Social Capital and Incentives in the Provision of Product Quality by Cooperatives

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Abstract

This paper highlights the interaction between social capital, pooling and quality premiums and their influence on cooperative members' decisions regarding their product quality. A necessary condition for adopting the cooperative equitable principle of complete pooling is that there exists a high level of social capital in the cooperative. When the level of social capital is high, the social motivation in the cooperative can guarantee high product quality while economic incentives are weak. When the level of social capital declines, an income rights structure with stronger quality incentives must be adopted by the cooperative to maintain product quality. The cooperative is uniquely efficient when the farmers are risk averse and product quality is uncertain. When the level of social capital in cooperatives is higher than a threshold, which is decreasing in members' subjective risk towards production uncertainty, cooperatives are able to achieve higher product quality than IOFs.

Keywords: Quality, Social Capital, Cooperatives, Income Rights Structure

‘Cooperation is jointly determined by social factors and incentive alignment.’

(Williamson, 1985:6)

1. Introduction

Cooperatives are often associated with low-quality products. The decentralised decision-making mechanism (Pennerstorfer and Weiss, 2013) and various traditional cooperative business practices seem not to be conducive to meeting consumers’ need for quality (e.g. Saitone and Sexton 2009; Merel, Saitone and Sexton, 2009; Fulton and Sanderson, 2002). Specifically, ‘the practice of pooling in cooperatives is commonly believed to place cooperatives at a competitive disadvantage in quality-differentiated markets’ (Liang, 2013:66).

In a pooling arrangement, ‘revenues and costs are to a certain extent allocated independent of quantity and/or quality’ (Hendrikse and Feng, 2013:509). Under the assumption of self-interest or opportunism, due to the free-riding behaviours of individual members, collectively optimal quality outcomes will not arise under pooling. Low product quality of cooperatives is thus essentially a problem of collective motivation. To solve this problem, cooperatives need to adopt an income rights structure with a well-designed pooling policy and quality premiums to promote the quality provisions of members (Deng and Hendrikse, 2013), and keep high-quality farmers (Hendrikse, 2011). There is evidence showing that the cooperatives delivering high quality products are characterised by paying quality premiums to members. For example, Balbach (1998) reports that after the extractable sugar contracts were introduced by cooperative processors to provide additional incentives to reduce impurities, the average sugar losses to molasses fell by 36%, while actual sugar production per ton of beets rose by 12%, representing significant increases in quality and value.

However, there is also considerable evidence showing that the informal aspects of cooperative organisations such as social norms and reputation effects among members are no less important than the formal institutional settings of cooperatives (e.g. Nilsson and Hendrikse, 2011). Actually, social capital can enable cooperatives to produce high-quality products even with the practice of complete pooling. Chloupkova, Svendsen and Svendsen’s (2003:243-244) case study of the Danish dairy cooperative movement records that, starting from 1882, an increasing number of Danish farmers started to deliver all their milk to their own cooperatives. The cooperatives were formed by circles of energetic entrepreneurs in the local rural communities and ‘valuable social capital was created bottom-up’ (p.243). The cooperative dairies became very successful and the quality of the butter was increased. Milk was delivered in good condition because the social control mechanism guaranteed that none of the members would cheat. It is worth noticing that the milk quality was secured under complete pooling while no quality measurement and incentive were provided in such an early stage of Danish dairy cooperatives: ‘a single horse-drawn carriage collected the milk from every farm’ (p.244). This study shows that social mechanisms have been effective in influencing the product quality by

eliminating the free-riding problem in the provision of product quality. In addition, cooperatives nowadays are also able to achieve higher product quality than IOFs under similar quality incentive structures. Cechin et al. (2013b) point out that some important differences regarding relationship characteristics between the farmers and processors could account for the higher quality performance of Brazilian broiler cooperatives. Ruben and Heras (2012) also find that the productive and economic performance of Ethiopian coffee cooperatives is enhanced by intra-community bonding social capital. Therefore, it is desirable to include the role of social capital in the study of the provision of product quality by cooperatives.

According to Granovetter (2005:43), 'a firm cannot be viewed simply as a formal organisation, but must also be understood as having the essential elements of any social community'. Granovetter's argument is particularly true of agricultural cooperatives, which are jointly owned and controlled by a society of farmers. According to Valentinov (2004:5), 'every cooperative represents simultaneously an association of persons in the sense of sociology and social psychology, i.e. social group, and a joint enterprise, owned and operated by the same members of this group'. Cooperatives are therefore with 'double nature' (Valentinov, 2004:5) or regarded as 'dual organization' (Nilsson and Hendrikse, 2011:339).

Social capital has been defined in a number of ways. Payne et al. (2011) categorise social capital by distinguishing the external (bridging) and internal (bonding) aspects and the individual and collective aspects of social capital. The issues typically related to the notion of internal social capital in cooperatives include ideology, culture, value, trust, identity, norms, etc. (e.g. Valentinov, 2004; Feng, Nilsson, Ollila and Karantininis, 2011; Nilsson, Svendsen and Svendsen, 2012). Member loyalty and commitment are often expressed as important indicators of social capital in cooperatives (Feng, Nilsson, Ollila and Karantininis, 2011). Previous research on cooperative's social capital has referred to the different facets of internal social capital and they can be clustered into three dimensions: structural, cognitive, and relational (Nahapiet and Ghoshal, 1998). The structural dimension reflects 'the patterns and strength of ties between the members of a group' (p.244). The cognitive dimension is the 'shared representations, interpretations and systems of meaning among parties, which reflects the members' collective understanding of the organisation's culture, shared vision and purpose, common language and codes, etc.' (p.244). The relational dimension refers to 'those assets created and leveraged through relationships, including trust and trustworthiness, norms and sanctions, obligations and expectations, and identity and identification' (p.244). In essence, the relational dimension serves as the key resource that can create comparative advantages for cooperatives by facilitating members' collective actions. In this paper, our analysis of social capital in cooperatives will focus on the collective-internal perspective and the function of its relational dimension in mitigating free-riding problems in cooperatives. As such, social capital in this study is conceptualised as 'the ability of a group of agents linked by horizontal social relations to discipline individual behaviour' (Putnam, 1993; in Spagnolo, 1999:3).

The importance of social capital for cooperatives has been well recognised. However, to our knowledge, a theoretical analysis of social capital in cooperatives is still missing. Moreover, prior studies on cooperatives' income rights structure generally do not consider the interplay between economic incentives and social capital. This paper fills the gap by presenting a model regarding the interaction between cooperative's social capital and economic incentives and its influence on product quality. Prior models on social capital have explicitly highlighted the value of social motivation generated by the relational dimension of social capital. These models emerge from the standard economic models by introducing a social (dis)utility term into the utility function of agents. This social utility term can be specified in different ways but all serve as a non-pecuniary source of agents' motivation. The modelling approach in this paper is mainly adapted from Casadesus-Masanell (2004), Akerlof and Kranton (2005) and Uzea and Fulton (2009). According to Casadesus-Masanell (2004), an effort-averse agent will observe three significant bases for trust, i.e. norms, ethical standards, and altruism, which create intrinsic motivation and result in larger total surplus. Akerlof and Kranton (2005) develop a model of identity and work incentives. Their principal-agent model incorporates the notion of identity, where employees may have identities that lead them to behave more or less in concert with the goal of their organisations. The analysis shows that with such an identity, workers are willing to put in high effort rather than low effort with limited wage dispersion. Similarly, Uzea and Fulton (2009) develop a model to demonstrate how the core firm in a strategic network can use identity to deter opportunism by network members. Their main argument is that when members identify strongly with their network, they lose utility if they deviate from the network norm.

In this paper, we highlight not only the value of social capital in a cooperative, but also the necessity of changing the cooperative income rights structure when the level of social capital changes. In our model, social capital generates social motivation for the members to abide by the product quality standard of the cooperative. The members will lose utility if their actions deviate from the standard. We demonstrate how the social motivation, based on cooperative's social capital, and the economic motivation, based on the pooling policy and quality premiums formulated in the contract between members and processor, jointly influence members' decisions regarding product quality. The results show that when the level of social capital is high, the social motivation in the cooperative can support high product quality under a collective income rights structure with low quality incentive intensity, and complete pooling can be efficient; as social capital declines, the social motivation alone is incapable of supporting the cooperative's quality performance, and the income rights structure must be changed by replacing the weak quality incentive structure with strong economic incentives. Additionally, the value of social capital in a cooperative is highlighted by comparing the cooperative with an IOF in terms of their product quality and payoff. Social capital makes the cooperative uniquely efficient when the farmers are very risk averse and the product quality is highly uncertain. We show that when the social capital level in the cooperative is higher than a threshold, which is decreasing in members' subjective risk towards production uncertainty, the product quality of the cooperative will be higher than that of the IOF.

This paper proceeds as follows. In Section 2, we specify the game between the processor and farmers. Section 3 determines the equilibrium. Section 4 compares the product quality and payoff of processors in different governance structures. In Section 5, we discuss the results and present some empirical implications. The last section presents conclusions and suggestions for future research.

2. Model

This section presents a non-cooperative game regarding product quality. The decision-making parties, the choices, the payoffs, the information structure and the sequence of the decisions will be specified.

There are two parties: a group of n upstream farmers and a downstream processor. The farmers are identical and produce a raw commodity that needs to be processed before reaching the final market. Each farmer produces one unit and supplies it to the processor. Each farmer decides individually regarding the quality of his or her produce. The product quality decision of farmer i is q_i, where $i = 1,2,\dots,n$, and the cost associated with the quality provision is

$$C(q_i) = \frac{1}{2} c q_i^2.$$

The quality provision cost coefficient c is identical for all farmers and is treated as a constant. Without loss of generality, the production costs of the raw produce are sunk and will not enter into the analysis (Saitone and Sexton, 2009). We assume that one unit of the raw produce will be processed into one unit of the final product.

We model the transactions between the processor and the farmers in a principal-agent framework (Holmström, 1979). The processor acts as a risk-neutral principal, and the farmers are risk-averse agents who are rewarded by the outcome of their efforts invested in the product quality. The efforts per se are not observable, but the quality of the delivered raw produce from the farmers to the processor is observable and verifiable. The processor offers the farmers a linear contract

$$P = \alpha + \beta q.$$

P is the unit price of the raw produce that the processor will pay for. $\alpha\ (\geq 0)$ is the base (guarantee) price and $\beta\ (\geq 0)$ is the quality premium. An important function of the linear contract between the principal and agent is to 'balance the costs of risk bearing against the incentive gains' (Milgrom and Roberts, 1992:207). This form of contract is commonly used in agribusiness, whether the processor is an IOF or a cooperative (Gow et al., 2000; Levy and Vukina, 2002; Dubois and Vukina, 2004; USDA, 2004; Cechin et al., 2013b). The farmers are risk-averse, and their von Neumann-Morgenstern utility function of an uncertain payoff $\pi_i\ (i = 1,2,\dots,n)$ is

$$U_i = -\exp(-r\pi_i).$$

Parameter r, which is assumed identical for all farmers, is the farmers' coefficient of absolute risk aversion, i.e. the higher r is, the more risk averse the farmers are. The payoff uncertainty results from

the risks in agribusiness. Agricultural production and marketing are subject to different types of risks, including biological risk, price risk and institutional risk (Bogetoft and Olesen, 2004). We focus on the risk of quality uncertainty in agricultural production. The realised product quality after harvest is $q_i + \epsilon_i$, where ϵ_i is a normally distributed random noise term, with mean zero and variance ρ_i^2, representing the uncertainty in the production. We assume that the uncertainty regarding product quality is identical for all farmers, i.e. $\epsilon_i = \epsilon,\ \rho_i^2 = \rho^2$. The variance ρ^2 represents the objective risk of production.

The processor further processes the raw produce supplied by the famers and sells the final products in the market, which is assumed to be competitive. The market differentiates product quality and the processor receives a unit price P_m from the market based on the average product quality Q (Pennerstorfer and Weiss, 2013):

$$P_m = P_0 Q$$

$$Q = \frac{1}{n}\sum_{i}^{n}(q_i + \epsilon).$$

$P_0 (> 0)$ measures the market's marginal preference for quality and can be understood as the aggregated 'taste parameter' of the market (Mussa and Rosen, 1978:301). We refer to the difference in the quality as in the realm of vertical product differentiation (Mérel et al., 2009). The quality of the raw produce determines the quality of the final product, and the processing itself cannot change the product quality. The processor's aggregate product quality Q is thus the average quality of the raw produce of all farmers.

We compare two governance structures: a marketing cooperative and an investor owned firm (IOF). The difference between these governance structures is threefold. First, the cooperative, which is collectively owned by a society of farmers, is assumed to possess a certain amount of social capital within the organisation. By contrast, the social capital, either between the farmers and the IOF processor or among the farmers, is assumed low and ignorable as compared with that in the cooperative. In other words, the farmers delivering raw produce to the IOF are unsocialised and the relationship between the farmers and the IOF is seen as solely seller-buyer. Second, the cooperative may apply a pooling policy in its income rights structure while the IOF pays each farmer an individualised price for the supply of the raw produce. Third, a cooperative is characterised by the zero-profit feature, i.e. revenues of the processor are returned to its members, while the IOF maximises the processor's profit. In the following, the farmers' certainty equivalent payoff will be determined for each governance structure.

Cooperative

Pooling is a general practice used by traditional cooperatives (LeVay, 1983; Staatz, 1987). It has a beneficial insurance function for risk-adverse farmers (Hendrikse and Feng, 2013). The cooperative

can decide on a pooling policy by choosing the pooling ratio σ, where $0 \leq \sigma \leq 1$ (Saitone and Sexton, 2009). σ denotes the portion of each member's produce that is assigned to a common pool. It determines the pooled payment received by a farmer and is contingent on the pooled quality Q_c. $1-\sigma$ denotes the portion of produce that determines a member-specific payment based on q_i. When $\sigma = 1$, the cooperative applies the complete pooling policy, whereas when $\sigma = 0$, the cooperative applies no pooling policy. Partial pooling is characterised by $0 < \sigma < 1$. The cooperative processor retains no profit and maximises the joint economic certainty equivalent payoff of the processor and members by choosing the base price α_c, quality premium β_c, and the pooling ratio σ. A cooperative member therefore receives

$$P_c = \alpha_c + \beta_c[\sigma Q_c + (1-\sigma)(q_i + \epsilon)]$$

$$Q_c = \frac{1}{n}\sum_{i}^{n}(q_i + \epsilon).$$

We suppose that social capital generates a social mechanism making a cooperative member internalise the ethical standard in the organisation and will lose utility if his action deviates from this standard (Casadesus-Masanell, 2004). Although this is indeed an extreme simplification of the concept and functionality of social capital, we show that the model is suitable for highlighting the basic function of social capital in terms of affecting members' behaviour. In our model, the cooperative's ethical standard is set as a product quality standard Q_s, which is the product quality desired by the cooperative. The cooperative's social capital level, denoted as Δ (≥ 0), measures the pressure felt by the members to abide by the quality standard. Intuitively, social capital in the cooperative results in intrinsic motivation because the further away the product quality is from the standard, the larger the social loss the member will suffer. This loss in members' utility can be guilt or the loss of reputation from other members (Gulati et al., 2000), as a kind of social penalty

$$U_{Loss} = -\frac{1}{2}\Delta(q_i - Q_s)^2.$$

A member's overall payoff therefore consists of not only an economic but also a social part:

$$\pi_i(q_i) = \alpha_c + \beta_c[\sigma Q_c + (1-\sigma)(q_i + \epsilon)] - \frac{1}{2}cq_i^2 - \frac{1}{2}\Delta(q_i - Q_s)^2.$$

The member's certainty equivalent payoff is

$$CE_i = \alpha_c + \beta_c\left[\frac{\sigma}{n}\sum_{i}^{n} q_i + (1-\sigma)q_i\right] - \frac{1}{2}cq_i^2 - \frac{1}{2}k\beta_c^2\left[\frac{\sigma^2}{n} + (1-\sigma)^2\right] - \frac{1}{2}\Delta(q_i - Q_s)^2.$$

$k \equiv r\rho^2$ denotes the member's subjective risk towards the product quality uncertainty. The subjective risk is the corresponding objective risk scaled by the farmer's degree of risk aversion (see Bolton and

Dewatripont, 2005: Chap. 4). The term $\frac{1}{2}k\beta_c^2\left[\frac{\sigma^2}{n}+(1-\sigma)^2\right]$ is the risk premium, which is the disutility of risk.

IOF

When the processor is an IOF, it pays for individual product quality of each farmer. The IOF will maximise its total profit subject to the farmers' participation constraints by deciding on the linear contract

$$P_f = \alpha_f + \beta_f q_i.$$

It is assumed that social capital plays no role in the transactions between the farmers and the IOF, i.e. the social (dis)utility does not enter into the farmers' certainty equivalent payoff. The payoff of a farmer i is

$$\pi_i = \alpha_f + \beta_f(q_i + \epsilon) - \frac{1}{2}cq_i^2.$$

Both the quality premium and risk premium in farmer i's certainty equivalent payoff are individualised. The certainty equivalent payoff of a farmer trading with the IOF processor is therefore

$$CE_i = \alpha_f + \beta_f q_i - \frac{1}{2}cq_i^2 - \frac{1}{2}k\beta_f^2.$$

We assume that the members' coefficient of absolute risk aversion, quality provision cost coefficient, quality uncertainty in production, and the market's preference for quality are common knowledge. The product quality can be perfectly measured. The cooperative's social capital level is also known and treated as exogenous. The game consists of three stages. The efficient governance structure (cooperative or IOF) is determined in the first stage. The linear contract (and pooling ratio of the cooperative) is decided by the processor in the second stage. In the third stage, the farmers decide their product quality. The game will be solved by backward induction.

3. Equilibrium Quality Incentive

In this section, we derive the equilibrium linear contract (and the equilibrium pooling ratio of the cooperative) in the two governance structures.

Cooperative

Member i's decision of product quality in the third stage of the game is obtained via the FOC (first-order condition) of his certainty equivalent payoff:

$$q_i^* = \frac{\beta_c\left(\frac{\sigma}{n}+1-\sigma\right)+\Delta Q_s}{c+\Delta}.$$

Because CE_i is concave, the member will choose a product quality between the selfish option and the quality standard. As all members are identical, the average product quality of the cooperative is

$$Q_c^* = \frac{\beta_c\left(\frac{\sigma}{n} + 1 - \sigma\right) + \Delta Q_s}{c + \Delta} + \frac{1}{n}\sum_i^n \epsilon.$$

We assume that the cooperative's product quality standard is the product quality that generates the first-best cooperative economic payoff:

$$Q_s = \frac{P_0}{c}.$$

The pooling ratio σ and the quality premium β_c are determined in the second stage of the game. Assume that the processing costs and value-added of the cooperative processor are sunk. The joint certainty equivalent payoff of the processor and members is

$$\pi_c = E\left\{nP_0Q_c^* - \frac{n}{2}cq_i^{*2} - \frac{n}{2}k\beta_c^2\left[\frac{\sigma^2}{n} + (1-\sigma)^2\right]\right\}.$$

The cooperative maximises π_c by choosing σ $(0 \le \sigma \le 1)$ and β_c $(0 \le \beta_c \le P_0)$[1]. The FOC of σ leads to

$$\sigma^* = \frac{\frac{c(P_0 - \beta_c)}{(c+\Delta)^2}\left(\frac{1}{n} - 1\right) + k\beta_c}{\frac{c\beta_c}{(c+\Delta)^2}\left(\frac{1}{n} - 1\right)^2 + k\beta_c\left(\frac{1}{n} + 1\right)}.$$

When n is large, $\frac{1}{n} \approx 0$ and

$$\sigma^* \approx 1 - \frac{P_0}{\left[1 + ck(1 + \frac{\Delta}{c})^2\right]\beta_c}.$$

Because $0 \le \beta_c \le P_0$, the pooling ratio the cooperative can choose is

$$0 \le \sigma^* \le \frac{ck\left(1 + \frac{\Delta}{c}\right)^2}{1 + ck\left(1 + \frac{\Delta}{c}\right)^2}.$$

And the FOC of β_c leads to

$$\frac{\beta_c^*}{P_0} \approx \frac{1}{\left[1 + ck(1 + \frac{\Delta}{c})^2\right](1 - \sigma)}.$$

[1] The quality premium will not be larger than the market's marginal preference for quality because the cooperative has a zero-profit feature.

Because $0 \leq \sigma^* \leq \frac{ck(1+\frac{\Delta}{c})^2}{1+ck(1+\frac{\Delta}{c})^2}$, we have

$$\frac{1}{1+ck(1+\frac{\Delta}{c})^2} \leq \frac{\beta_c^*}{P_0} \leq 1.$$

Combining the solution of σ^* and β_c^*, we denote the optimal income rights structure of the cooperative as

$$S^* \equiv \frac{\beta_c^*}{P_0}(1-\sigma^*) = \frac{1}{1+ck(1+\frac{\Delta}{c})^2}.$$

Because the cooperative operates with a zero-profit constraint, the base price can be obtained by

$$\alpha_c^* = q_i^*(P_0 - \beta_c^*).$$

$\frac{\beta_c^*}{P_0}$ is the ratio between the quality premium of the linear contract and the marginal market price with respect to product quality. It measures the absolute strength of the cooperative's quality premium provided by the linear contract. $1-\sigma^*$ denotes the portion of produce of a member that receives a price according to the member's individual product quality. It measures the extent to which the quality premium is individualised and the strength of the connection between the quality premium and quality provision effort of each member. Therefore, S^* essentially measures the overall quality incentive intensity of the cooperative's income rights structure.

The optimal income rights structure is determined by the social capital level Δ in the cooperative and members' subjective risk towards quality uncertainty k. When the cooperative has a very high level of social capital, S^* approaches zero. It entails that the cooperative can adopt the income rights structures with very low quality incentive intensity or even without economic incentive at all if the social capital level is very high. At the same time, the cooperative is able to produce high product quality given that every member's quality decision will be close to the quality standard: $lim_{\Delta\to\infty} q_i^* = Q_s$. A high level of social capital thus plays a role of substituting economic incentives for product quality. This function is manifested through the potential utility loss the members will suffer if their quality decisions deviate from the quality standard. However, as the cooperative's social capital level Δ declines, the cooperative should increase S^*. It entails that when social motivation fades away, the cooperative should compensate for the loss by increasing the incentive intensity in its income rights structure. This increase can be achieved either by increasing the quality premium β_c^* or by decreasing the pooling ratio σ^*. The relationship between S^* and Δ is stated in Proposition 1 and depicted in Figure 1.

Proposition 1: When the cooperative's social capital level declines, the quality incentive by the cooperative will be stronger.

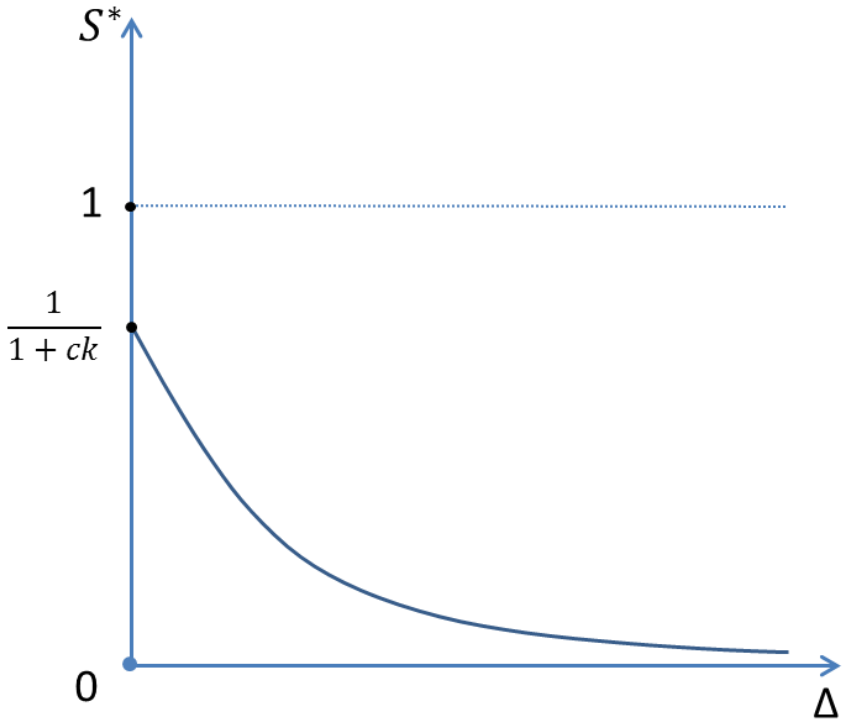

Figure 1: The relationship between social capital and quality incentive intensity

Proposition 2 formulates the comparative statics result regarding the members' subjective risk towards quality uncertainty. Given any level of social capital, a higher level of subjective risk k requires the cooperative to adopt the income rights structures with lower quality incentive intensity. This is because a strong quality incentive results in substantial risk bearing of the members and generates large disutility. The cooperative thus should choose a high pooling ratio, which shares more risks among members, or a large base payment, which makes the processor bear more risk. This is in line with the results of the classic principal-agent framework (Holmström, 1979).

Proposition 2: When members' subjective risk towards quality uncertainty increases, the cooperative chooses lower quality incentive intensity, given the level of social capital.

The choice of β_c^* and σ^* in S^* is pairwise because the cooperative is faced with a trade-off between providing a quality premium and sharing production risk. Figure 2 illustrates the values of β_c^* and σ^* in the optimal income rights structure of the cooperative. S_0 represents the value β_c^* and σ^* when there is no social capital in the cooperative, while S_1 represents the case when the level of social capital Δ is positive. S_0 serves as a benchmark in highlighting the effect of social capital. In both cases, we assume that the members' subjective risk is equal to k.

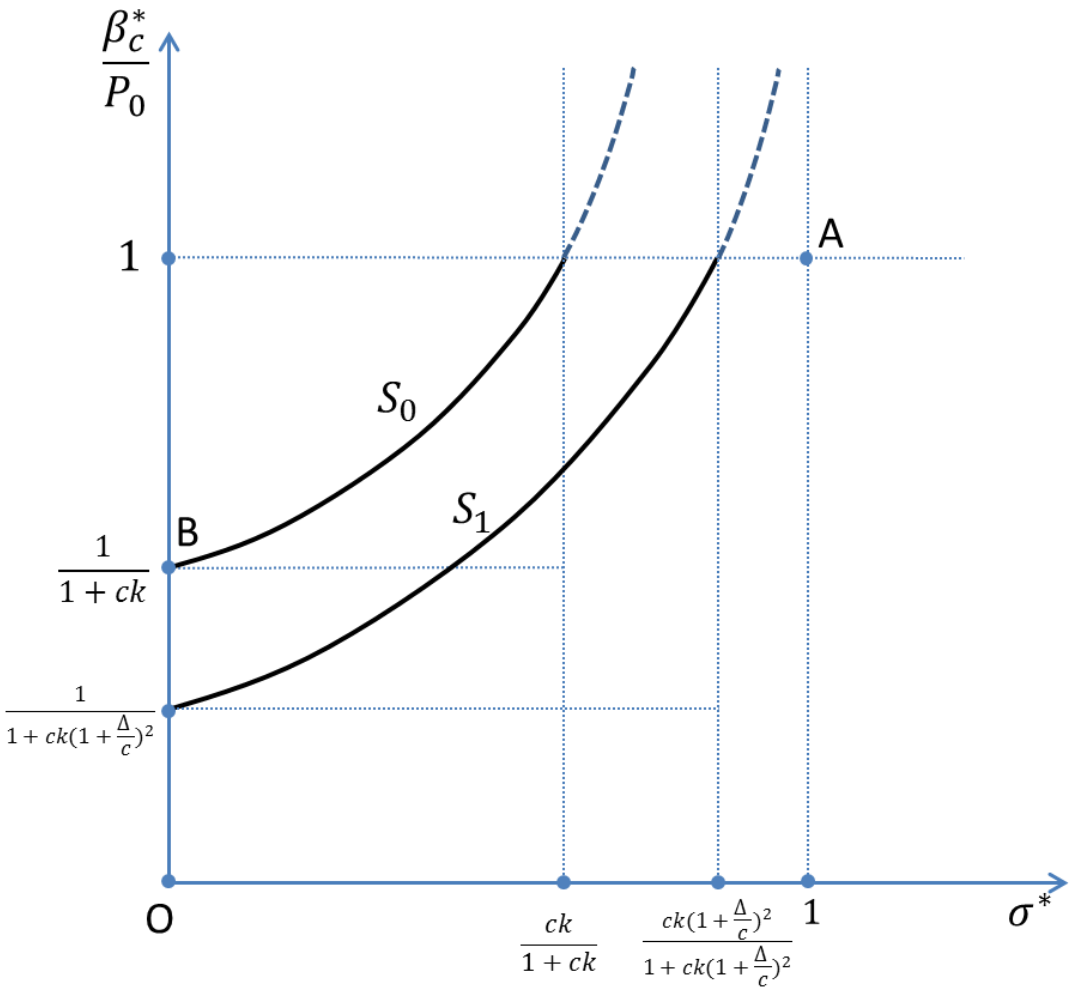

Figure 2: Trade-off between pooling ratio and quality premium in the quality incentive intensity

In the case that the cooperative has no social capital, i.e. $\Delta = 0$, the optimal income rights structure S^*converges to $S^* = \frac{1}{1+ck}$. The solid part of the curve S_0 is the efficient frontier of the optimal income rights structures and the dashed part represents the unfeasible choices (Deng and Hendrikse, 2013). In the trade-off between β_c^* and σ^*, while a high pooling ratio reduces the risk premium term $\frac{1}{2}k\beta_c^2\left[\frac{\sigma^2}{n} + (1-\sigma)^2\right]$ in the members' certainty equivalent payoff via sharing more risk, it also reduces the members' incentive to improve product quality and boosts free-riding. Hence, the cooperative needs a large quality premium β_c^* in the linear contract to maintain the product quality provisions from the members when the pooling ratio is high. On the other hand, when the pooling ratio is low, the quality premium must decrease. When the pooling ratio is low, its risk-sharing function will decrease whereas the quality premium will become effective because of less free-riding. The low pooling ratio individualises not only the risk of production uncertainty but also the rewards for product quality. Therefore, with a low pooling ratio, the cooperative needs a relatively low incentive premium to support product quality but a high base price to decrease the members' disutility from the risk of

production uncertainty. When $\Delta = 0$, the highest pooling ratio that the cooperative can enact is $\frac{ck}{1+ck}$, whereby the cooperative will pay no base price to the members and the quality premium of the linear contract will be at the highest level, i.e. $\beta_c^* = P_0$. If the cooperative chooses the no-pooling policy, i.e. $\sigma^* = 0$, the lowest quality premium $\beta_c^* = \frac{P_0}{1+ck}$ must be chosen and the highest base payment must be paid in order to reduce the members' utility loss due to quality uncertainty. The range of the efficient pooling ratio is $\left[0, \frac{ck}{1+ck}\right]$, and the range of the efficient quality premium is $\left[\frac{P_0}{1+ck}, P_0\right]$. A pooling ratio larger than $\frac{ck}{1+ck}$ is unfeasible because, under such circumstances, the cooperative has to use $\beta_c^* > P_0$ to maintain the product quality level. However, as the cooperative operates on a zero-profit condition, choosing $\beta_c^* > P_0$ entails that $\alpha_c^* < 0$. This means that the cooperative charges the members a base fee for each unit of produce they deliver. Therefore, the values of β_c^* and σ^* on the dashed part of the curve should not be chosen by the cooperative.

Now we consider the situation when a certain amount of social capital exists in the cooperative, i.e. $\Delta > 0$. With social capital, the frontier of the efficient income rights structures expands from S_0 to S_1. The highest efficient pooling ratio is correspondingly increased from $\frac{ck}{1+ck}$ to $\frac{ck(1+\frac{\Delta}{c})^2}{1+ck(1+\frac{\Delta}{c})^2}$, and the lowest quality premium is decreased from $\frac{P_0}{1+ck}$ to $\frac{P_0}{1+ck(1+\frac{\Delta}{c})^2}$. These changes show the value of social capital as it gives the cooperative more flexibility in the income rights structure choice. Other conditions the same, the cooperative can choose a higher level of pooling or a lower quality premium. This makes it possible to boost risk sharing among the members or have the cooperative processor bear more risk. Social capital therefore reduces the members' utility loss due to quality uncertainty in production and increases the joint economic certainty equivalent payoff of the cooperative. The social capital in a cooperative is thus valuable in response to the quality risk in agribusiness. Proposition 3 formulates the relationship between the level of social capital and the flexibility in designing the optimal income rights structure of the cooperative.

Proposition 3: The frontier of efficient income rights structure expands when the level of social capital increases, i.e. $\boldsymbol{\sigma^* \in \left[0, \frac{ck(1+\frac{\Delta}{c})^2}{1+ck(1+\frac{\Delta}{c})^2}\right]}$ ***and*** $\boldsymbol{\frac{\beta_c^*}{P_0} \in \left[\frac{1}{1+ck(1+\frac{\Delta}{c})^2}, 1\right]}$.

When the social capital level is very high, i.e. $\Delta \to \infty$, curve S^*will further expand and its end points will approach Point A and Point O in Figure 2. On Point A, the income rights structure consists of $\alpha_c = 0, \beta_c = P_0, \sigma = 1$. It entails that the cooperative is able to adopt the equitable principle of complete pooling when a very high level of social capital exists in the organisation. Complete pooling distributes the net revenue to members completely based on delivered volume, regardless the quality of the product. The members share the revenue equally and there is no need to pay a base payment. Or, the cooperative can simply adopt another type of equitable principle by paying each member a fixed

price for their deliveries and the pooling is unnecessary, i.e. $\alpha_c = P_0 Q_s, \beta_c = 0, \sigma = 0$ (Point O). In both situations, the high level of social capital in the cooperative prevents the members from free-riding. Their decisions on product quality will be consistent or very close to the quality standard Q_s set by the cooperative.

The existence of a high level of social capital thus explains why some cooperatives are able to maintain high product quality while maintaining an equitable principle such as complete pooling. Under these circumstances, the members act in their collective interests even when they have the chance to behave opportunistically. A high level of social capital creates large certainty equivalent payoff for the members because the risk premium is minimised under equitable principles. In addition, as the intensive quality control and supervision is avoided, a high level of social capital in the cooperative also saves on monitoring and measurement costs. This result is stated in the next corollary.

Corollary: A necessary condition for cooperative equitable principles of complete pooling is that there exists a very high level of social capital in the cooperative.

IOF

Given the linear contract offered by the IOF processor, farmer i makes the decision of product quality by maximising his certainty equivalent payoff. According to the FOC of CE_i:

$$\frac{\partial CE_i}{\partial q_i} = \beta_f - cq_i = 0$$

$$q_i^* = \frac{\beta_f}{c}.$$

Assuming that the processing costs and valued-added of the IOF processor are sunk, the IOF will maximise its profit subject to the farmers' participation constraint as a reservation certainty equivalent payoff R. The participation constraint of the farmers to deliver his raw produce to the IOF is

$$CE_i^* = \alpha_f + \beta_f q_i^* - \frac{1}{2} c q_i^{*2} - \frac{1}{2} k \beta_f^2 \geq R.$$

The IOF will simply pay the lowest possible base payment so that the farmers are willing to deliver:

$$\alpha_f^* = R - \frac{\beta_f^2}{2c} + \frac{1}{2} k \beta_f^2.$$

The total expected profit of the IOF is

$$\pi_f = E\left[nP_0 q_i^* - n\left(\alpha_f^* + \beta_f q_i\right)\right] = n\left(\frac{P_0 \beta_f}{c} - \frac{1}{2} k \beta_f^2 - \frac{\beta_f^2}{2c} - R\right).$$

The IOF maximises its profit by choosing β_f ($0 \leq \beta_f \leq P_0$):

$$\frac{\partial \pi_f}{\partial \beta_f} = n\left(\frac{P_0}{c} - k\beta_f - \frac{\beta_f}{c}\right) = 0$$

$$S^* = \frac{\beta_f^*}{P_0} = \frac{1}{1+ck}.$$

The optimal linear contract the IOF shall offer can be represented by Point B in Figure 2.

4. Governance Structure Choice

We now compare the cooperative with the IOF in terms of the equilibrium product quality and certainty equivalent payoff. With the optimal income rights structures, the cooperative's expected aggregate product quality is

$$Q_c = E[Q_c^*] = Q_s\left[1 - \frac{ck(1+\frac{\Delta}{c})}{1+ck(1+\frac{\Delta}{c})^2}\right].$$

Each member's certainty equivalent payoff is

$$CE_i^* = \frac{P_0^2}{2c}\left[1 - \frac{ck}{1+ck(1+\frac{\Delta}{c})^2}\right].$$

The cooperative retains no earnings: $\pi_c = 0$. The joint certainty equivalent payoff of the farmers and the processor for each unit of product is

$$\pi_c^J = CE_i^* + \pi_c = \frac{P_0^2}{2c}\left[1 - \frac{ck}{1+ck(1+\frac{\Delta}{c})^2}\right].$$

As for the IOF, given the equilibrium linear contract offered by it, the expected average product quality of the IOF is

$$Q_f = E\left(\frac{\beta_f^*}{c} + \frac{1}{n}\sum_i^n \epsilon\right) = Q_s\left(1 - \frac{ck}{1+ck}\right).$$

Each farmer's certainty equivalent payoff is equal to the reservation payoff and the IOF keeps the remaining part of the payoff for each unit of the product:

$$CE_i^* = R$$

$$\pi_f = \frac{P_0^2}{2c}\left(1 - \frac{ck}{1+ck}\right) - R.$$

The joint certainty equivalent payoff of the farmers and the processor for each unit of product is

$$\pi_f^J = CE_i^* + \pi_f = \frac{P_0^2}{2c}\left(1 - \frac{ck}{1+ck}\right).$$

Table 1 summarises the product quality, the farmer's certainty equivalent (CE) payoff, the processor's payoff and the joint payoff per unit of product in each governance structure.

Table 1: Product quality and CE payoff per unit of product

	Cooperative	**IOF**
Product Quality	$Q_s\left[1-\frac{ck(1+\frac{\Delta}{c})}{1+ck(1+\frac{\Delta}{c})^2}\right]$	$Q_s\left(1-\frac{ck}{1+ck}\right)$
Farmers' CE Payoff	$\frac{P_0^2}{2c}\left[1-\frac{ck}{1+ck(1+\frac{\Delta}{c})^2}\right]$	R
Processor's Payoff	0	$\frac{P_0^2}{2c}\left(1-\frac{ck}{1+ck}\right)-R$
Joint Payoff	$\frac{P_0^2}{2c}\left[1-\frac{ck}{1+ck(1+\frac{\Delta}{c})^2}\right]$	$\frac{P_0^2}{2c}\left(1-\frac{ck}{1+ck}\right)$

The comparison of the product quality of the cooperative and IOF is illustrated in Figure 3. Figure 3a compares the product quality of the cooperative and IOF when $0 < k < \frac{1}{c}$ and Δ varies. First, if there is no social capital in the cooperative, i.e. $\Delta = 0$, or if the social capital is equal to a threshold level $\Delta^{\circ} = \frac{1}{k} - c$, the cooperative and IOF will have the same product quality. Second, the sufficient condition for the cooperative to have higher product quality than the IOF is $\Delta > \Delta^{\circ}$, which is obtained by solving the inequality of $Q_c > Q_f$. Especially, when $k \geq \frac{1}{c}$, the threshold level $\Delta^{\circ} \leq 0$, the existence of any level of social capital in the cooperative, i.e. $\forall \Delta > 0$, will lead the cooperative to have higher product quality. This situation is highlighted in Figure 3b. Third, the sufficient condition for the IOF to have higher product quality than the cooperative is obtained by solving the inequality of $Q_c < Q_f$ and it is $0 < \Delta < \Delta^{\circ}$. The results are summarised in the following proposition:

Proposition 4: The cooperative and IOF will have the same product quality when $\Delta = \mathbf{0}$ ***or*** $\Delta = \frac{\mathbf{1}}{\boldsymbol{k}} - \boldsymbol{c}$***. The cooperative will supply lower quality than the IOF if and only if*** $\Delta \in \left(\mathbf{0}, \frac{\mathbf{1}}{\boldsymbol{k}} - \boldsymbol{c}\right)$.

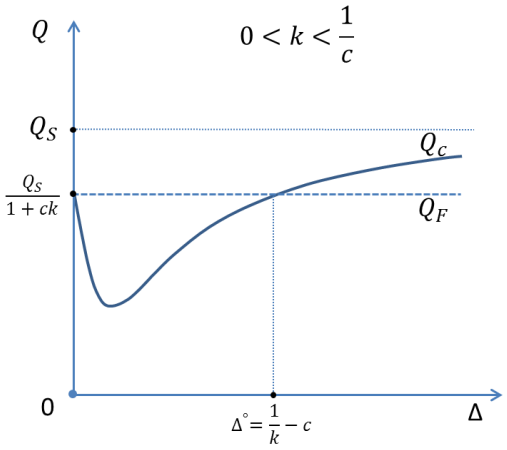

Figure 3a: Quality comparison $0 < k < \frac{1}{c}$

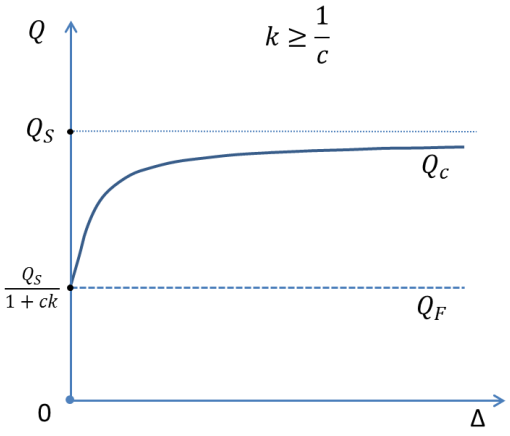

Figure 3b: Quality comparison $k \geq \frac{1}{c}$

The comparison of product quality yields the following insights. First, the cooperative maximises the members' certainty equivalent payoff by reaching an optimal trade-off between incentivizing the product quality and reducing the disutility of risk. Higher quality incentive intensity will increase product quality but at the same time decrease the members' certainty equivalent payoff because the members are exposed to more risk. When $\Delta = 0$, there is no social motivation in the cooperative and the two governance structures have the same quality incentive intensity ($\frac{1}{1+ck}$) under the optimal income rights structure. The cooperative and IOF thus will have the same product quality ($\frac{Q_s}{1+ck}$). However, the cooperative has more flexibility than the IOF in determining the payment structure by choosing different pairs of β_c^* and σ^* on the solid part of the curve S_0. To the contrary, the IOF can only choose Point B (Deng and Hendrikse, 2013).

Second, when $\Delta > 0$, the cooperative is able to choose weaker quality incentives than the IOF does because the social capital in the cooperative serves as a social motivation substituting economic incentives for the members' quality provisions. There is a difference of quality incentive intensity between the cooperative and IOF: $S_c^* - S_f^* = -\frac{\Delta k\left(2+\frac{\Delta}{c}\right)}{\left[1+ck\left(1+\frac{\Delta}{c}\right)^2\right](1+ck)} < 0$. When $\Delta = \Delta^\circ$, the quality loss due to the weaker economic incentive in the cooperative is exactly offset by the social motivation geared by social capital, the cooperative and IOF thus have the same product quality. When $\Delta > \Delta^\circ$ ($0 < \Delta < \Delta^\circ$), the quality improvement due to the social motivation exceeds (undergoes) the quality loss due to the weaker economic incentive, the cooperative thus has the higher (lower) product quality than the IOF.

Third, the threshold social capital level $\Delta^\circ = \frac{1}{k} - c$ is determined by the members' subjective risk towards quality uncertainty. In essence, it reflects the relative effectiveness of economic incentive and

social motivation in different contexts. The solid curve in Figure 4 provides a graphical illustration of Δ°. The area above curve Δ° and the horizontal axis represents the range of social capital, with which the cooperative will have higher product quality. The area surrounded by curve Δ°, the horizontal and the vertical axis represents the situations where the IOF will have higher product quality. When k is large, the economic incentive is less effective in eliciting quality provisions because the highly risk-averse farmers will be reluctant to invest efforts in quality improvement as the payoff is treated as highly uncertain. Therefore, a low level of social capital in the cooperative is sufficient to generate social motivation that compensates the weaker economic quality incentive. Δ° will then be low. To the contrary, when k is low, the economic quality incentive becomes more effective. A high level of social capital is needed to supplement the weaker economic incentive and support the product quality and Δ° will be high. Cooperatives therefore do not always benefit from social capital in product quality provisions. Only when the social capital within the organisation is higher than the threshold level Δ°, can the cooperative produce higher product quality than the IOF. As the product quality of cooperatives depends on both social capital and members' subjective risk towards quality uncertainty, comparison of the product quality of the cooperative and IOF provides a potential explanation to the fact that cooperatives and IOFs coexist in most agricultural markets, some of which 'have lower quality products provided by cooperatives, whereas other markets have high quality products provided by cooperatives' (Liang, 2013:65). As Δ° is decreasing in k, the advantage of the cooperative's social capital for product quality provisions is more prominent when the subjective risk of the farmers is high. This result is formulated in Proposition 5:

Proposition 5: In the agribusiness with high (low) quality uncertainty in production, high-quality products are mainly produced by cooperatives (IOFs).

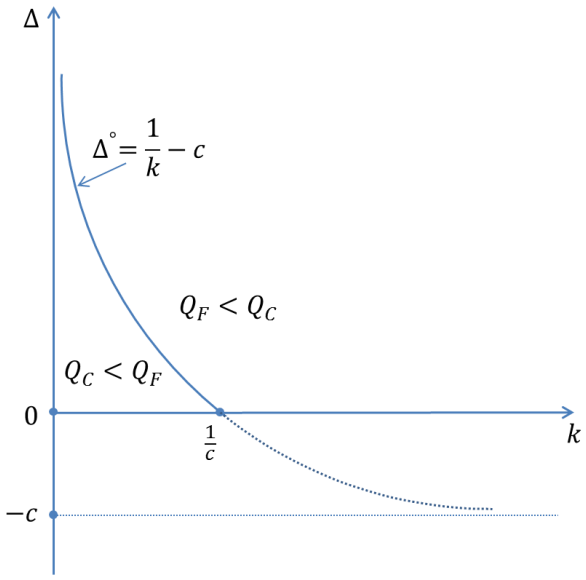

Figure 4: Product quality, social capital and subjective risk

Straightforward comparison of the joint certainty equivalent payoff shows that when an optimal income rights structure is chosen by the cooperative, the joint certainty equivalent payoff of the

cooperative will always be higher than that of the IOF if the cooperative's social capital level is higher than zero. The existence of social capital in the cooperative replaces economic incentives and helps reduce disutility from the risk of production uncertainty when the farmers are risk averse. Therefore, with social capital, the cooperative is always more efficient than the IOF. Proposition 6 states the result:

Proposition 6: The cooperative is uniquely efficient when $\Delta > 0$.

5. Discussion

In this section, we discuss the results of our model and link the propositions with the empirical observations in previous cooperative studies. While there are no direct tests of our theory, there is some related evidence that is worth mentioning. First, we review the relationship between social capital and the practices and success of cooperatives. Second, we discuss the change in social capital when cooperatives develop and the consequences of this change in cooperatives' performance and income rights structure. Finally, we highlight the need for maintaining and recovering social capital in cooperatives and discuss how to achieve it.

Social Capital and Cooperative Success

Cooperative social capital has long been recognised as a main comparative advantage of the cooperative form (Røkholt, 1999; Spear, 2000; Hogeland, 2006). According to Borgen (2001), control and coordination in cooperatives cannot be fully accomplished by means of prices or by the authority. Successful cooperatives are characterised by their capacity to overcome this gap with social capital. With the informal control and coordination geared by social capital, monitoring and transaction costs can be saved (Chloupkova, Svendsen and Svendsen, 2003; Volentinov, 2004), and the problem of coordination and aligning preferences can be alleviated (Castiglione, van Deth and Wolleb, 2008). The model in this paper highlights the informal control function of cooperatives' social capital and captures its values in three aspects.

First, as a substitute for formal control, social capital mitigates the free-riding problem and generates social motivation for members' quality provisions. Proposition 3 and its Corollary show that the equitable principles adopted by most traditional cooperatives, especially those in the early stage of the lifecycle, is based on the high level of social capital they possess. As cooperatives usually start on a small scale, members are usually well acquainted and there is strong social relationships among them (Nilsson, Svendsen and Svendsen, 2012). The trust among members makes them believe that no one will shirk their duties. Social sanctions and reputational effects in the cooperative community make opportunistic behaviour costly. Members are loyal to their cooperatives and have high commitments.

With a high level of social capital, traditional cooperatives enjoy the benefits of complete pooling to share production risk among members to the largest extent and achieve economy of scale. At the same time, high product quality can still be sustained because a high level of social capital diminishes the

tendencies to free-ride and default for individual advantage (Paldam and Svendsen, 2000). As demonstrated by the Danish dairy cooperatives case, farmer cooperatives were historically superior in the production of large and homogeneous volumes of high-quality agricultural products. Social capital provides a foundation for their success. By contrast, if there is insufficient social capital, complete pooling becomes inefficient and should not be adopted by cooperatives. Actually, if there is only weak social capital within the membership, the members tend to be ignorant and free-riding behaviour will prevail. Empirical evidence from Macedonia, Russia and Eastern Europe shows that if there exists insufficient social capital between potential members, especially the mutual trust between individual farmers, cooperatives will not be founded or be successful because no collective actions can be enabled and sustained (Nilsson and Hendrikse, 2011). Social capital is thus regarded as the 'point of departure' in the governance of traditional cooperatives (Nilsson, Svendsen and Svendsen, 2012:190) and the '*sine qua non*' for the success and adaptation of cooperative enterprises (Feng, Nilsson, Ollila and Karantininis, 2011:1). Social capital provides a social explanation to the common practice of complete pooling in traditional cooperatives, which appears difficult to explain when being analysed purely on the grounds of economic incentives.

Second, Proposition 2, 4 and 5 indicate that social capital is especially valuable when economic incentives are less effective for product quality provisions. As stated in Proposition 2, when farmers' subjective risk towards quality uncertainty is high, the risk attitude of farmers imposes large constraints on the applicability of economic incentives. The processor has to adopt a limited strength of economic incentive under these circumstances, and high product quality is difficult to obtain. Social capital gives cooperatives an additional degree of freedom to incentivise their members and make cooperatives capable of achieving high product quality. This argument can be generalised to other situations where economic incentives fail. In our model, farmers' subjective risk is the scale of their absolute risk aversion level and the objective quality risk in production. The objective quality risk is assumed to be adhered to the nature of agricultural production per se. However, there are also other sources of uncertainty in the agribusiness value chain that will contribute to the quality risk. When this uncertainty exists, economic incentives will also become ineffective and give rise to the role of social capital. For example, the uncertainty in grading and testing mechanisms will cause a systematic underinvestment of farmers in farm-level quality control when a price-grade type incentive structure is applied (Hennessy, 1996). The case of the US sugar beet industry also shows that, when trading with an IOF, the farmers may face additional uncertainty towards the IOF's quality measurement and payment (Balbach, 1998). This uncertainty in the agribusiness value chain makes farmers less willing to invest in improving product quality. In both situations, the social motivation geared by social capital may help cooperatives overcome the impediment of economic incentives and support high product quality. Nevertheless, this prediction is subjected to more empirical tests.

Third, as stated in Proposition 6, social capital can generate a higher certainty equivalent payoff for cooperative members. Agricultural production is usually uncertain and farmers are generally risk averse. Although linear contracts are designed to optimally trade off risk bearing against quality

incentives, the risk premium the farmers bear will increase with the quality incentive intensity. As social capital provides social motivation for quality improvement, it plays a role of reducing the use of economic incentives or even completely substituting them in the case that the social capital level is very high. This is beneficial for cooperative members because weaker quality incentives imply a larger pooling ratio or a larger base payment in the linear contract, which expose the members to less risk from quality uncertainty and make the processor bear more risk. The loss of certainty equivalent payoffs due to risk premium is reduced by social capital, which justifies the advantage of the cooperative business form.

Cooperative Growth, Social Capital, and Failure

Nowadays, cooperatives tend to adopt market-oriented strategies in order to respond to increasing competitive pressure and changing market situation. While facilitating their growth, cooperatives often expand horizontally by merging with others and/or vertically by moving forward in the value chain (van der Krogt, et al., 2007). However, the social capital level in cooperatives is supposed to decline as they become large and complex cooperatives (Nilsson, Svendsen and Svendsen, 2012). The reasons are multifaceted. First, horizontal expansions tend to create a large and heterogeneous membership (Nilsson, Svendsen and Svendsen, 2012), which is detrimental to cooperative social capital. According to Hogeland (2006), the culture in traditional cooperatives will be changed as the cooperative expands. When cooperatives become large and complex, the social interactions between members, which serve as the mechanism to develop and maintain shared beliefs, values and vision, become less frequent. Without sufficient social interactions, the conditions for building personal trust are no longer in place either (Granovetter, 1985). In addition, according to Granovetter (2005:34), 'the larger the group, the lower is its ability to crystallise and enforce norms, including those against free-riding'. Second, vertical integration strategies drive cooperatives enter into value-added business which is far away from members' on-farm activities. Cooperatives' business becomes so complex that members have difficulty in understanding it (Nilsson and Hendrikse, 2011). At the same time, as more decision power is allocated to professional managers, members have limited influence on the cooperatives' decision making (Bager, 1996, Hart, 1997; Bhuyan, 2007, Bijman, Hendrikse and van Oijen, 2013). The shrinking members' control in large cooperatives not only changes the governance of cooperatives, but also makes them act more like IOFs and more corporate-oriented (Hind, 1997, 1999; Hendrikse, 2005), thereby weakening identification of members with the cooperative (Borgen, 2001). Third, ideology plays a less prominent role in cooperatives nowadays. According to Fulton (1995), changes in society's values are likely to make cooperation more difficult. Farmers today are more pragmatic about their cooperatives and members' decisions are based mainly on economic terms (Karantininis and Zago, 2001). The behavioural constraints that social capital can set on members are much weaker.

Low social capital in the organisation has been used to explain the failure of large and complex cooperatives in the past decades. Nilsson, Svendsen and Svendsen (2012:187) summarise that the drain of social capital is reflected in 'less involvement for mutual benefits, less collaboration and members'

decreasing trust in their cooperatives' leaders, as well as in each other'. With a low level of social capital, members forgo cooperative value and care mainly about individual economic benefits; members lose their loyalty to their cooperative; members are not willing to sacrifice any short-term loss for long-term gain; members tend to be free riders and they are unwilling to provide equity to cooperatives; members do not trust managers and make inadequate commitment to control the management; collaboration in cooperatives becomes cumbersome and efficiency is lost, to name a few.

Regarding product quality provisions, low social capital in large and complex cooperatives will lead to weak social motivation. Weak social motivation and an income rights structure with weak economic incentives is a misalignment in the incentive system. Members will have insufficient motivation to deliver high quality products and it leads to low product quality of cooperatives. According to Proposition 1, when the cooperative's social capital level declines, the cooperative must provide stronger economic incentives for product quality provisions. To do this, the cooperative can change the income rights structure either by increasing the quality premium in the linear contract or by decreasing the pooling ratio. Proposition 3 specifies the highest efficient pooling ratio a cooperative can enact. As the social capital level in the cooperative declines, the highest efficient pooling ratio will also decrease. It entails that the income rights structure needs to become more individualised. In addition, when the cooperative's social capital level declines, the necessary condition for the complete pooling policy does not hold anymore. With severe free-riding problems, the complete pooling policy becomes very inefficient and should be abandoned.

The change of income rights structure of The Greenery provides an example of conversion from collective to more individualised forms of income rights structure. The Greenery is the outcome of a merger of nine Dutch regional fruit and vegetable auction cooperatives. Besides the large size, The Greenery's membership heterogeneity increased (Hendrikse, 2011). In the first few years after the merger, some large growers left the cooperative because of the cross-subsidisation of small growers (Bijman and Hendrikse, 2003). Meanwhile, some innovative producers left because the equality principle of pooling limits the payoff they could receive for their innovation efforts (Hendrikse, 2011). Explained from the social capital perspective, as a large and complex cooperative, The Greenery has very limited social capital in the organisation. Members' patronage commitment is no longer associated with social motivation but with economic incentives. The Greenery later introduced the member benefit programmes, which increased the number and extent of quality attributes covered by specific clauses in the incentive contracts. Members receive the payoff for higher product quality in terms of a quality-specific price (Hendrikse, 2011). With the member benefit programmes, the cooperative increased the economic incentive density for product quality. After that, innovative producers did not leave The Greenery anymore and some even came back to the cooperative (Hendrikse, 2011). The Greenery case shows the necessity of adjusting the income rights structure according to the level of cooperative social capital. As a large and complex cooperative with heterogeneous membership, The Greenery has to introduce strong economic incentives, as its social capital seems to have played no role in providing motivation for quality provisions.

Maintain and Recover Cooperative Social Capital

Although we argue that changing the income rights structure is necessary when cooperative's social capital level declines, it is also important to emphasise that cooperatives should never forgo the potential of social capital in bringing relative advantages to cooperatives. Besides the values of generating social motivation and bringing larger welfare to members, social capital can generate other benefits for cooperatives and members. For instance, social capital also helps cooperatives to obtain financial resources and stability. Since cooperatives generally have to obtain additional equity from their members (Hansmann, 1996), members who trust their cooperative are more willing to invest in the cooperative. In addition, the cooperative ideology of members makes them more willing to accept a large amount of unallocated equity capital (Fahlbeck, 2007).

Maintaining social capital during the development of the cooperative may become increasingly difficult as the membership base expands and becomes more heterogeneous (Valentinov, 2004). Nevertheless, it can still be very successful. Social capital in organisations mainly relies on the factors that shape the evolution of the social relationship between members, namely, time, interaction, interdependence, and closure (Nahapiet and Ghoshal, 1998). Horizontal and vertical expansion of a cooperative may change all or most of these factors by modifying the social network structure of cooperatives, decreasing the possibility of interactions among members, lowering the interdependency between members, and weakening the identity of membership. In other words, the growth of cooperatives goes at the expense of social capital (Nilsson, Svendsen and Svendsen, 2012). If cooperative members and managers can identify the detrimental trends of declining social capital and initiate proper membership strategies to counter it, social capital in cooperatives can be maintained.

Uzea and Fulton (2009) provide empirical evidence of the Co-operative Retailing System (CRS) in Canada, where identity management has successfully been applied, together with economic mechanisms, to manage opportunisms in the network, such as shirking on quality maintenance of the brand name, patronising outside and overexpansion. CRS is a network of about 264 retail cooperatives and their wholesaler, Federated Co-operatives Limited (FCL). The strategy of FCL to maintain social capital mainly consists of 'identity management' (p.16), which includes establishing CRS identity, fostering retails' identification with the system and establishing succession planning. Empirical study has shown that strong identification is a significant trust-making mechanism in cooperative organisations (Borgen, 2001). CRS successfully removed individualistic norms, created cooperative norms, enhanced common and mutual understanding, shared knowledge and promoted loyalty. By inducing the members to identify with the network, members have the desire to 'act in compliance with one's own identity' (p.5). The robust cooperation among members is promoted. In combination with the identity management, the economic mechanisms of CRS such as the patronage refund system and the marketing programme are also introduced to deter opportunisms by the retails. For example, the patronage refund system, which distributes part of the net savings to members in proportion to their patronage, 'providing retails strong incentive to operate in the system' (p.23). The well-designed

combination of social and economic mechanisms brought great success to CRS. It is worth noting that the social capital in CRS, represented by retails' identification with the system, is reinforced by the success of the CRS, 'providing the retails with even stronger incentives to co-operate in patronising their wholesaler' (p.32). The success of CRS demonstrates cooperative success achieved by strategically building cooperative's social capital in combination with proper economic incentives.

6. Conclusion and Further Research

A model is formulated to study the value of social capital in cooperatives and the importance of the balance between social capital and the income rights structure for cooperatives. It highlights the value of social capital in the provision of product quality by cooperatives. Social capital generates social motivation for members to abide by the product quality standard of the cooperative. With social capital, the cooperative is able to adopt less intensive economic incentives for product quality, and expose members to less quality uncertainty. The existence of a very high level of social capital supports the equitable principle of complete pooling in traditional cooperatives. With social capital, cooperatives can generate a larger joint certainty equivalent payoff and thus are more attractive than IOFs. However, social capital may change with the development of cooperatives. The increasing prevalence of a market-oriented perspective has led marketing cooperatives to assign increasing importance to expansion strategies (van der Krogt, et al., 2007). Cooperatives tend to lose social capital when they expand horizontally and vertically. We argue that when social capital in cooperatives is incapable of supporting product quality by providing sufficient social motivation, the change in cooperatives' income rights structure becomes necessary. When the cooperative's social capital level declines, stronger quality incentives will be introduced by the cooperative.

Social capital provides social motivation for cooperative members in the provision of product quality; however, it will not always lead cooperatives to have higher product quality than IOFs. Whether cooperatives have higher product quality depends on the social capital level and the subjective risk aversion level of farmers. When farmers have a high subjective risk towards quality uncertainty, the economic quality incentive becomes less effective in eliciting their quality efforts. The social motivation geared by the social capital becomes more advantageous. As an IOF is less able to elicit high quality supplies from the farmers by using economic incentives, a low level of social capital in the cooperative is already sufficient to make the cooperative supply higher product quality than the IOF through the mechanism of social motivation. To the contrary, when the farmers have a low subjective risk toward quality uncertainty, the economic quality incentive will become more effective, and a high level of social capital will be needed to supplement the weaker economic incentive in the cooperative. Therefore, social capital is supposed to make cooperatives more competitive in the agribusinesses with higher quality uncertainty in production.

In this paper, our notion of social capital is much more basic and elementary than those discussed in the voluminous literature on social capital. However, the value of our social capital model lies in

explanatory power of the functional aspects of relational social capital, the mechanism behind it, and what relational social capital can accomplish for a cooperative. This paper offers a rigorous theoretical explanation of the value of cooperative social capital and indicates various possibilities for further research. First, the members' social motivation to act according to the cooperative's standard is treated as exogenous and is determined by the social capital level of the cooperative in the model. There is the possibility that pooling policies may influence social capital as well, i.e. the two-way interaction between the economic incentives and social motivation. Partial pooling represents a higher intensity of individualised quality incentives for members than complete pooling. It may, positively or negatively, affect the members' social preference of contributing to the well-being of the cooperative. In other words, the decrease of the pooling ratio can have the 'crowding-in' or 'crowding-out' effect on the cooperative's social capital, which provides intrinsic motivation for members to perform (Bowles and Polania-Reyes, 2012:368). The next step is therefore to model the interaction between the cooperative income rights structure and social capital by making the latter as an endogenous attribute of the cooperative. Second, the members' cost parameter of product quality and their risk aversion level are assumed identical. We do not investigate the adverse selection problem caused by the decreasing social capital in this paper (Hendrikse, 2011). Further modelling is called for to address heterogeneous members' decisions. Third, a longitudinal study of the evolution of social capital in a single large cooperative along its lifecycle is lacking. Such studies are helpful to provide cooperative practitioners and researchers with a better understanding of the balance of the cooperative's social and economic attributes.

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