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

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Abstract

This article 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 cooperative equitable principles such as 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 the 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 toward 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 factor and incentive alignment."

(Williamson, 1985. p6)

1. Introduction

Cooperatives are often associated with low quality products. For example, most wine cooperatives in Germany and in Spain are characterized by low quality due to the defense-oriented characteristics of traditional cooperatives, in which the income rights are based on patronage without incentives for quality (Frick, 2004; Theodorakopoulou and Iliopoulos, 2012). Pennerstorfer and Weiss (2012) also report low quality of wine by cooperatives in Austria. The decentralized decision-making mechanism (Pennerstorfer and Weiss, 2012) and various traditional cooperative business practices seem not to be conductive to meeting consumers' need for quality (Merél, 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). Most traditional cooperatives use a "pooling arrangement in which members share equitably on a per-unit basis in the revenue stream that has been created" (Cook and Iliopoulos, 1999: 526). Low product quality of cooperatives is thus essentially a problem of collective motivation. Under the assumption of self-interest or opportunism, collectively beneficial quality outcomes fail to arise due to the actions motivated by the private benefits and efforts to individual members. Cooperatives therefore need to adopt an income rights structure with a well-designed pooling policy and quality premiums to promote the quality provision of members (Deng and Hendrikse, 2013), and attract high-quality farmers (Hendrikse, 2011). There is evidence showing that the cooperatives delivering high quality products are characterized 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 (impurities) fell by 36 percent, while actual sugar production per ton of beets rose by 12 percent, representing significant changes in quality and value.

However, there is also considerable evidence showing that the informal aspects of cooperative organizations such as social norms and processes among members are no less important than the formal institutional settings of cooperatives for the provision of product quality. For example, cooperatives were able to produce high quality products even with the practice of complete pooling. Chloupkova, Svendsen and Svendsen's (2003) study of the Danish dairy cooperative movement records that, starting from 1882, an increasing number of Danish peasants bound themselves 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 an immediate success and the quality of the butter was increased. Milk was delivered in good condition, and the social control mechanism of a cooperative guaranteed that none of the neighbors would cheat. It is worth noticing that the milk quality was secured under complete pooling while no economic incentive was provided in such an early stage of Danish dairy cooperatives: "a single horse-drawn carriage collected the milk from every farm" (p.244). In Danish dairy cooperatives, social mechanisms have been shown to influence the product quality by eliminating the free-riding problem. In addition, cooperatives nowadays are also able to achieve higher product quality than IOFs under similar quality incentive structures. Cechin et al. (2012) 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. It is therefore desirable to include the role of social capital in the study of the provision of product quality by cooperatives.

According to Granovetter (2005), a firm cannot be viewed simply as a formal organization, 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. 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 regarded as "social-capital-supported organizations" (Valentinov, 2004) or as "dual organization" (Nilsson and Hendrikse, 2011). Payne et al. (2011) characterizes 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 collective social capital in cooperatives include ideology, culture, value, trust, identity, norms, and 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. The cognitive dimension is the "shared representations, interpretations and systems of meaning among parties" (p.244), which reflects the members' collective understanding of the organization's culture, shared vision and purpose, common language and codes, etc. 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. In essence, the relational dimension serves as the key resource of cooperatives that can create the unique and valuable capabilities by facilitating coordinated collective action for mutual benefit. 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 problem in the organization. As such, the concept of social capital in this paper is conceptualized as in Putnam (1993): the ability of a group of agents linked by horizontal social relations to discipline individual behavior.

The importance of social capital for cooperatives has been well recognized. However, to our knowledge, a theoretical analysis of social capital in cooperatives is still missing. 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 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 modeling approach in this paper is mainly adapted from Casadesus-Masanell (2004), Akerlof and Kranton (2005) and Uzea and Fulton (2009). Casadesus-Masanell (2004) evaluates the role of trust in

agency contracts by considering three significant bases for trust: norms, ethical standards, and altruism. In Casadesus-Masanell's model, an effort-averse agent will observe ethical standards, norms and altruism that will allow for larger intrinsic motivation of the agent 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 organizations. The analysis shows that with such an identity, workers are willing to put in high effort rather than low effort with limited wage dispersion. Uzea and Fulton (2009) develop an economic model of behavior 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 a social motivation for the members to abide by the product quality standard set by 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, jointly influence members' decisions regarding their products' quality. The results show that when the level of social capital is high, the social motivation in the cooperative can guarantee a high product quality under an income rights structure with a low quality incentive intensity, and complete pooling is only efficient where the social capital level is very high; 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 risk averse and the product quality is uncertain. We show that when the social capital level in the cooperative is higher than a threshold, which is decreasing in members' subjective risk toward production uncertainty, the product quality of the cooperative will be higher than that of the IOF.

The 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 functioning market. Each farmer produces one unit and supplies it to the processor. Each farmer decides individually regarding the quality of their 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. α (≥ 0) is the base (guarantee) price and β (≥ 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 (Holmström, 1979). 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, 2012). The farmers are risk-averse, and their von Neumann-Morgenstern utility function of an uncertain payoff π_i $(i = 1,2, \dots, n)$ is

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

Parameter r , which is assumed to be 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 realized 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, 2012)

$$P_m = P_0 Q\ .$$

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

$P_0 (> 0)$ measures the market's marginal preference for quality and can be understood as the aggregated "taste parameter" of the market (Mussa and Rosen, 1978). 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 organization. By contrast, the social capital, either between the farmers and the IOF processor or among the farmers, is assumed to be low and ignorable as compared with that in the cooperative. In other words, the farmers delivering raw produce to the IOF are unsocialized and the relationship between the farmers and the IOF is seen as solely seller-buyer like. Second, the cooperative may apply a pooling policy in its income rights structure while the IOF pays each farmer an individualized price for the supply of the raw produce. Third, a cooperative is characterized by the zero-profit feature, i.e. revenues of the processor are returned to members. The IOF maximizes 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. 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 characterized by $0 < \sigma < 1$. The cooperative processor retains no profit and maximizes 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 internalize the ethical standard in the organization 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' behavior. 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, 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 toward 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 maximize its total profit subject to the farmers' participation constraint 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 individualized. 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 deduction.

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

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

The cooperative's product quality standard is assumed to be 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 maximizes π_c by choosing σ $(0 \le \sigma \le 1)$ and β_c $(0 \le \beta_c \le P_0)$[1]:

$$\frac{\partial \pi_c}{\partial \sigma} = \frac{nP_0\beta_c}{c+\Delta}\left(\frac{1}{n} - 1\right) - \frac{nc\beta_c}{(c+\Delta)^2}\left(\frac{1}{n} - 1\right)\left[\left(\frac{1}{n} - 1\right)\sigma\beta_c + \beta_c + \frac{\Delta P_0}{c}\right] - nk\beta_c^2\left(\frac{\sigma}{n} - (1-\sigma)\right) = 0.$$

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

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

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

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

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

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

And the FOC of β_c leads to

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

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 the 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 individualized and the strength of the connection between the quality premium and quality provision effort of each member. Therefore, S^* essentially measures the 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 toward quality uncertainty k. When the cooperative has a very high level of social capital, S^* approaches to zero. It entails that the cooperative can adopt the income rights structures with very low quality incentive intensity or even those 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 members' quality decision will be close to the quality standard: $\lim_{\Delta\to\infty} q_i^* = Q_s$. A high level of social capital 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 it by increasing the incentive intensity in its income rights structure.

It 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.

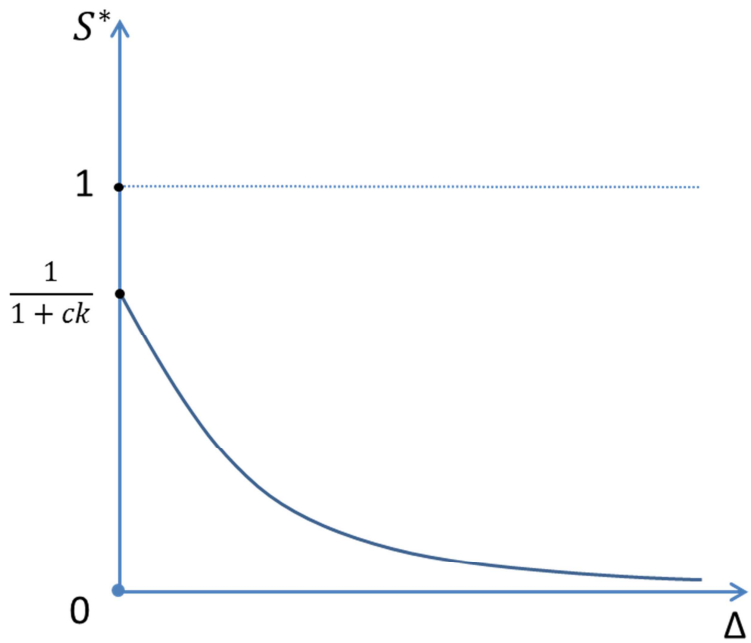

Figure 1: The relationship between social capital and the quality incentive intensity

Proposition 2 formulates the comparative statics result regarding the members' subjective risk toward quality uncertainty k. 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 so because when the members' subjective risk is high, 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 traditional principal-agent framework (Holmström, 1979).

Proposition 2: When members' subjective risk toward quality uncertainty increases, the cooperative chooses a 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 tradeoff 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.

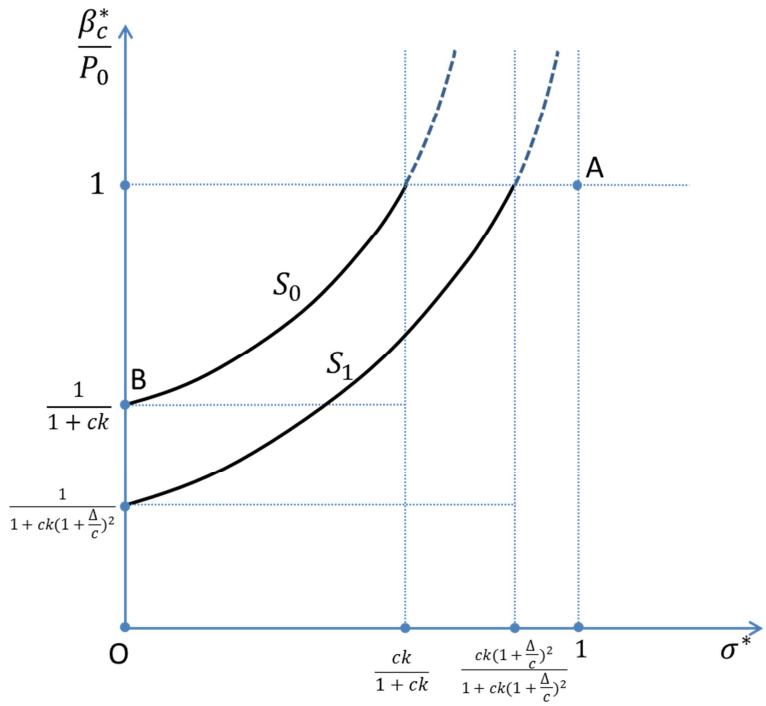

Figure 2: Tradeoff between pooling ratio and quality premium in the quality incentive intensity

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 infeasible choices (Deng and Hendrikse, 2013). In the tradeoff 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 provision 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 individualizes 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 the 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 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 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 infeasible because under such a circumstance, because 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 $\alpha_c^* < 0$. It 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 a positive Δ, 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 the social capital by giving 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 the risk sharing among the members or have the cooperative processor to 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.

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

When the social capital level is very high, $\Delta \to \infty$, curve S^*will further expand and its end points will approach Point A and Point O in Figure 2. It entails that the cooperative is able to adopt the equitable principle of complete pooling only when a very high level of social capital exists in the organization. The equitable principle of complete pooling distributes the net revenue to members completely based on delivered volume, regardless the quality of the product. The cooperative can therefore adopt the complete pooling policy. The members share the revenue equally and there is no need to pay a base payment. The income rights structure of complete pooling consists of $\alpha_c = 0, \beta_c = P_0, \sigma = 1$ (Point A). Or, the cooperative can simply pay each member a fixed price for their deliveries and the pooling is not necessary, 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 of product quality will be consistent or very close to the quality standard Q_s set by the cooperative.

The existence of a very high level of social capital thus explains why some cooperatives are able to maintain a high product quality while maintaining an equitable principle such as complete pooling. Under these circumstances, the members act in their collective interest even when they have chances to behave opportunistically. A very high level of social capital creates large certainty equivalent payoff for the members because the risk premium is minimized under the 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 maximizing 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 maximize its economic 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

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

The IOF will simply pay the lowest possible base payment so that the farmers are just 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

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

The IOF maximizes its profit by choosing β_f $(0 \leq \beta_f \leq b)$

$$\frac{\partial \pi_f}{\partial \beta_f} = n(\frac{b}{c} - k\beta_f - \frac{\beta_f}{c}) = 0.$$

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

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

4. Governance Structure Choice

In this Section, we compare the cooperative with the IOF in terms of the equilibrium product quality and certainty equivalent payoff. We choose the efficient governance structure that maximizes the joint certainty equivalent payoff of the processor and farmers.

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 certainty 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 summarizes the product quality, the farmer's certainty equivalent payoff, the processor's payoff and the joint payoff per unit of product in each governance structure.

Table 1: Product quality and certainty equivalent (CE) payoff per unit of product

Processor	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, i.e. $\Delta = \Delta^{\circ} = \frac{1}{k} - c$, 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 $\Delta > \frac{1}{k} - c$, 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 $0 < \Delta < \frac{1}{k} - c$. The results are summarized in the following proposition:

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

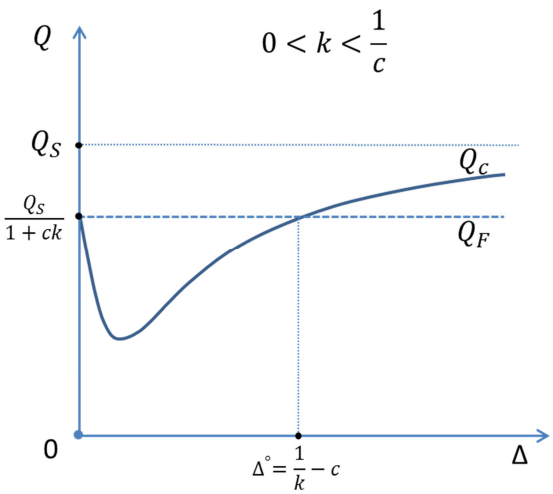

Figure 3a: Quality comparison when $0 < k < \frac{1}{c}$

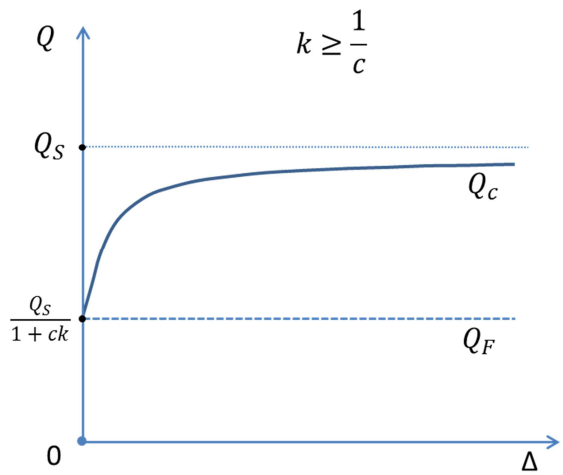

Figure 3b: Quality comparison when $k \geq \frac{1}{c}$

The results regarding product quality yield the following insights. First, the cooperative maximizes the members' certainty equivalent payoff by reaching an optimal tradeoff between incentivizing the product quality and reducing the disutility of risk. A 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 complementing the economic incentive for the members' quality provision. The difference of quality incentive intensity between the cooperative and IOF is $-\frac{\Delta k\left(2+\frac{\Delta}{c}\right)}{\left[1+ck\left(1+\frac{\Delta}{c}\right)^2\right](1+ck)} < 0$. When $\Delta = \Delta^{\circ} = \frac{1}{k} - c$, the quality loss due to the weaker economic incentive in the cooperative is exactly offset by the social motivation geared by the social capital, the cooperative and IOF thus have the same product quality. When $\Delta > \frac{1}{k} - c$ ($0 < \Delta < \frac{1}{k} - c$), 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 toward 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 provision 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 the social capital in product quality provision. Only when the social capital within the organization 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 toward quality uncertainty, the 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 product provided by cooperatives (Liang, 2013). As Δ° is decreasing in k, the advantage of the cooperative's social capital for product quality provision 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).

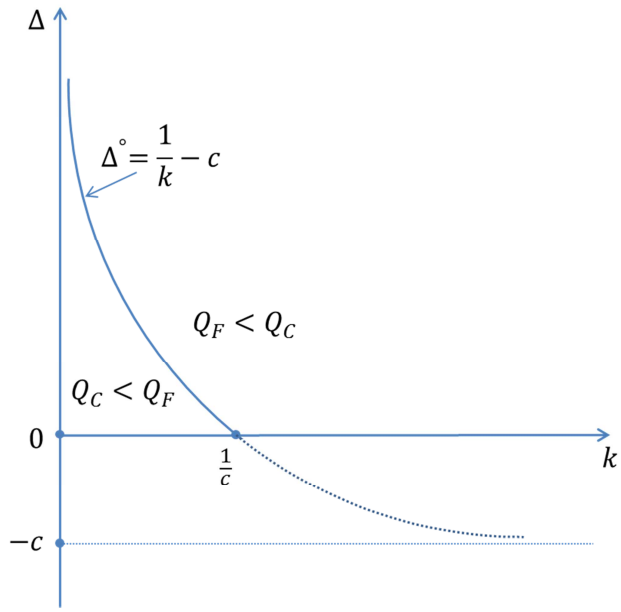

Figure 4: Product quality, social capital and subjective risk

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 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 some empirical observations. First, we review the relationship between social capital and the practices and success of traditional cooperatives. Second, we discuss the change of social capital when cooperatives develop and the consequences of this change on cooperatives' performance and income rights structure. Lastly, we highlight the need for maintaining and recovering social capital in cooperatives and discuss how to achieve it.

Social capital and cooperative success

Cooperatives' social capital has long been recognized as a main comparative advantage of the cooperative form (Røkholt, 1999; Spear, 2000; Hogeland, 2006). According to Borgen (2001), control and coordination in cooperatives can neither be fully accomplished by means of prices nor by the fiat mechanism. Successful cooperatives are characterized by their capacity to overcome this gap with the strength of social bonds, featured by their mutuality, long-term thinking and trust. With the informal control and coordination geared by social capital as a network of relationships between individuals and institutions, monitoring and transaction costs can be saved (Chloupkova, Svendsen and Svendsen, 2003) 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 cooperative's social capital and captures the values of it in three aspects.

First, social capital mitigates the free-riding problem and generates social motivation for members' quality provision. With the social motivation, cooperatives are able to adopt the pooling policy. *Proposition 3* and the *Corollary* show that the complete pooling policy adopted by most traditional cooperatives, especially those in the early stage of lifecycle, is based on the high level of social capital they possess. Without social capital, complete pooling is never efficient and should not be adopted (Deng and Hendrikse, 2013). Social capital is thus regarded as the point of departure in the governance of traditional cooperatives (Nilsson, Svendsen and Svendsen, 2012) and the *sine qua non* for the success and adaptation of cooperative enterprises (Feng, Nilsson, Ollila and Karantininis, 2011). Traditional cooperatives enjoy the benefits of social capital by using complete pooling to share production risk among members and achieving economy of scale. At the same time, the product quality can still be maintained. Historically, farmer cooperatives were superior as concerns the production of large and homogeneous volumes of high-quality agricultural products (Nilsson, Svendsen and Svendsen, 2012). Social capital provides a social explanation to the common practice of complete pooling in traditional cooperatives, which appears difficult to explain when analyzed purely on the grounds of economic incentives.

Second, *Proposition 4 and 5* indicate that social capital is especially valuable in the situations where economic incentives are less effective for product quality provision. As stated in *Proposition 2*, when farmers' subjective risk toward quality uncertainty is high, the risk attitude of farmers imposes large constraints on economic incentives. The processor has to adopt a limited economic incentive under these circumstances, and high product quality is hard to obtain. Social capital gives cooperatives an additional degree of freedom to incentivize their members and make cooperatives capable of achieving high product quality. This result can be generalized to other situations where economic incentives fail. In this paper, 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 a role of social capital. For example, the uncertainty in the grading and testing mechanisms will cause a systematic underinvestment in farm-level quality control when a price-grade type incentive structure is applied (Hennessy, 1996). Under such circumstances, social capital in cooperatives can help overcome this impediment to high product quality.

Third, as stated in *Proposition 6*, social capital generates a higher certainty equivalent payoff for farmers. Agricultural production is usually uncertain and farmers are generally risk averse. Although linear contracts are designed to optimally tradeoff risk bearing against incentives provision, the quality risk that farmers bear increases with the quality incentive intensity. As social capital provides a social motivation for quality provision, social capital plays a role by reducing the economic incentive or even completely substituting it in the case that an ultimately high level of social capital exists. This is beneficial for generating a larger certainty equivalent payoff for the 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. The certainty equivalent payoff loss

due to the risk premium is reduced by social capital, which justifies the existence of the cooperative business form.

Cooperative growth, social capital, and failure

Nowadays, cooperatives tend to adopt consumer-oriented strategies in order to respond to the increasing competitive pressure and changing market situation. While facilitating the growth of cooperatives, however, the social capital level in cooperatives is supposed to decline gradually in large and complex cooperatives (Nilsson, Svendsen and Svendsen, 2012). The reasons are multifaceted. First, the trend to horizontal integration tends to create a large and heterogeneous membership (Nilsson, Svendsen and Svendsen, 2012). As a consequence, members feel more and more alienated (Nilsson, Kihlen and Norell, 2009; Österberg and Nilsson, 2009). According to Hogeland (2006), the culture that is supportive for the traditionally organized cooperatives becomes successively threatened as the cooperative expands. The traditional conditions for personal trust-building are no longer in place. The social interactions in cooperatives, which serve as the mechanism to develop and maintain the shared beliefs, values and norms, become less frequent. The larger the group, the lower is its ability to crystallize and enforce norms, including those against free riding (Granovetter, 2005). Second, market-oriented strategies drive cooperatives' business far away from members' farming activities. Cooperatives' business becomes more complex and members have difficulty understanding them. At the same time, the management becomes increasingly autonomous and members have limited influence on the cooperatives' decision making (Bager, 1996, Hart, 1997; Bhuyan, 2007, Bijman, Hendrikse and van Oijen, 2012). The shrinking members control in the large cooperatives not only changes the culture of cooperatives, but also makes them act more like IOFs and, and more corporate-oriented (Hind, 1997, 1999). The identification of members with the cooperative weakens (Ole 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. The first language of society appears to be one of individualism. Farmers today are more pragmatic about their cooperatives and members' decisions are based mainly on economic terms (Karantininis and Zago, 2001). The behavioral constraints that social capital can set on egoistic members are much weaker.

Low social capital in the organization has been used to explain the failure of large and complex cooperatives in the past decades (Fulton and Hueth, 2009). Nilsson, Svendsen and Svendsen (2012) summarize 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. Regarding product quality provision, the decrease of social capital in cooperatives will cause an unbalance between the economic and social incentives for product quality. Weak social motivation under a low level of social capital and an income rights structure with weak quality incentives is a misalignment in the incentive system. *Proposition 3* specifies the highest efficient pooling ratio a cooperative can enact, which is dependent on the social capital level in the cooperative. And without a sufficiently high level of social capital, the necessary condition for the complete pooling policy does not hold anymore. The complete pooling thus becomes inefficient as it causes severe free-riding problems and leads to the low product quality of many cooperatives. *Proposition 1* states that when the cooperative's social capital level declines, the income rights structure with low economic incentives relying on social capital will fail to provide sufficient motivation for product quality

provision. The cooperative thus must change the income rights structure either by increasing the quality premium of the linear contract or by decreasing the pooling ratio.

Maintain and recover cooperative's social capital

Proposition 1 highlights the necessity of changing the income rights structure when cooperative's social capital level declines. Nevertheless, it is important to emphasize that cooperatives should never forgo the potential of social capital for improving the performance of cooperatives. Instead of solely relying on economic incentives, cooperatives should try to recover and maintain their social capital. Besides the values of bringing larger welfare to members as pointed out in our model, social capital can bring other benefits for cooperatives and members. For example, social capital also helps cooperatives to obtain financial resources. Since cooperatives generally have to obtain additional equity from existing and new members (Hansmann, 1996), members who trust their cooperative will be more willing to invest in it.

Although maintaining social capital during the development of the cooperative may become increasingly difficult as the membership base expands and becomes more heterogeneous (Valentinov, 2004), it can still be very successful. Social capital in organizations 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). Time is important for social capital because trust and norms of cooperation depend on stability and continuity of the social structure (Putnam, 1993). Social relationships are generally strengthened through interaction but die out if not maintained (Adler and Kwon, 2002). Social capital is eroded by factors that make people less dependent upon each other (Coleman, 1990). Network closure facilitates the development of norms, identity and trust (Coleman, 1990). Horizontal and vertical expansion of a cooperative may change all or most of these factors by modifying the social structure, decreasing the possibilities of interaction 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, the social capital in cooperatives can be maintained.

Uzea and Fulton (2009) provide empirical evidence of the Co-operative Retailing System (CRS) in Canada, where the identity has successfully been maintained, together with economic mechanisms, to manage opportunisms in the network, such as shirking on quality maintenance of the brand name, patronizing 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", which includes establishing CRS identity, fostering retails' identification with the system and establishing succession planning. Empirical study has shown that the strong identification is a significant trust-making mechanism in cooperative organizations (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". The robust cooperation among members is promoted. In combination with identity management, the economic mechanisms of CRS such as the patronage refund system and the marketing program are also introduced to deter opportunism by the retails. For example, the

patronage refund system, which distributes part of the net saving 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 noticing that the social capital in CRS, i.e. retails' identification with the system, is reinforced by the success of the CRS, "providing the retails with even stronger incentives to co-operate in patronizing their wholesaler" (p.32). The success of CRS demonstrates a cooperative success achieved by strategically building cooperative's social capital in combination with economic mechanisms.

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 in the cooperative generates the social motivation for the members to abide by the product quality standard. With social capital, the cooperative is able to adopt less intensive economic quality incentives, which expose the 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 efficient than IOFs. However, social capital will change with the development of cooperatives. The increasing prevalence of a market-oriented perspective has led marketing cooperatives to assign increasing importance to the techno-structure (executives) over the socio-structures (Bataillie-Chedotel and Huntzinger, 2004). Cooperatives tend to lose social capital when they expand horizontally and vertically. We argue that when social capital in cooperatives is incapable of supporting the product quality by providing social motivation, the change of cooperatives' income rights structure becomes necessary. When the cooperative's social capital level declines, stronger quality incentive will be introduced by the cooperative.

Social capital provides social motivation for cooperative members in the quality provision, 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 toward 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 supply from the farmers, a low level of social capital in the cooperative is already sufficient, by the mechanism of social motivation, to make the cooperative supply a higher product quality than the IOF. To the contrary, when the farmers have a low subjective risk toward quality uncertainty, the economic quality incentive becomes more effective, and a high level of social capital will be needed to supplement the weaker economic incentive in the cooperative. Therefore, social capital will make cooperatives more competitive in the agribusinesses with high quality uncertainty in production.

There are various possibilities for further research. First, the members' social motivation to act according to the cooperative's standard is treated as exogenous and is decided by the social capital level of the cooperative in the model. There is the possibility that pooling policies may influence the social capital as well, i.e. the two-way interaction between the economic and social incentive. Partial pooling represents a higher intensity of individualized quality incentive 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). The next step is therefore to model the interaction between the cooperative income rights structure and social capital as an endogenous attribute of the cooperative. Second, the members' cost parameter of product quality and their risk aversion level are assumed to be identical. We do not investigate the adverse selection problem caused by the decreasing social capital in this paper. Further modeling 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 social and economic attributes.

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