to 0.431. The respondents' relationship quality (*Relationship_quality*) with their own cooperative has a significant negative effect on the indicated switching intention. Hence, *Relationship_quality* provides evidence for H4, i.e., the better the relationship quality between members and their cooperatives, the lower the members' overall willingness to switch to another business partner. Furthermore, the switching cost and the respondent's readiness to switch indicated by *Switching_cost_readiness,* as well as farmers' satisfaction with the prices paid by their own cooperative (*Satisfaction_prices*) are significantly associated with SI.

The results of the model-specifications in M3 and M4 estimating SIO, i.e. the evaluation of the switching intentions of other farmers in the respondent's area, show interesting differences to the results from M1 and M2. While the results for *St_price*, *Lt_price* and *Neighbour* are similar to the results from M1 and M2, the estimators for *Coop_perform_low* and *Farm_orient* decrease by roughly half the size of the respective variables in M1 and M2. Furthermore, the results show a significant influence of the variable *Switch_Other* on SIO. Hence, the larger the number of cooperative members in an area that have switched to a competitor in the current year, the more the respondents indicated that the emergence of additional switching decisions of other cooperative members in the area was likely. Additionally, the results for M4 show no significant influence for *Switching_cost_readiness*, but a negative significant influence of *Herd_size* on SIO.

6   Discussion

The results of the analysis indicate the importance of several contextual factors on switching intentions. First, and not surprisingly, monetary indicators seem to play a crucial role for switching intentions, because both short- and long-term indicators show a significant positive association with SI and SIO. Especially striking is the influence of *St_price*, i.e. the differences in prices paid over the last three months, which was measured in four levels (from similar prices to a maximum difference of 1.5 cents per kg raw milk). Given the usually long-lasting business relationships in the dairy sector and the high uncertainty regarding future prices, the importance of prices paid over the course of three months might seem rather surprising. However, given a strong economic pressure on the dairy sector (also indicated by the rather low mean price satisfaction in the sample) the results reflect the statements from the expert interviews, that current prices are rather crucial for farmers' satisfaction with their dairy. While the analysis reveals several important factors that influence switching intentions, competitive prices are a key factor. Fulton (1999, p.2) states in this sense that "Co-ops that are not able to offer comparable prices and service will eventually lose market share and be forced out of business or into restructuring", which underlines the importance of paying competitive prices. Furthermore, prices may work as "eye catchers" in the vignette as well as in reality, since prices are indicators which are relatively easy to compare. While two of the vignette-estimators (*Coop_perform_low* and *Farm_orient*) are substantially smaller in the models estimating SIO (M3 and M4) as a dependent variable in comparison to the models estimating SI (M1 and M2), the estimates for the economic dimensions are relatively similar. This may further underline the

significance of competitive prices, not only for a farmer's own switching intentions, but also for the evaluation of the behaviour of other cooperative members. In fact, one would assume that, because of an averaging effect, respondents' evaluations of other farmers' behaviours are less extreme, as they have to evaluate the behaviour of a whole group (all other remaining members in the area). However, whereas the standard deviation of the SIO is smaller than the corresponding standard deviation of the SI, the sizes of the estimates for the monetary indicators are similar. One explanation may be that, overall, respondents evaluate others switching behaviours as relatively more likely than their own switching behaviour, which is indicated by the left-skewed distribution of the SIO and may be explained by the perceived low satisfaction of other members of the cooperative (potentially caused by the existence of relatively low prices in reality). Moreover, *Coop_perform_low* significantly influences the evaluation of switching decisions in all models. This variable takes-up the potential risk of losing an assured market, but may also influence the prospects of future payouts, because a low performing cooperative is unlikely to increase its prices for raw milk. Hence, this variable may also indicate the overall importance of information that has the potential to contribute to the formation of future prospects under complex and uncertain situations, such as the dairy sector.

The expected relationship quality or farmer orientation of the hypothetical competitor (*Farm_orient*) and the perceived quality of a farmer's relationship with their own cooperative significantly influences the evaluation of switching decisions. These findings provide evidence for the importance of latent factors associated with the context of farmers' business relationships. Hence, the relationship quality with their own cooperative, but also the prospects of the relationship quality with a potential alternative dairy plays a crucial role. These findings are in line with previous empirical findings (e.g., Jensen, 1990; Schulze et al., 2006) and the theoretical features of cooperative business relationships (e.g., Fulton, 1999; Nilsson et al., 2012).

The vignette-dimension *Switch_Other*, which describes the switching behaviour of other members in the respondent's area, is significantly associated with the indicated SIO in M3 and M4, but not with the indicated SI in M1 and M2. Hence, respondents anticipate that members leaving the cooperative would have a peer-effect on the other remaining members. This effect, which could also be interpreted as herd-behaviour (Banerjee, 1992), underlines the perceived fragility of the cooperative's membership base. For the SI, the operationalisation of this dimension (i.e. percentages of other members in the area that switched to the hypothetical competitor described in the vignette) might be too abstract. While it seems reasonable that, after reporting the prior switching decisions of cooperative members in the area, respondents expected other farmers to switch as well, the famers participating in the survey might not have responded to this treatment due to the experimental setting. However, the results provide, nonetheless, evidence for the potential influence of other farmers on respondents' switching intentions. Even though the results show no significant effects of the interaction term *St_price* Neighbour*, the base effect *Neighbour* is significantly associated with the dependent variables. This shows an interesting factor: even if the competitor pays prices similar to those of a farmer's own cooperative, the simple fact that a neighbouring farmer delivers to the hypothetical competitor influences the respondents' intention to switch to that competitor as well. Since the neighbouring farmer described in the vignette scenario started to deliver to the hypothetical competitor in the current year, the long term economic indicator *Lt_price* can be neglected from this perspective, because the farmer has yet to generate a better income from trading with the competitor. Consequently, these findings may result from a pure neighbour effect, perhaps due to the perceived ease of delivery when the neighbour is already delivering to that specific competitor. Additionally, this effect may also describe the fear of a neighbour generating a better future income from trading with the competitor, which, again, may result from some kind of enviousness between farmers. Such advantages could have consequences for the farmer's competitiveness, e.g., on the land market.

All in all, the results for *Switch_Other* as well as the base effect *Neighbour* not only underline the relevance of the dynamics of the membership base, but also the importance of a farmer's local environment, e.g. the influence of the neighbouring farmers. Whereas the significance of the dynamics in a supply base is widely accepted in other research areas, e.g. in operational research (e.g., Choi et al., 2001), such phenomena are rather neglected in cooperative research. Additionally, the consideration of the local conditions to which a farmer is subject, also called local embeddedness, is widely lacking in extant research (one exception being Han and Chuang (2015)).

Interestingly, the results show no significant effect of the organizational form of the hypothetical competitor. While it is often assumed that cooperatives are farmers' preferred trading partners (James Jr. & Sykuta, 2006; Roe et al., 2004; Zeuli & Bentancor, 2005), this does not seem to be the case for the respondents in the sample. These findings may be rooted in a substantial dissatisfaction with trading partners, or from the fact that the respondents in the sample do not associate their cooperatives with the advantages of cooperative membership, such as member-control and solidarity, as often mentioned in the literature. Since a substantial fraction of the respondents are members of a very large dairy cooperative, which, in itself, is often associated with increased member alienation (Nilsson et al., 2012), they might not believe in the cooperative model. This especially holds since the hypothetical competitor is assumed to have a similar quantity of farmers and trading partners to those of the farmers' own cooperatives.

7   Conclusion

This article contributes to cooperative research and practice in multiple ways. Firstly, the theoretical perspective on cooperative member loyalty is broadened by explicitly integrating financial as well as social switching incentives into one model of member switching intentions. Furthermore, social incentives are divided into vertical and horizontal relationships, thus taking into account the specific relevance of social cohesion in traditional cooperatives. Secondly, the high level of uncertainty surrounding switching decisions, particularly in the dairy sector, where notice periods of several years are usual, is also taken into account. Thirdly, by means of a factorial survey, a method that is relatively new to economics, the characteristics of complex situations can be analysed by means of the vignette-mode (i.e. the vignette-descriptions).

Following the theoretical lines of researchers (Gigerenzer, 2000; Gilovich et al., 2002) who acknowledge the influence of context upon decision-making processes, the analysis consequently provides a broader view of switching decisions in cooperatives by analysing the effects of the different contexts in which such decisions may take place. The factors used for the factorial survey experiment were gathered from the literature, as well as from sector experts. The results provide empirical evidence for the influence of short term and long term monetary indicators, the performance of the cooperative, the farmer orientation and the relationship quality, as well as the influence of other members' switching decisions and neighbouring farmers. These findings have noteworthy implications for cooperative managers, as well as for cooperative scholars. If cooperative managers want to retain their members, they should pay competitive prices, but also try to establish a good relationship quality with their members. They should also try to prevent fears of the cooperative struggling in the market place, pointing to the relevance of belief formation amongst farmers. Since the switching decisions of farmers are highly motivated by the prospects associated with a business relationship, a good reputation in terms of the relevant factors, such as business development and farmer oriented decision-making, becomes key. Consequently, the facilitation of an appropriate supplier relationship-management may be of value. Moreover, cooperatives should monitor wherever members switch to other dairies. The concept of the dynamics of cooperative membership bases is a rather new and often neglected point in cooperative literature. Hence, more research should be devoted to the dynamics of cooperative supply bases. Additionally, the local

conditions to which farmers are subject (i.e. the spatial embeddedness of the membership-base) seem to determine a cooperative's stability. Cooperative managers are consequently well advised to explore local structures.

Regarding the whole cooperative sector in the dairy industry, it is striking that the farmers in the sample do not value cooperatives significantly more than investor-owned firms. This is in stark contrast to prior research from a number of countries, which have shown a strong preference for the cooperative model. Hence, cooperatives should try to improve their unique selling points in order to differentiate themselves form their private counterparts. A key element here is the perceived farmer-orientation, i.e. the degree to which farmers expect a buyer to take into account their perspective and to act in their best interests. However, our sample did not seem to perceive this element as a key to cooperative policies, and further empirical evidence should be sought regarding the potential spread of this perception.

The factorial survey targeted German dairy cooperative members. The coordination between German dairy farmers and dairy cooperatives is very traditional, being characterised by a high degree of interdependency and uncertainty with regard to potential switching intentions. We argue that the insights obtained from this very specific situation are transferable to other countries and sectors with similar coordination schemes (even assuming a less complex decision-space, it is probable that uncertainty will still influence the farmer, but to a smaller degree). Moreover, even if there is no prevalent problem with farmers switching or leaving their cooperatives, these factors are most likely still of relevance. In such cases, the previously reported factors could simply affect farmers' commitment to their cooperative and, consequently, indirectly influence farmer-cooperative relationships with regard to other behaviours. Beyond the cooperative model, problems reported in other sectors and in developing countries, such as side-selling through other contractual arrangements, could be analysed in the same way.

Even though the findings presented in the article provide new insights, more research is required. Future research should aim to attain larger sample sizes, as well as to include other sectors. Additionally, a different operationalisation of the factors should be tested, since the results attained by this study might also be due to the specific levels-dimension combination of the experiment. Nevertheless, factorial surveys seem to be a promising means to enriching the literature on agricultural cooperatives, not only due to the opportunity to gather information on "soft" factors, but also due to the method's ability to cope with the complexity of the factors driving the processes.

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Appendix

Items	Mean	Median	Stdev. .	Factor Loadings	
				Relationship_quality	*Satisfaction_prices*
Overall, I am satisfied with the cooperation with my dairy cooperative.	4.11	4	1.86	**0.793**	0.401
I can trust my dairy cooperative.	3.66	4	1.87	**0.821**	0.482
The cooperation with my cooperative is good overall.	3.92	4	1.76	**0.837**	0.366
I feel committed to my dairy cooperative.	4.16	4	2.05	**0.866**	0.269
Even if something goes wrong, I remain loyal to my cooperative.	3.98	4	1.96	**0.841**	0.299
Farmers and their cooperative pull together.	3.45	3	1.97	**0.801**	0.380
The cooperative takes farmers seriously when problems arise.	3.73	4	2.09	**0.826**	0.365
Farmers and cooperatives pursue different goals, there can be no question of cooperation.	3.55	3.5	1.96	**-0.662**	-0.228
With the prices paid by my cooperative I am generally…	2.42	2	1.59	0.336	**0.867**
Compared to other dairies, I am… with the current prices of my cooperative.	2.88	2	1.83	0.313	**0.834**
Compared to other dairies, I am… with the prices paid by my cooperative over the last three years.	2.16	1.5	1.64	0.343	**0.85**

Table 4: Descriptive statistics and factor loadings of items for *Relationship_quality* and *Satisfaction_prices*

Items *Relationship_quality* measured on 7point Likert-scales from "totally disagree"(1) to "totally agree"(7)

Items *Satisfaction_prices* measured on 7point Likert-scales from "entirely dissatisfied"(1) to "entirely satisfied"(7)

Items	Mean	Median	Stdev. .	Factor Loadings *Switching_cost_readiness*
I've often thought about switching to another dairy.	4.44	4	2.17	**0.544**
A change of dairy is out of the question for me.	2.94	3	1.81	**-0.664**

Switching dairy requires a lot of time, money and effort.	3.89	4	1.93	**-5.040**
There are enough dairies to whom I can deliver my milk to beside my cooperative.	3.72	4	2.05	**0.800**
It's easy for me to switch to another dairy.	3.39	2.5	2.21	**0.794**

Table 5: Descriptive statistics and factor loadings of items for *Switching_cost_readiness*

Items *Switching_cost_readiness* measured on 7point likert-scales from "totally disagree"(1) to "totally agree"(7)