Asset specificity and the emergence of New Generation Cooperatives – The case of a Danish potato starch cooperative

by
Eliona Hajderllari[1]
Kostas Karantininis[2]
Fabio Chaddad[3]

[1]University of Copenhagen, e-mail:elh@ifro.ku.dk
[2]Swedish University of Agricultural Sciences (SLU), e-mail: Karantininis.Konstantinos@slu.se
[3]University of Missouri, Columbia, USA, e-mail: chaddadf@missouri.edu

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Abstract

In this paper we analyze the factors that determine the emergence of new generation cooperatives using the formation and structure of the Danish potato starch cooperative KMC as a historical example. The transaction cost framework has been used in order to analyze how actors chose among different types of governance structures. Theoretical framework and interviews have been combined in exploring and investigating the transactions in different settings. We show in our analysis that the governance structure choice depends heavily on the level and orientation of asset specificity as well as on the downstream market structure. Different problems that occur as a result of transaction costs related to the asset specificity are compared in different settings. Furthermore we claim that the orientation of the asset specificity and the contract-based downstream market have resulted on the emergence of the new generation cooperative.

Key words: Cooperative, asset specificity, holdup problem

1. Introduction

Agricultural cooperatives in developed countries have experienced processes of strategic reorientation and restructuring, such as internationalization (Theuvsen and Ebneth, 2005), new financial structures (Nilsson, 1999), and new ownership forms (Chaddad and Cook, 2004)(For an overview of cooperative conversions and restructuring, based on case studies, see Fulton and Hueth (2009)). Among these transformations, a notable development is the emergence of new generation cooperatives (NGC), which became an important topic of scholarly inquiry since the 1990s (Cook, 1995; Cook and Iliopoulos, 1999; Holland and King, 2004). Defined by two core attributes, closed membership and tradable delivery rights, this non-traditional cooperative model has attracted significant interest by researchers, but most importantly by cooperative leaders and investors (Nilsson and Germundsson,2000). According to Chaddad and Cook (2004) the traditional cooperatives are facing survival challenges as a result of the agricultural industrialization process. Although "new" in the NGC terminology mostly refers to those cooperatives developed in the 1990s, there exist cooperatives established earlier that resemble much of the structural elements of the NGC model. One such entity is the KMC (*Kartoffelmelcentralen* or Potato Starch Central), the starch potato cooperative in Denmark, which was established in 1933. Our detailed scrutiny of the literature did not show any reference to this historical case of KMC as an early version of the NGC model. Shedding light on this unique cooperative structure is the first contribution of this article. The second contribution of this research is that we develop a better understanding of the structure and determinants of the NGC by constructing a game theoretic model of governance choice based on transaction cost theory.

Besides the term "new generation", cooperatives have been organized according to similar "new generation" principles since much earlier in both Europe and the US (Nilsson and Germundsson, 2000; Harris et al., 1996). While Cook and Iliopoulos (1999) claim that the NGCs emerged in the early 1990s, Fulton (2000) stresses that they were created as a result of the adaptation process of the cooperatives to changes in their internal and external environments. We argue that the NGC isactually a type of organization that has existed since a long time ago as a response to a certain hold-up problem. Specifically we examine the case of a potato starch cooperative in Denmark, which has been operating until today with the same structure since 1933. The following questions are raised in this paper: First, why a certain business activity, starch processing, was organized as a cooperative? More specifically, the second question asks why this particular cooperative was organized following non-traditional principles, especially long before the agro-industrialization process began in earnest? The Common Agricultural Policy (CAP) which enforced the quota system – hence imposed some kind of capacity constraint in the potato production system – was implemented much later (1995-1996) and cannot be the reason for the formation of the potato starch NGC in Denmark. Our main premise is that transaction costs, and particularly those arising due to highly specific assets, combined with capacity constraints and fixed starch sales contracts, are the key elements that determined the choice of this organizational form. Bound by fixed starch sales contracts, starch factories were restricted to procure certain levels of potatoes. Farmers were more flexible to choose among starch factories but also could sell their potatoes to the fresh market. This left starch factories vulnerable to hold-up by farmers, which reduced their incentives to invest on the highly idiosyncratic starch asset.

According to transaction cost economics theory, the principal source of transaction cost is the variation in asset specificity (Riordan and Williamson, 1985). The presence of asymmetric asset specificity in a business relationship raises the hold-up problem (Klein et al., 1978; Williamson,

1979; Koss and Eaton, 1997). In order to avoid the potential of a hold-up, the parties involved need to undertake actions, such as ex-ante and ex-post negotiations, contractual arrangements, monitoring and need to put in place several safeguards, all of which generate transaction costs. Certain governance structures and organizational forms are put in place in order to mitigate the hold-up problem. We hypothesize that the NGC as an organizational form was chosen in order to mitigate the hold-up problems resulting from specific assets, particularly in the processing stage. Maybe those problems are more common nowadays, but we stress that they have existed since a long time ago. The Danish potato starch cooperative makes a suitable illustration of the problem, since it has existed since 1933 and has maintained the same structure since then.

Henriksen (1999) and Nilsson and Germundsson (2000) deal with a similar issue as ours. Henriksen argues that cooperatives were an organizational form that avoided the problem of potential lock-in resulting from asset specificity. She claims that the evolution of the cooperative organization on butter dairies, more than in other product lines, can be explained purely within the industrial organization framework. Specifically, transaction costs are found to be the key factor that affects organizational form choice. She emphasizes the fact that within butter products the cooperative organizational form was dominating due to the costly and specific investment, while on other food products, for example the bacon or fluid milk processing, investor-owned processors were more competitive. Nilsson and Germundsson (2000) use a Swedish potato starch cooperative as a case study to emphasize the fact that the NGCs have existed before they became a hot topic in the literature. They present a detailed description of the way the cooperative deals with the traditional cooperative problems such as the horizon, free-rider, portfolio problem and control problems. The EU policy for potato starch is briefly mentioned as a factor that affects the cooperatives success.

We follow the same logic as Henriksen (1999), in trying to explain why a cooperative with limited delivery rights has been created in the starch market, and also why there are no investor-owned firms in that market. Different from Henriksen (1999), our analysis of governance structure choice is based on two main parameters – asset specificity and the product market structure. Different from Nilsson and Germundsson (2000), we give a detailed empirical and analytical analysis of the NGC as the solution to the asymmetric asset specificity and the specific product market, and we also explain the role of the EU policy on the organizational form.

In section 2, we discuss the evolution of cooperatives in Denmark and more specifically the potato starch cooperative KMC. In section 3 we examine why quotas have been created in the starch industry. Using the transaction cost framework, we show in section 4 why a cooperative and not an investor owned firm (IOF) would solve the hold-up problem. In section 5, we show why the NGC form was a solution to the holdup problem in this particular case. Section 6 continues with discussion and section 7 concludes.

2. Cooperatives in Denmark

The cooperative movement has been dominating, strong and influential in Denmark in almost every aspect of economic and social life. The factors usually associated with the success of the Danish cooperative movement are N.F.S.Grundtvig and the folk high school (Jakobsen, 2006). Many farmers' sons went to folk high schools, where they not only dealt with concrete knowledge, but also with various different issues. The youth schools became a strong and powerful instrument which generated a new social culture of more debate and more open-mindedness (Jakobsen, 2006).Inspired by the English co-operative movement of the early 1840s,

farmers in Hjedding near Varde in the western part of Denmark developed the concept of home dairy into that of a co-operative dairy (Svendsen and Svendsen, 2000). The first cooperative creameries were established in the county of Ribe in 1882 (Henriksen, 1999). Technical improvements which upgraded both quantity and quality were introduced, making the dairy cooperative a model soon to be followed by other sectors (Chloupkova, 2002; Haggard, 1911). The dairy cooperative was followed by the slaughterhouse cooperative which was built in 1897. Later on in 1903 a survey revealed that 81% of all milk cow farms were members of a cooperative creamery, 51 per cent of pig breeding farmers were members of a cooperative bacon factory, while the liquid milk trade that supplied big towns was almost entirely organized as investor-owned businesses (Henriksen, 1999). According to Henriksen, that was determined by the transaction costs associated with each type of organization for each of the respective products. While creamery and slaughterhouse cooperatives were growing strong in the market, the number of IOFs was going down. In 1888 there were 388 creamery cooperatives and 468 IOFs; 11 years later the numbers changed to 1163 cooperatives and 255 IOFs (Henriksen, 1999). Later on, beside the dairy and meat sectors, cooperatives started to flourish in other sectors as well. Below we present the potato starch cooperative organization that, similar to creameries and slaughterhouse cooperatives, dominates the market.

2.1 The organization of the Danish potato starch cooperative

(All information regarding the cooperative's organization has been collected from the interviews with key people at KMC).

Until the year 1900 potato starch was produced everywhere in private households, especially in the country side. Since 1900 a few private owned factories were built as a response to the increased Danish market consumption. They all failed just a few years later due to fluctuations in market prices and severe competition from imported potato starch. The shortages during the war increased the potato starch prices considerably. Moreover from 1916 on, several small and primitive but expensive factories were built as investor-owned firms as well as producer-owned co-operatives. From the end of war in 1918 onwards, large volumes of imported potato starch led to severe competition and very low prices. German, Dutch and Polish potato starch was sold at dumping prices on the Danish market. Furthermore, the Danish currency revaluation worsened the situation and made imported potato starch even cheaper. The fact that these factories were built at expensive times, indicating that a costly and specific investment was undertaken, coupled with market instability, resulted in their failure.

During that time Denmark was suffering unusually intensive discrimination against its exports, due to the many tariffs and quotas directed at agricultural products(By the end of 1931, 95% of the value of the Danish imports required foreign exchange permits, for more see Eichengreen and Irwin (2009) or Salmon (2003)).. The response to that situation was to introduce a system of exchange and import control, which transformed Denmark to the country with the greatest regulation of economic life among all western countries (Salmon, 2003). The key instrument used was the import licensing system which was implemented in 1931. KMC started its activity in 1933 right at the time when the Danish government was trying to recover. The government itself decided to support the national economy by giving free licenses to build 7 potato starch factories and by protecting them from imports. Today KMC, even though bigger and extended, still applies the same rules as in 1933. The reason for the cooperative type of organization to dominate the starch potato market is similar to what Henriksen (1999) argues for the creamery cooperatives. For such a type of product, requiring a high specific investment from the processor

side, similar to the creamery products, the transaction cost associated with the IOF type of organization is high. Controlling, monitoring but most importantly convincing farmers firstly to deliver and secondly to deliver good quality was quite a challenge. For a cooperative on the other hand, where farmers know each other, the social life was quite important. No farmer would want to be excluded from the group. In the old times that would be common if the farmer didn't respect the "rules" of the group. Not only the person but the whole family would have to carry the burden of shame for a long time. Furthermore, under such conditions the cooperative was the solution to many of the problems associated with the IOF type of organization. Beside the holdup problem the low market price due to the severe competition from the imported starch was another important factor which led to the failure of the previous small starch factories. At that time people were poor and a substantial share of starch production was used in private households for food, starching table clothes and shirts. The production at that time was all marketed domestically as the starch export market started later on. A profitable sale contract for starch with the Danish supermarket chain FDB Brugsen was the solution to the price fluctuations. Moreover the contract based market and the limited capacity resulted in a limited delivery rights/obligations type of organization.

There are actually three levels involved in the whole organization, where farmers own the three factories, and the three factories own KMC.

I. Farmers. They are responsible for producing quality potatoes and delivering a pre-specified quantity to the plant, according to contractual delivery obligations.
II. Factories. The three factories are responsible for producing high quality starch in the most efficient way.
III. KMC. This federated cooperative is responsible for starch marketing, implementation of EU regulation and lobbying, new product development, and research and development.

2.2 Potato starch production contracts

Unlike the former potato starch cooperatives built in 1916, KMC started in 1933 with a well-organized structure from the beginning. As mentioned above KMC had a contract with asupermarket chain, indicating that the market was stable(in terms of price and quantity). The key terms of the contract signed by the farmers are described below.

Limited delivery rights: The potato starch cooperative is characterized by limited membership, regulated by delivery contracts. A planned and controlled production was the key instrument in running the cooperative. Both over-production and under-production would cause problems to the cooperative. The factories have a limited capacity, as well as they pre-sell all their starch production in the market, therefore they cannot exceed their limits. Also, a lower than the pre-specified production implies high average costs, given that there is a high fixed cost tied to the factories. Also, if factories cannot deliver their pre-specified quantities of starch, they pay penalties. In order to deliver their product to the starch factories, farmers had to buy shares. In 1933 one share represented the right and the obligation to deliver 100 kg of potatoes and the price was 0.5 DKK(DKK=Danish Kroner. 1 EURO=7.6 DKK approximately). Today, one share still represents the same delivery right of 100 kg, while the price has risen to 60 DKK.

Price/payment: After potato delivery, growers receivea minimum price. The bonus is delivered later on depending on the total sales. The bonus is tied to the quality of the potato delivered. However there is a strict quality threshold which each farmer should respect, otherwise the production goes to waste and the farmer is punished with a lower price – at extreme cases a farmer with really bad quality may not even get any type of payment from the cooperative.

Tradable delivery rights: The final element of the contract has to do with the investment flexibility. The interest for the company is to have active farmers, which means 100% of shares is used by the growers indicating full delivery. The shares are tradable, there exists a spot market where farmers can trade their shares. Farmers do not necessary need to grow potatoes, but all the quantities specified in the delivery share must be delivered one way or another. The responsibility lies with the holder of the delivery right.

3. Why quotas?

The EU has implemented limited quotas for starch production since 1995. Under this system, quotas were fixed by member states and then allocated among them in the form of sub-quotas. The main provisions under the Common Agriculture Policy (CAP) were restriction of production, payment to potato producer, and premium to the starch manufacturer. The potato starch quota for Denmark is 168,215 tons. It was a requirement for each member to respect the quota otherwise penalties are implemented.
At first it can be thought that the starch potato cooperative would be affected by the agricultural policy and more specifically by the quota system. It would be simple and understandable if a limited production due to the quota restriction would require a limited membership. However, the story was different and the opposite was true, the limited membership type of organization urged the limited quotas. Before the quota was introduced, not earlier than 1995, the company tried to adapt to the market all the time. The problem was that they were always one year behind the market – a classic incidence of the cobweb theorem. When the production was high the prices were going down and when the production was low the prices went up. The starch production subsidies resulted in a steady increase in the potato starch production. The bumper harvest and the low prices in 1992 led to pressures on the EU Commission to balance the market (Burell, 1995). At that time potato was the only major arable crop not regulated, while cereals, oilseeds, animal protein and the sugar sectors were regulated. Farmers were subsidized per ton of potatoes delivered, so they all had an incentive to produce more. On the other hand, potato starch was competing in the same market as cereal and wheat starch. The quota system was then an alternative which was actually initiated by the sector itself. It came as a solution to keep a stable production, and to continue receiving the subsidies from the EU.

When the quota system was implemented, the question was how to increase the added value while keeping the production stable. Sincethen the company has focused on research and development, and the challenge has been to get the most value out of the product. Before the quota, the only part used out of potatoes was starch, and potatoes contain at best 20% starch. After the quota they use most of the raw material with new products traded in a free market, such as granules and flex. The quota was the instrument which enabled the market stabilization.

4. Why not an IOF?

Transaction cost is considered a key factorin examining the choice among spot market, contracting and vertical integration as devices to organize production (Williamson, 1979). Asset specificity is defined as the most important dimension for describing a certain transaction. The reason behind it is that once the specific investment is made, the parties are effectively operating in a bilateral exchange relation for a considerable period thereafter. Different levels of asset specificity may result in a hold-up problem, and the structural form of any organization is a market response to that problem (Williamson, 1985). The high and specific investment in technology, labor, buildings etc. that a starch potato processor must undertake in order to run the factory, indicates his potential to be held up. The starch processor would be at the mercy of potato farms, if no contracts were implemented between them. Even if contracting was applied to tie the farmer to the processor, that would still result inhigh transaction costs. The uncertainty and the lack of information make the contracts more complex and incomplete (Knoeber, 1989). It is widely recognized by economists, lawyers, and others who deal with contracting that enforcing and writing complex contracts are costly. The principal-agent problem that results fromcontracting with an IOF would lead to high transaction costs. The problems of "cheating" from farmers and the "middleman exercising market power" over the farmers are tied to the IOF type of organization (Henriksen, 1999). Ownership enjoys the advantage over market contracting where optimal asset specificity is substantial (Williamson, 1989).
In addition vertical coordination, besides minimizing the contracting cost, is documented as an important instrument in improving the product quality (Dries et al., 2009 and Noev et al., 2009). For the specific case of the starch potato, the farmer actually has the power to choose and the processor is the locked-in party to a contract. For growing potato the farmer needs to invest in specific assets such as potato planters, harvesters, irrigation systems and drilling andstorage houses. However, the potato product itself involves a range of products such as fresh potato, starch potato or seed potato. The switching cost for producing any of these products is relatively small or in the extreme case, such as full flexibility, the cost would be zero. Furthermore the fresh potato market is a spot market with no entry barriers. The small or zero switching cost and the outside option such as the fresh market put the farmer in a superior bargaining position. On the other hand, the starch processing plants are product specific, since they can only use potatoes as raw material, making the potato starch processor fully locked-in to the investment. Here we stress that the case of potato starch is highly asymmetric asset specific with the processor bearing the potential hold-up risk. We have mentioned above that the uncertainty and the asset specificity make contracts complex and costly to run. The processor farmer position in the starch industry is similar to the farmer creamery processor case. In such a setting similar to Henriksen (1999) we would argue that the high transaction cost is the main factor that explains the non-existence of the private IOFs.

5. Why not a traditional cooperative?

The potato starch market is competitive upstream and downstream. On the output market potato starch competes with maize and cereal starch. On the input market, the starch processor competes for the procurement of potatoes with the food industry and fruit and vegetable processors. It is quite a challenge to operate in such a dynamic market with high pressure from both sides. The other characteristic of the potato starch processing industry, as mentioned above, is the specific

investment. Taking it from the previous section, we consider the cooperative as the market response to the processor's asset specificity problem. We analyze the potential problems that would emerge if production were organized as a traditional cooperative. In case of an open-membership cooperative the farmers are free to deliver (D) or not to deliver (N) to the coop. The interactions between the two farmers are modeled as a prisoner's dilemma played once per year, where there is asymmetric information. Our initial assumption consists of the starch processor trading in a perfectly competitive market and thus it cannot influence the price (P_c). Starch is a globally traded commodity, which makes a single starch factory unable to affect the market price. On the other hand, the table potato market is a national market and it is assumed to be influenced by even single farm delivery. Represented by a downward slopping demand curve, the smaller the quantity in the market the higher is the demand and the higher is the product price (P_h), while the higher the quantity in the market, the lower is the price (P_l). Assuming that there are only two farmers (1 and 2) playing the game, the total quantity of the coop is $Q = q_1 + q_2$. The total cost of the coop is assumed to be higher than the individual farmer's investment, so $TC_C > TC_1/TC_2$. In this model we consider three scenarios:

I – Both farmers deliver to the coop.
II – Only one farmer delivers to the coop.
III – Both farmers deliver outside.

I. Both farmers deliver to the coop

In this case the net value (V) of both farmers and the starch processor cooperative is:

$$V_1^I = R_1^I - TC_1 \geq 0 \quad (1)$$
$$V_2^I = R_2^I - TC_2 \geq 0 \quad (2)$$
$$V_C^I = R_C^I - TC_C \geq 0 \quad (3)$$

where$V_i^I; R_i^I; TC_i^I$ for i= 1, 2, c represents the net value, the total revenue and the total cost of both farmers and the cooperative respectively. The coop's total cost TC = variable cost (VC) + fixed cost (FC) and the $R_1^I = P_i Q_i$ where P_i for i=1, 2, c represents the product price for both farmers and cooperative respectively. We assume that farmer's price per unit is the average net value of the coop$P_i^j = \frac{R_{Cj} - TC_c}{Q_j}$ for $(i = 1{,}2\ and\ j = I, II)$. Farmers total cost ($TC_i$) for *i= 1, 2*is assumed to be constant through the analysis, and not affected by the delivery options. Substituting the revenues and costs into equation 1, 2 and 3 we get the net value of each of them as follows:

$$V_C^I = P_c Q - VC_C Q - \mathrm{FC}_C \quad (4)$$
$$V_1^I = P_1^I q_1 - TC_1 = \frac{P_c Q - VC_C Q - \mathrm{FC}_C}{Q} q_1 - TC_1 = \left[P_c - VC_C - \frac{\mathrm{FC}_C}{Q}\right] q_1 - TC_1 \quad (5)$$
$$V_2^I = P_2^{II} q_2 - TC_2 = \frac{P_c Q - VC_C Q - \mathrm{FC}_C}{Q} q_2 - TC_2 = \left[P_c - VC_C - \frac{\mathrm{FC}_C}{Q}\right] q_2 - TC_1 \quad (6)$$

II. One of the farmers (farmer 2) does not deliver to the coop

$$V_C^{II} = P_c q_1 - VC_C q_1 - \mathrm{FC}_C \quad (7)$$
$$V_1^{II} = P_1^{II} q_1 - TC_1 = \frac{P_c q_1 - VC_C q_1 - \mathrm{FC}_C}{q_1} q_1 - TC_1 = \left[P_c - VC_C - \frac{\mathrm{FC}_C}{q_1}\right] q_1 - TC_1 \quad (8)$$
$$V_2^{II} = P_h q_2 - TC_2 \quad (9)$$

where P_{out} represents the outside option opportunity cost. In our specific case that is represented by the table potato price. Following our assumption regarding the table potato price $P_{out} = P_h$if only one farmer supplies his production to the table market, and $P_{out} = P_l$ if they both supply the product to the table market, and the $P_l < P_i^j < P_h$.

III. Both farmers deliver outside

$V_1^{II} = P_l q_1 - TC_1$ (10)
$V_2^{II} = P_l q_2 - TC_2$ (11)
We follow our analysis with a summary of the results in Table 1.

Table 1: Farmers net returns possibilities in a traditional cooperative

	D	N
D	$q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_1$; $q_2\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_2$	$q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_1$; $P_h q_2 - TC_2$
N	$P_h q_1 - TC_1$; $q_2\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_2$	$P_l\, q_1 - TC_1$; $P_l q_2 - TC_2$

The difference in the net values of the farmer who delivers in both scenarios is as follows:

$$V_1^I - V_1^{II} = \left(\frac{V_C^I}{Q} * q_1 - TC_1\right) - \left(\frac{V_C^{II}}{q_1} * q_1 - TC_1\right) = \mathrm{FC}_c\left(\frac{Q-q_1}{Q}\right) \quad (12)$$

From the equation (12) we can see that since $\mathrm{Q} \geq q_1; \mathrm{FC}_c\left(\frac{Q-q_1}{Q}\right) \geq 0$. The result indicates that the farmer who delivers is worse off in scenario II compared to scenario I. From our assumptions $P_h > V_1^I$ which is actually $> V_1^{II}$. In absolute terms, the (D; D) box represents the highest return given that they both get a relatively higher return compared to other boxes. However, farmers fear to deliver if the other one does not deliver, and this is captured by the boxes (D; N) and (N; D). The cost they have to bear in case the other farmer does not deliver, is actually the cooperatives fixed cost which they collectively share, and is represented by $\mathrm{FC}_c\left(\frac{Q-q_1}{Q}\right)$. As such, for farmer 1 assuming that the other one will deliver it is better off not to deliver since P_h represents a better off return. On the other hand for farmer 1 assuming that the other farmer will not deliver, it is again better off not to deliver in order to avoid bearing the fixed cost. Under uncertainty and rationality, both farmers would prefer not to deliver and get the outside market price(P_l) which in the table is captured by the box (N; N). Seen from the game theory perspective, a continuous prisoner's dilemma, where farmers would remember the actions of the other farmers from the previous season, would reduce farmer's willingness for cooperation, applies for farmer 2. Therefore the dominating strategy under the abovementioned circumstances would be (N; N).

6. Why a NGC?

In this sectionwe capture the enforced penalty as an instrument which contributes to the farmer's decision to deliver the production to the cooperative. The farmer who does not deliver the signed amount of quantity has to pay a penalty that the cooperative has enforced.
The penalty enforced in order to be an exit barrier is assumed to be greater than zero, X ≥ 0 and most importantly is a function of the cooperative's quantity, $X = \rho(Q - Q^{\acute{}})$ where ρ- captures the penalty and $Q^{\acute{}}$which is$< Q$ represents the production deficiency. Similar to the traditional cooperative case we consider two scenarios (I and II) where scenario I captures when both farmers deliver, and scenario II captures where one farmer delivers to the cooperative while the other one does not. Farmers' net returns from scenario I, for the NGC case are identical to the traditional cooperatives ones, since Q´ = Q and that makes $= \rho(Q - Q^{\acute{}}) = 0$, which are captured by equation (5) and (6). In scenario II:

$$V_c^{II} = P_c Q^{`} - CV_C Q^{`} - \mathrm{FC}_C + \rho(Q - Q^{`}) \quad (13)$$

$$V_1^{II} = P_1^{II} q_1 - TC_1 = \frac{P_c Q^{`} - CV_C Q^{`} - \mathrm{FC}_C + \rho(Q - Q^{`})}{Q^{`}} q_1 - TC_1 = q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c - \rho(Q - Q^{`})}{Q^{`}}\right) - TC_1 \quad (14)$$

$$V_2^{II} = P_h q_2 - TC_2 - X = P_h q_2 - TC_2 - \rho(Q - Q^{`}) \quad (15)$$

In scenario III:

$$P_l q_1 - TC_1 - \rho(Q - Q^{`}) \quad (16)$$

$$P_l q_2 - TC_2 - \rho(Q - Q^{`}) \quad (17)$$

All the potential returns, resulting from the three scenarios are summarized in Table 2.

Table 2: Farmers net returns alternatives in a NGC

	D	N
D	$q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_1$; $q_2\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_2$	$q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c - \rho(Q - Q^{`})}{Q^{`}}\right) - TC_1$; $P_h q_2 - TC_2 - \rho(Q - Q^{`})$
N	$P_h q_1 - TC_1 - \rho(Q - Q^{`})$; $q_2\left(P_c - VC_c - \frac{\mathrm{FC}_c - \rho(Q - Q^{`})}{Q^{`}}\right) - TC_2$	$P_l q_1 - TC_1 - \rho(Q - Q^{`})$; $P_l q_2 - TC_2 - \rho(Q - Q^{`})$

The difference in the net values of the farmer who delivers in both scenarios, which we estimate using equations (5) and (14), is as follows:

$$\Delta V_1 = q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c}{Q}\right) - TC_1 - q_1\left(P_c - VC_c - \frac{\mathrm{FC}_c - \rho(Q - Q^{`})}{Q^{`}}\right) - TC_1 = \mathrm{FC}_c\left(\frac{1}{Q^{`}} - \frac{1}{Q}\right) - \frac{\rho(Q - Q^{`})}{Q^{`}} \quad (18)$$

The total effect here depends on both parameters Q` and $\rho$. The higher the Q` the smaller is the difference between the two scenarios, indicating that the smaller the cost that the farmer who delivers to the cooperative has to bear, if the other farmer does not deliver. On the other hand for a smaller Q` the effect will depend on the penalty. The higher is ρ, the smaller is the cost that the farmer who delivers has to bear. The smaller is ρ the higher is the fixed cost the delivery farmer

bears. The game is now as follows: Farmer 1 assuming that farmer 2 delivers, decides based on the penalty; on the other hand farmer 1 assuming that farmer 2 does not deliver decides again based on the penalty. From equation (13), we see that the higher the ρ the lower is the net return of the farmer who does not deliver. For a penalty such as $P_h - \rho < P_i^I$, the decision game is as follows: Farmer 1 assuming that farmer 2 will deliver is better off if he delivers; on the other hand farmer 1 assuming that the other farmer will not deliver, will be better off if he delivers. In this condition, the dominating strategy is captured by the box (D; D). However the same is not true if the penalty is such $P_h - \rho > P_i^I$. It is a condition that requires the penalty to be big enough so that the non-delivery option does not result in a higher return than the delivery ones.

7. Discussion

The potato starch cooperative represents a special case that fully adapts to the NGC principles. It did not come as novel or as an adaption to any change; it has actually been there since a long time ago. Throughout the paper we seek to identify the factors that stand behind its existence by using analytical analysis and qualitative data. In-depth interviews with KMC leaders and farmers helped us to understand and dig into the problem. We had 10 interviews with different representatives, and each interview took approximately 1 hour and 30 minutes. From the interviews we were able to stress that the quota policy did not affect the organizational structure. The fact that the cooperative has existed since 1933, and it has been using the same organizational features, while the quotas were introducedin 1995, rejects the hypothesis that quotas might have influenced the organization structure in any way. Furthermore a discrete structural analysis has been undertaken, where three possible organizational forms are analyzed. The farm-IOF interactions are characterized by a highly asymmetric asset specificity, which results in a serious potential hold-up problem.

The IOF as a potential organizational form could not enter the market due to the serious potential hold-up problem. The high specific and costly investment characterizing the processors on one hand, and the flexible farmer due to the outside option, on the other hand, did not allow such an organization to operate in the starch market. The fact that the starch production in Denmark is carried outonly on a cooperative basis illustrates that an IOF type of organization would be potentially held-up by the farmers. Henriksen (1999) has described in her article why an IOF type of organization, which is quite competitive fluid milk industry, wouldn't undertake an investment in the creamery industry. The high transaction cost related to the processor, the transportation cost, or the cold storage tied to the product specificity indicates why such a product would not fit into an IOF form. We argue in the same way regarding the fact why such a form does not exist in the starch potato industry. While the open cooperative type of organization was the solution to the high transaction cost associated with the IOF type of organization, it was not much of a solution to the problemsemerging from the technology as well as from the respective market.For the specific case of potato starch processing, the factories have a limited capacity. Either overproduction or underproduction creates problems in terms of efficiency. Overproduction is tied to the limited production the factories can process, while underproduction is tied to the fixed cost. The other element that creates the urge for a planned and controlled production is the contract based market. The starch market is fully contract based and there is no spot market. Contracts with industrial buyers precede starch production. The fact that the customers are represented by big industrial firms makes the product plan even stricter. The NGC type of organization emerged as a solution to both hold up problem and capacity constraints.

8. Conclusion

In this paper we analyzed why new generation cooperatives have existed since a long time ago. Analytical results and qualitative interviews were undertaken in order to analyze the case of an old NGC. Our finding is that the organizational choice was a result of a highly asymmetric specific investment and a contract based type of market. The transaction cost caused by the asset specificity was the barrier to the IOF as a potential form of organization in the potato starch industry. The hold-up problem is shown to be avoided through the cooperative type of organization and particularly by penalty enforcement. One of the main characteristics of the NGC, which is limited delivery rights, results from the contract-based starch market. Furthermore, the tradable shares represent an instrument to attract farmers to invest in such a specific type of investment. We conclude that the NGC of the old times have resulted due to a complexity of problems linked to both investment and market organization associated with a specific product.

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