Relative Performance Payment in Cooperatives – A Model-Theoretical Analysis

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Abstract

Governing the cooperatives' management by payment systems turns out to be a non-trivial problem due to the specific characteristics of the legal structure. Evaluating the management's performance is complicated by the business relations between members and their cooperative. A relative performance payment can make a significant contribution to the reduction of target inconsistencies between the members and the management of cooperatives.

It is based on the idea that for evaluating the performance of a manager not only the company's results of its "own" company are used, but also the competitors' or industry's results. There are three advantages of a relative performance evaluation:

- The inclusion of the results of other companies allows reducing systematic arising risks of the compensation scheme for the CEO.
- The compensation scheme can include the cooperative's profit for the evaluation of the market success and a comparison of the purchase prices for the members´ products in order to measure the member value. This will lead the CEO's decisions and labor effort toward members´ aims.
- The members can use the compensation scheme as a strategic variable to reduce competition intensity between the cooperatives.

The paper considers the incentive characteristics of linear contracts based on relative performance evaluation for CEOs under the specific requirements of cooperatives. The analysis includes a comparison of different compensation schemes and their utility for cooperatives in several market scenarios.

Keywords: Cooperative Governance, compensation schemes, relative performance payment, Cournot model

1. Introduction

According to the International Cooperative Alliance over 800 million people worldwide are members of cooperatives (see http://www.coop.org/coop/statistics.html). In many countries, entire industries are dominated by cooperatives. The literature provides several explanations for the existence and the market power of cooperatives, but very few publications are around that are dealing with the performance measurement and the efficiency of cooperatives versus publicly listed firms in agribusiness. A substantial amount of research has indeed focused on how an optimal performance measure can help to adjust the agency problem in IOFs, especially publicly listed companies, whereas the CEO compensation in other governance structures, for example cooperatives, has received hardly attention. The situation in cooperatives is more complex than a standard principal-agent relationship. Firstly, it is difficult to assess the top manager´s contributions to a company due to the complexity of his task (Blanchard et. al., 1996). The tasks of a cooperative´s CEO are even more complex due to the cooperative´s goal of jointly maximizing member and cooperative returns (Peterson, Anderson, 1996, p. 376). Secondly, a managerial incentive contract is based on a performance measurement system, creating incentives that align the goal of the agent (CEO) with that of the organization and its principals (members). However, there are no simple indicators of cooperative managerial performance or automatic incentive systems (e.g. a stock price). Trechter et. al. (1997) document that CEO compensation schemes in cooperatives vary substantially. Consequently, designing a contract ensuring the mutual compatibility of a cooperative´s goal and the CEO´s incentives is an even more complex task. So far, payment systems in the sense of an incentive-oriented payment have rather been disregarded in the research of cooperative organisations (FENG/HENDRIKSE, 2009). But the research in the field of other corporate organisations then cooperatives has shown that it is necessary to provide the management of an organisation with incentives in order to ensure that they will act in the interests of the owners.

For that it is due to provide the self-interest maximising managers with extrinsic incentives to reduce the target inconsistencies between the owners of the companies and the management. Especially for cooperatives the specific legal form (owners resp. members are also suppliers or consumers of the organisation) has to be taken into account. Thus, a sole maximisation of the shareholder value or of the dividend for rating the performance of an organisation as it applies to organisations like IOFs is in case of cooperatives not appropriate.

This contribution proposes the usage of relative performance payment in order to remunerate the cooperatives' management. Thus, the managers of cooperatives can be efficiently compensated considering the specific characteristics of the legal form.

In section 2 the study shows and discusses the necessity of an incentive-based compensation by classifying the contribution based on the corresponding literature and by reflecting investigations in the field of cooperatives. In section 3 the basic characteristics of a relative performance payment are presented and section 4 explains some preconditions for the practical implementation. In section 5 the application to cooperatives is tested and approaches are presented. Section 6 summarises the paper.

2. Incentive-based and cooperative compensation systems

The incentive-oriented payment is based on the principal-agent theory according to Jensen/Meckling (1976). The central approach describes the necessity of delegating various responsibilities within larger entities, in which the owner/owners are no longer able to deal with everything that needs to be done. An agent (manager) is entrusted by a principal

(company owner) with the management of the company, for what the agent needs to be compensated (Kara, 2009).

In this context asymmetric information enable the agent to pursue his personal preferences which are not identical to the preferences of the principal (Lambert, 2001). Examples for the inconsistencies between agent and principal are, among other things, different risk attitudes or time preferences. Furthermore, the agent can try to act opportunistically and due to discretionaries like e.g. to keep the working burden low or unnecessarily waste corporate resources (Hess, 1999). Based on the assumption of an utility-maximising manager the use of extrinsic incentives is necessary in order to reduce the trade-off (Weibel/Rost/Osterloh, 2007).

Regarding the delegation of decisions, the compensation of managers helps reducing the target inconsistencies between principal and agent (Bailey/Brown/Cocco, 1998). The usage of compensation systems in order to delegate managers has been extensively investigated in the economic research. The literature streams can be divided into empirical and model-based analyses regarding the payment of the management. All empirical analyses came to the result that, in practice, the payment systems are mainly designed to be not incentive-compatible (Schwalbach/Graßhoff, 1997). Overviews of these analyses can be found, among others, in Finkenstein/Hambrick (1988), Gibbons/Murphy (1990), Rosen (1992) or Barkema/Geroski/Schwalbach (1997).

The model-based analyses observe various types of payment systems for governing managers. In doing so, besides pre-set performance-based systems (e.g. profit indicator oriented or corporate value oriented in Gillenkirch (2004), the type of market or the corporate structure vary. The manifold analyses show, that the appropriate compensation system strongly depends on the basic conditions and therefore a generally valid statement seems not to be possible. But subject to certain conditions the goal inconsistencies between the corporate management and the owners can be overcome or at least reduced.

Regarding the incentive-oriented compensation of the cooperative management there are arising further problems besides those known from other legal forms complicating an effective payment system.

Some approaches regarding payment in other legal forms as for example a connection to the corporate value cannot be pursued in cooperatives due to its unique form of governance (Nolting/Bornemann, 2011).

Other operating figures for measuring the management's performance like the corporate profit do not capture the whole complexity of the cooperative's corporate goals. According to the Cooperative Law the cooperatives' main focus is to maximize value to its members. Basically, the economic support of the members can be divided into three dimensions, i.e. the mandate to directly, indirectly, and to sustainably promote the members (Theurl, 2005).

The direct promotion describes the support of the members within the business relationship with the cooperative. The indirect promotion is realised by providing the members with dividend payments or by reimbursement. Allocations to reserves from surpluses of the cooperative represent the sustainable promotion. The annual surplus resp. the resulting performance measures do not involve the direct support of the members in any case. It seems that payment systems of other legal forms can not simply be applied to cooperatives and that there is a backlog demand of the cooperative research.

This is also emphasised for the corporate practice by empirical studies regarding the payment of the cooperatives' management. Trechter et al (1997) observed the payment practice of cooperative managers by interviewing five cooperatives regarding the structures and aims of their payment systems. This qualitative analysis documents that the CEO compensation in

cooperatives varies between different payment schemes. Some have implemented pre-set performance-based bonuses, some use bonuses paid on post performance, and other do not use bonuses at all. Hueth/Marcoul (2009) also confirm this result by a survey of cooperatives. They found out that the interviewed cooperatives rarely use an incentive-oriented compensation and that for cooperatives in general the incentive-oriented payment is unusual.

Richards/Klein/Walburger (1998) interviewed members of cooperatives and documented that the owners are not satisfied with the performance of the management. From this the necessity of a cooperative specific compensation system providing the management with incentives for a better promotion of the members should be developed:

Cook (1994) and Feng/Hendrikse (2009) pursued model-based analyses of the main differences between the requirements on the management of cooperatives compared to other types of organisations. They realised that the corporate structure of cooperatives compared to other legal forms requires specific ompensation systems in order to meet the members' interests. Therefore, a payment system considering all economic dimensions of the members' promotion has to be used. To elaborate such a system a modification of the relative performance payment system could be used.

3   Relative-performance-payment

The relative performance compensation is based on the principle, that for evaluating the performance of a manager not only data of the own company are taken into account but also that third-party indicators are used. Such an indicator could be the corporate performance of a cooperative´s competitor. The assessment of the competitors's results eliminates systematic market risks from the compensation of the management and is based on Holmström (1982).

The conventional compensation function within the relative performance payment scheme consists of a fix and a variable component (Asseburg/Hofmann, 2009). The variable component involves the difference of the corporate performance measure compared to the weighted results of the competitors. Generally, the economic results of the competitors are included in the compensation with a negative weighting factor, so that the performance is only defined by a performance difference to the competitor. Hereby, positive and negative distortions of the market on the corporate result can be filtered. This results in two major advantages for the firm owners.

On the basis of the corporate result the owners can identify the performance of the management. Without involving performances of other organisations the variable compensation could only be identified by the own corporate data over time. In this case market influences can compensate the manager's performances so that the payment is not linked to the performance of the manager but under certain circumstances to a large extent to the market developments.

Furthermore, indroducing a variable compensation the manager has to be compensated for taking over a higher risk. By filtering the market risks within the relative performance rating the risk of the payment will be reduced. As a result, the managers have to be provided with lower risk compensation. Besides the general advantages of a relative performance rating also strategic aspects increasing the corporate profit and thus enhancing the benefit of the owners can be taken into account (Aggarwal/Samwick, 1999). We will demonstrate this solution by introducing a different compensation schemes in a relative performance payment model.

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4   Implementation and practical implications for cooperatives

In order to maximise the member benefit and to realise a target congruency as high as possible between management and members a payment system is due to involve all economic promotion dimensions. But this requirement is not trivial as the different dimensions can affect each other.

The direct cooperative promotion as a performance criterion is mainly reflected by the prices of the goods the members produce and sold to the cooperative or of the inputs purchased by the members through the cooperative. But the determination of the quality of the direct promotion is not given by regarding the prices in absolute terms as they are subject to considerable market fluctuations. It makes more sense to compare the prices in relation to the prices paid by other organisations in order to quantify the promotion benefit.

The indirect promotion in terms of dividend payments to the members and the sustainable promotion in terms of profit retentions (see Nolting/Bornemann, 2011) are key figures, which jointly represent the annual surplus of a cooperative. Thus, the annual profit doesn't contain information regarding the distribution of the profit to the different promotion dimensions, but it reflects the total amount of the promotion and can be used as performance indicator. The absolute number here is also not really meaningful as it is generally strongly correlated to the size of the company.

Thus, all monetary promotion dimensions regarding the members can be basically demonstrated by the price conditions and the annual surplus of a cooperative. This is represented by figure 1.
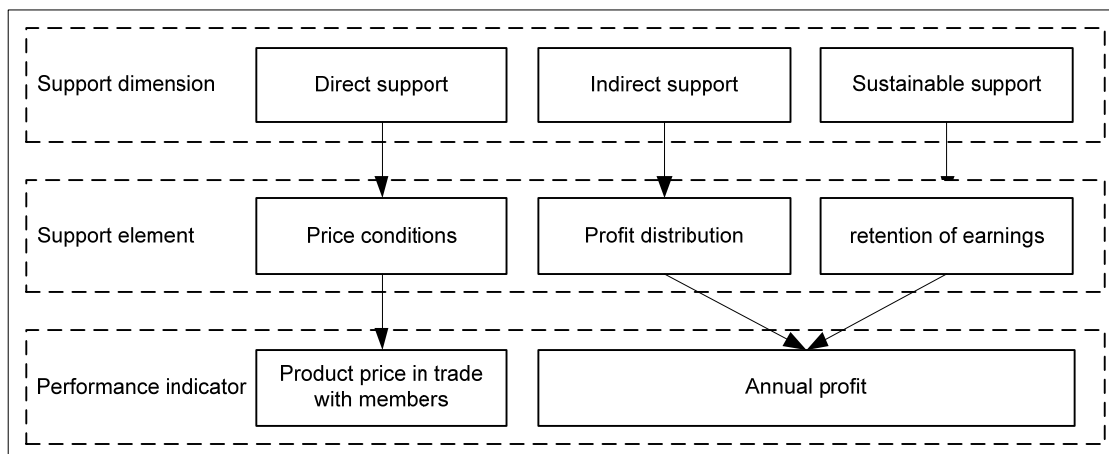

Figure 1

But it is problematic that there is a trade-off between the terms of trade of members and the annual profit. Depending on the function of a cooperatives as input supply, or marketing cooperative or a multi-purpose cooperative the prices received in the trade with the members reflect the basic revenues (in case of selling goods to the members) or the purchase prices reflect the main costs (in case of purchasing goods of the members). The revenues and the costs have a significant influence on the annual surplus of the cooperative and offer the cooperative management considerable discretionary scope.

A bad performance of the management can be well covered by that, as small annual surpluses may be used as an indicator for high direct member promotion. Generally, the members can't easily verify this argument and an evaluation of the management's performance is nearly impossible for members. As already stated, the sole observation of the price conditions and the annual surplus in order to evaluate the management´s effort is not very meaningful. This

indicator can be strongly affected by the market conditions. The assessment of the cooperative management performance and an according incentive-oriented payment scheme should relate the operating results of a given cooperative to other competitors.

Therefore, a company needs data from several other companies of the industry resp. other cooperatives. Published annual reports of cooperatives, especially of smaller companies, do not contain the relevant data in order to cover all monetary promotion dimensions. As a result, a voluntary data transfer is necessary. Generally, companies avoid transferring information as they are afraid of resulting competitive disadvantages. Especially price information is seen as sensitive data which are not to be provided to a competing company. To solve this problem, transferring the information to an independent authority can be a possibility. This authority commits itself to collect the respective data and not to transfer them to a third party. Furthermore, it pursues the anonymisation and standardisation of the data. From standardised data average key figures per industry are compiled which do not allow conclusions regarding the original company data any longer. These average key figures are compared to the data of a cooperative and the performance result is reported to the respective cooperative. The cooperative can use these data and thus define the performance-related component of the management. Furthermore, the divergencies can be analysed in order to reveal possible deficiencies of the company. Considering the cooperative network structure cooperative auditing associations offer their service as independent authority. Figure 2 shows an overview of an evaluation process.
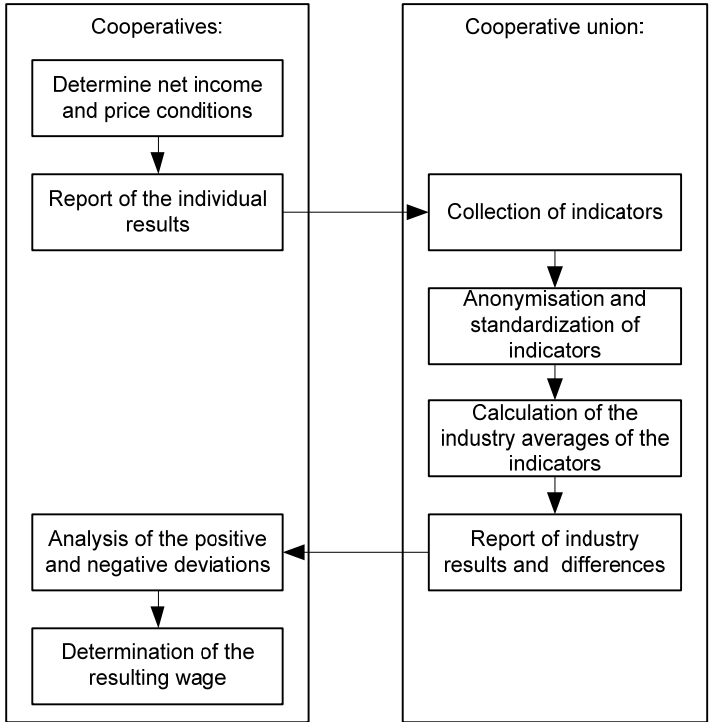

Figure 2

Besides the key figures involved in the payment system the process is like a benchmarking process extendible by further key figures as for example cost information. As a result, deficiencies in the production or trade process can be identified for all involved cooperatives. In that sense an improvement of all companies can be generated in the long term. Table 1 demonstrates the advantages rep. disadvantages of using a relative performance payment scheme.

Table 1: Advantages and disadvantages of the relative performance payment in the context of cooperatives

Advantages:	Disadvantages:
• Objective performance assessment of the management • Incentive character for the management and thus maybe an increase of the work input • Governing character for the management by considering the price conditions in the payment • Variable payment without market risks • Identifying deficiencies of the cooperative	• Effort of the key figure collection • Costs of processing the data by the association • Risk of outflowing sensitive data

Generally the question regarding the involvement of average key figures in the payment function of the management remains. The function is supposed to include the components annual profit x, purchase prices of goods sold by members p_s^M and sales prices of goods resp. services sold to members p_d^M in relation to the respective industry averages ($\overline{x}, \overline{p}_s, \overline{p}_d$). In order to integrate the size of the company in the evaluation of the annual surplus the particular annual profit (x) or industry average ($\overline{x}$) is due to be standardised by dividing by the number of members n resp. $\overline{n}$. Furthermore, in order to consider the relevance of a product for the cooperative the benefit rate (price difference) for the goods purchased by the members ($p_s - \overline{p}_s$) resp. for goods sold to members ($\overline{p}_d - p_d$) is due to be weighted compared to the quantity of sales resp. to quantity of procurement of the cooperative. For this, the payment function

$$w = f + \alpha \left(\frac{x}{n} - \frac{\overline{x}}{\overline{n}} \right) + \beta \sum_{s=1}^{S} \left(p_s - \overline{p}_s \right) + \lambda \sum_{d=1}^{D} \left(\overline{p}_d - p_d \right)$$

with the fix payment f, the premium rate α as basis for measuring the annual amount difference, the premium rate β as basis for measuring the purchase benefit rate and the premium rate λ as basis for measuring the sales benefit rate can be used. Thus, all dimensions of the monetary member promotion can be evaluated and used for the incentive-oriented compensation of the management. This will be demonstrated in section 5.

5 Basic notation and model structure

5.1. *Actions, preferences and compensation schemes*

We consider two cooperatives j ($j \in 1, 2$) to be in competition on a Cournot market. Each cooperative has $n \in \mathbb{N}$ upstream members and a risk neutral CEO (agent). At point of time $t = 4$ the CEOs choose their efforts $a_j \in \Re_+$ to increase the cooperative´s value, at $t = 3$ on their production quantities $Q_j \geq 0$ and at $t = 2$ they decide on the wholesale price p_j^M for the product of the cooperatives´ members. The members (principals) decide at $t = 1$ about the compensation scheme for the CEO.
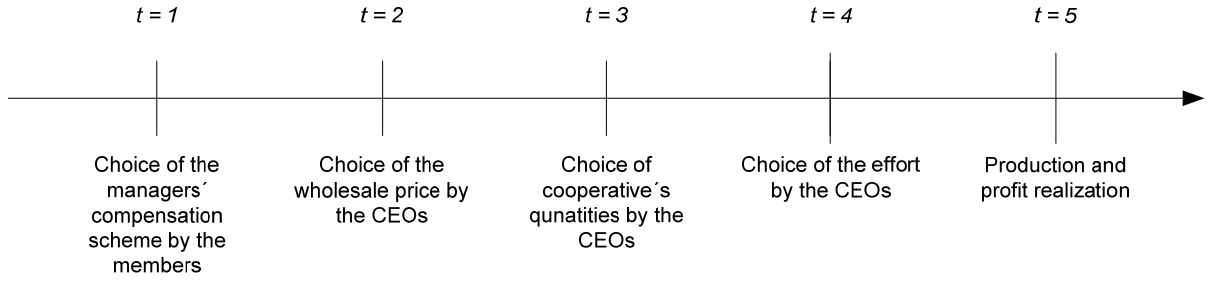
Figure 3: Time bar

The members produce a pre-product which is processed and sold on the downstream-market by the cooperative. An overview about the supply-chain gives Figure 4:
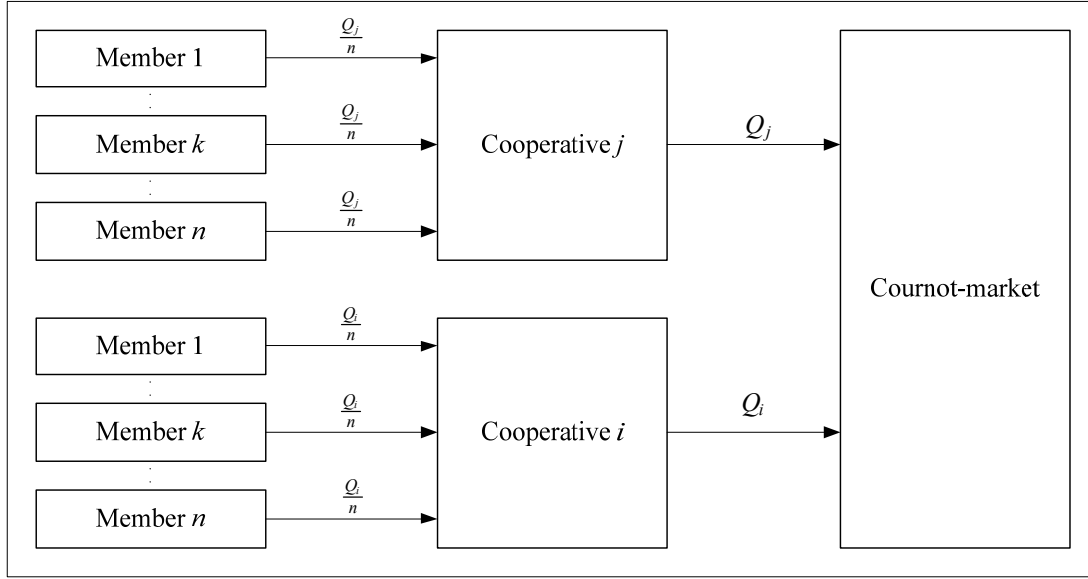

Figure 4: Supply chain

The CEOs´ personal cost of effort is assumed to be:

$$\kappa_j(a_j) = \frac{a_j^2}{2} \tag{1}$$

At $t = 5$ the cooperative´s profit x_j is disclosed. x_j is the sum of the cooperative market payoff π_j^M and the payoff of the CEO´s effort π_j^C.

$$x_j = \pi_j^C(a_j) + \pi_j^M(p_j^M, Q_j) + \varepsilon_j \tag{2}$$

with $\pi_j^C(a_j) = b \cdot a_j$, where $b > 0$ is the CEOs´ productivity. We assume that a CEO can reduce the fixed cost of his cooperative. The market payoff

$$\pi_j^M(p_j^M, Q_j) = (p_j^G(Q_j, Q_i) - p_j^M)Q_j = \left(m - \frac{Q_j}{2} - \frac{Q_i}{2} - p_j^M\right)Q_j, \quad j, i = 1, 2, \ j \neq i \tag{3}$$

is a function of the retail price p_j^G of the Cournot market, the wholesale price per unit p_j^M and the production quantity Q_j. We assume that the CEO can only choose between two prices (a high price $\overline{p}_j^M$ and a low price $\underline{p}_j^M$) for the members´ product p_j^M ($p_j^M \in \overline{p}_j^M, \underline{p}_j^M$).

The high price is as high as the half theoretical maximal price ($\bar{p}_j^M = \frac{1}{2} m$) and low price is a quarter of the high price ($\underline{p}_j^M = \frac{1}{4} \bar{p}_j^M$).

We assume that the members cannot reflect the effort of the agent because the cooperative´s profit x_j is uncertain with ε_j. ε_j is a noise term, which is assumed to be normally distributed with $\varepsilon_j \in N(0, \sigma^2)$ and may reflect uncontrollable firm-specific events. There is no correlation between the noise terms of the two cooperatives.

The agents get a compensation w_j which is given by

$$w_j^S = f_j^S + v_j^S \qquad j = 1, 2, \ S \in RP, PO, RE \tag{4}$$

where f_j is the fixed wage and v_j is a variable parameters to control the agent´s decisions. We compare three scenarios based on different types of compensation, a wage based on the relative performance (RP), a wage based on the cooperatives´ profits (PO) and a wage based on the cooperatives´ revenues (RE). We assume

$$v_j^{RP} = \frac{1}{n}(x_j - x_i) + \frac{2}{n}\left(p_j^M - p_i^M\right) \cdot Q_j \ , j = 1, 2, \qquad j \neq i \tag{5}$$

for the wage based on the relative performance. This compensation scheme should increase the effort of the CEO, save the market performance of the cooperative and lead to a high wholesale price to increase the member value.

We compare this scenario with two others in which the cooperatives make use of other compensation schemes. In the second scenario both cooperatives use

$$v_j^{PO} = \frac{1}{n}(x_j) \ , j = 1, 2 \tag{6}$$

for the CEOs´ compensation which is inspired by traditional payment schemes for investor owned firms. The third scenario is inspired by remuneration practices used in cooperatives and depends on the revenues of the co-ops:

$$v_j^{RE} = \frac{1}{n} p_j^M \cdot Q_j \qquad , j = 1, 2 \tag{7}$$

Based on the CEO´s preferences which are represented by the following utility function with

$$u_j = E\left[w_j\right] - \kappa_j(a_j), \qquad j = 1, 2 \tag{8}$$

the CEOs maximize their utility. A CEO has an outside option with a reservation wage and for the participation of the agent his utility must be bigger or equal his reservation wage. We assume that the wage is scaled to zero and so

$$u_j \geq 0.$$

The risk neutral members decide on the quantities and the compensation scheme for the CEO. A member maximizes the expected value of his payoff

$$\prod_k = E\left[\frac{x_j - w_j}{n} \middle| f_j, v_j, a_j, p_j^M, Q_j, Q_i\right] + \pi_k\left(p_j^M, Q_j\right), \quad k = 1, ..., n \text{ and } j = 1, 2, j \neq i \tag{9}$$

with his payoff as a cooperative member minus the compensation payment for the CEO and the payoff of his production activities

$$\pi_k\left(p_j^M, Q_j\right) = \left(p_j^M - c\right)\frac{Q_j}{n}, \qquad k = 1, ..., n \text{ and } j = 1, 2, j \neq i \tag{10}$$

where p_j^M is the price which pays the cooperative for the product and c the variable costs per unit. In the following section we solve the model with respect to the three compensation schemes.

Table 2: Compensation schemes

Scenario	CEO compensation
1 (RE)	$w_j^{RE} = f_j^{RE} + \dfrac{1}{n} p_j^M \cdot Q_j \qquad , j = 1, 2$
2 (PO)	$w_j^{PO} = f_j^{PO} + \dfrac{1}{n}\left(x_j\right) \qquad , j = 1, 2$
3 (RP)	$w_j^{RP} = f_j^{RP} + \dfrac{1}{n}\left(x_j - x_i\right) + \dfrac{2}{n}\left(p_j^M - p_i^M\right) \cdot Q_j \qquad , j = 1, 2, \qquad j \neq i$

5.2. Revenue Based Wage

In the context of scenario 1 the managers get for their employment in the cooperative a compensation-scheme based on the revenue of their company. Based on the principle of backward induction, it is necessary to identify the optimal effort level in $t = 4$ with respect to the utility functions of the managers first:

$$a_j \in \arg\max\left\{u_j \middle| a_j \in R_+\right\} = 0 \tag{11}$$

The optimal effort of the manager in this scenario is zero. This result is not surprising under the assumption of a utility-maximizing individual because the CEO cannot pull out a benefit of his effort. Instead, each unit of effort increases his personal cost of effort and reduces his utility. With respect to previous decisions the managers decide on the cooperatives` production quantities in $t = 3$. This leads in the following reaction functions:

$$Q_j \in \arg\max\left\{u_j \middle| Q_j \in R_+\right\} = m - \frac{Q_i}{2}, \qquad j = 1, 2, \qquad j \neq i \tag{12}$$

The resulting quantities in the equilibrium are:

$$Q_j^{RE} = \frac{2}{3}m \qquad , j = 1, 2, \qquad j \neq i \tag{13}$$

In $t = 2$ the managers should decide about the wholesale price per unit p_j^M. But in this scenario the retail price does not have an effect on the business success of the members because they split the whole cooperative´s profit among themselves and pay the managers a benefit only on the revenue. Furthermore, the compensation and benefits of the manager are independent of the retail price, making the choice of the appropriate price irrelevant to all concerned within the permissible limits. Therefore, in this scenario we waive on the election, because only the cooperative profit depends on it.

With respect to the choices in $t = 3$ and $t = 4$ the members decide about the fixed wage f_1 of the CEO:

$$f_j^{RE} \in \arg\max\left\{\Pi_k \middle| u_j = 0, f_j^{RE} \in R\right\} = -\frac{2}{9n}m^2 \tag{14}$$

The members only pay the CEO his reservation utility, which is defined as zero and so they choose a negative fixed wage.

Decisions on the use of labor and the sales volume lead to the following results:

Table 3: Results of the revenue wage

Actor	Dimension	Value
CEO	Wage	0
Cooperative	Quantity	$\dfrac{2}{3}m$
Members	Payoff	$\dfrac{2}{9n}m(m-3c)$
Supply-Chain	Profit	$\dfrac{2}{9}m(m-3c)$

5.3 Compensation based on the cooperative's profit

The managers now receive in addition to the fixed component a variable component based on their cooperative profit. Thus, the optimal effort in $t = 4$ does not only depend on his personal cost of effort but also of its payment w_j^{PO} and indirectly by the cooperative profit:

$$a_j \in \arg\max\{u_j \,|\, a_j \in R_+\} = \frac{b}{n} \tag{15}$$

The optimal effort level depends on the productivity of the CEOs because an increasing productivity caused a higher return on a work unit. Their work level also decreases by the number of members which results from the variable parameter $\frac{1}{n}(x_j)$ of the compensation scheme.

Based on the anticipated decision of the managers they make at $t = 3$ the choice of sales quantities:

$$Q_j \in \arg\max\{u_j \,|\, Q_j \in R_+\} = m - p_j^M - \frac{Qi}{2}, \qquad j = 1,2, \qquad j \neq i \tag{16}$$

It may be noted that the wholesale prices have now a negative impact on sales quantity of the cooperatives and influence the other decisions.

The members pay the managers a share of the cooperative's profit as compensation and thus the whole profit is not divided among them. So the wholesale prices represent costs for managers which have a negative impact on their sales quantity. This results in lower equilibrium quantities:

$$Q_j^{PO} = \frac{2}{3}\left(m - 2p_j^M + p_i^M\right) \qquad , j = 1,2, \qquad j \neq i \tag{17}$$

Based on these decisions the managers decide on the wholesale prices. The first derivative is always less than zero:

$$\frac{\partial u_j}{\partial p_j^M} = -\frac{8\left(m - 2p_j^M + p_i^M\right)}{9n} < 0 \qquad , j = 1,2, \qquad j \neq i \tag{18}$$

So a higher wholesale price will decrease the utility function of the managers. That is why both CEOs select the low price for the members´ product:

$$p_j^M = \underline{p}_j^M \qquad , j = 1,2, \qquad j \neq i \tag{19}$$

To reduce the compensation of the manager towards his outside option, the members decide about the fixed component of the wage:

$$f_j^{PO} \in \arg\max\left\{\Pi_k \middle| u_j = 0, f_j^{PO} \in R\right\} = -\frac{b^2}{2n^2} - \frac{2(m - \underline{p}_j^M)^2}{9n} \tag{20}$$

Based on the decisions taken Table 4 demonstrates the results of the model:

Table 4: Results of the Compensation based on the cooperatives' profit

Actor	Dimension	Value
CEO	Wage	$\dfrac{b^2}{2n^2}$
Cooperative	Quantity	$\dfrac{2}{3}\left(m - \underline{p}_j^M\right)$
Members	Payoff	$\dfrac{2(m - \underline{p}_j^M)(m + 2\underline{p}_j^M - 3c)^2}{9n} + \dfrac{b^2(2n-1)}{2n^3}$
Supply-Chain	Profit	$\dfrac{2(m - \underline{p}_j^M)(m + 2\underline{p}_j^M - 3c)^2}{9} + \dfrac{b^2(2n-1)}{2n^2}$

5.4 Compensation based on Relative Performance

In scenario 3 the compensation of the managers is based on the relative performance between the two cooperatives which will ensure the funding order. The managers should be influenced when choosing the retail price by the opportunities of benefit of the members. Taking into account the payment system w_j^{RP}, the managers choose their effort $t = 4$:

$$a_j \in \arg\max\left\{u_j \middle| a_j \in R_+\right\} = \frac{b}{n} \tag{21}$$

It is clear that the labor input in scenario 2 and scenario 3 is identical. The relative performance compensation system thus ensures the same extent of effort of the managers. But there is a different choice of the managers deciding on sales quantities in contrast to the previous scenario which leads directly to the following equilibrium:

$$Q_j^{RP} \in \arg\max\left\{u_j \middle| Q_j \in R_+\right\} = m + p_j^M - 2p_i^M, \qquad j = 1,2, \qquad j \neq i \tag{22}$$

The choice of each CEO is now independent of the competitor sales volume and smaller as in the other two scenarios. Based on those decisions the managers select the wholesale prices. The first derivative is always larger than zero:

$$\frac{\partial u_j}{\partial p_j^M} = \frac{m + 5p_j^M - 6p_i^M}{n} > 0 \qquad , j = 1,2, \qquad j \neq i \tag{23}$$

A higher wholesale price will increase the utility function of the managers. That is why both CEOs select the high price for the members´ product:

$$p_j^M = \overline{p}_j^M \qquad , j = 1,2, \qquad j \neq i \tag{24}$$

To reduce the compensation of the manager towards his outside option the members decide about the fixed component of the wage:

$$f_j^{PO} \in \arg\max\left\{\Pi_k \middle| u_j = 0, f_j^{PO} \in R\right\} = \frac{b^2}{2n^2} \tag{25}$$

Based on the decisions taken Table5 demonstrates the results of the modeling:

Table 5: Results of the Compensation based on relative performance

Actor	Dimension	Value
CEO	Wage	$\dfrac{b^2}{2n^2}$
Cooperative	Quantity	$\dfrac{1}{2}m$
Members	Payoff	$\dfrac{(m-\overline{p}_j^M)(\overline{p}_j^M-c)}{n}+\dfrac{b^2(2n-1)}{2n^3}$
Supply-Chain	Profit	$\dfrac{(m-\overline{p}_j^M)(\overline{p}_j^M-c)}{n}+\dfrac{b^2(2n-1)}{2n^3}$

5.5   Discussion

The three compensation systems can influence the CEOs in three different ways: The incentive for effort to reduce the cooperative´s fixed costs, the incentive to increase the member-value by the wholesale price and the quantity decision which leads in the market-behavior of the cooperative.

The RE and PO compensation schemes influence the effort of the CEOs positively because in both schemes a higher cooperatives´ profit is increasing the wage of the CEOs. That is why the managers choose a positive effort-level and so both compensation schemes are preferable compared to the other system in this point because the effort in RE is zero. In both the RE and the PO scenario the effort-levels are identically.

This part of the cooperatives´ profit increases the members´ profit as well as a higher wholesale price in PO and RP: Because the managers get a part of the profit in both schemes the members do not get the whole cooperatives´ profit. So a higher wholesale price reduces the part of the company's profit and the members get directly the benefit. The managers choose in RP the higher price and therefore this system is preferable to them compared to the PO. Under the assumption that in reality a company can never give the whole profit to its owners, the system based on relative performance should increase the members´ value and also dominate the revenue based system.

Comparing the quantity-decisions of the three scenarios it is possible to identify a strategic aspect of the compensation schemes. One can identify three different equilibria which lead to alternative cooperatives´ market payoffs. This is a result of the reaction functions which are illustrated in the following figure:
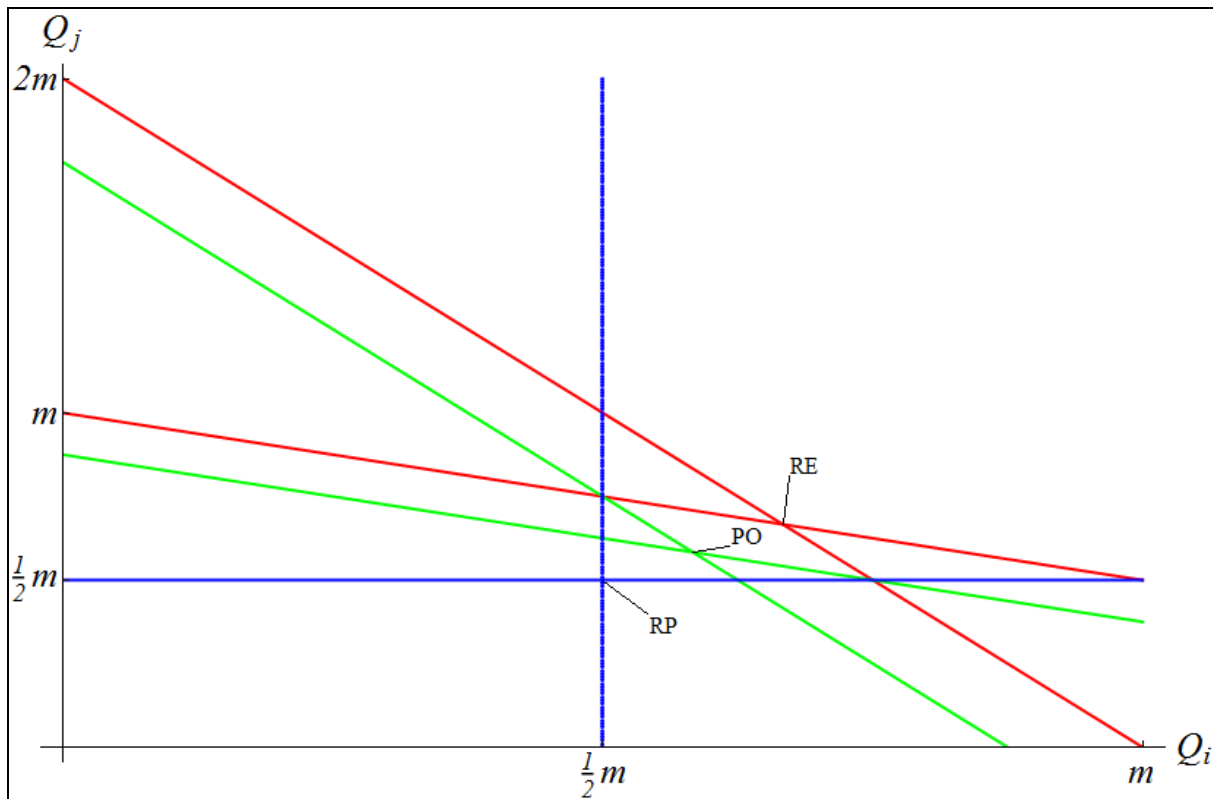
Figure 5: Reaction functions of the scenarios

In a Cournot competition a less aggressive market behavior increases the company's profit. A high output level decreases the price at the downstream-market and the revenue based compensation (RE) results in an aggressive market behavior of the managers. The profit based compensation (PO) reduces the fierce competition and both companies can benefit from the use of payment system. The best market result is determined by the relative performance compensation (RP). Using the high wholesale price for the member's product has a negative impact on the quantity decision. But this increases the cooperatives´ profit and so the members can benefit from the relative performance compensation scheme. To summarize the facts: the relative performance payment system dominates the other two in all aspects. See for an overview the following table:

Table 6: Results of the compensation based on relative performance

Compensation	Incentive for effort	Member-Value	Market-Strategy
RE	-	0	-
PO	+	-	+
RP	+	+	++

The second best option is a compensation based on cooperative´s profit. The compensation based on the cooperative´s revenue which is recommended by the practice is the poorest option. The following figure gives an overview about the members´ profit with respect to managers´ productivity:
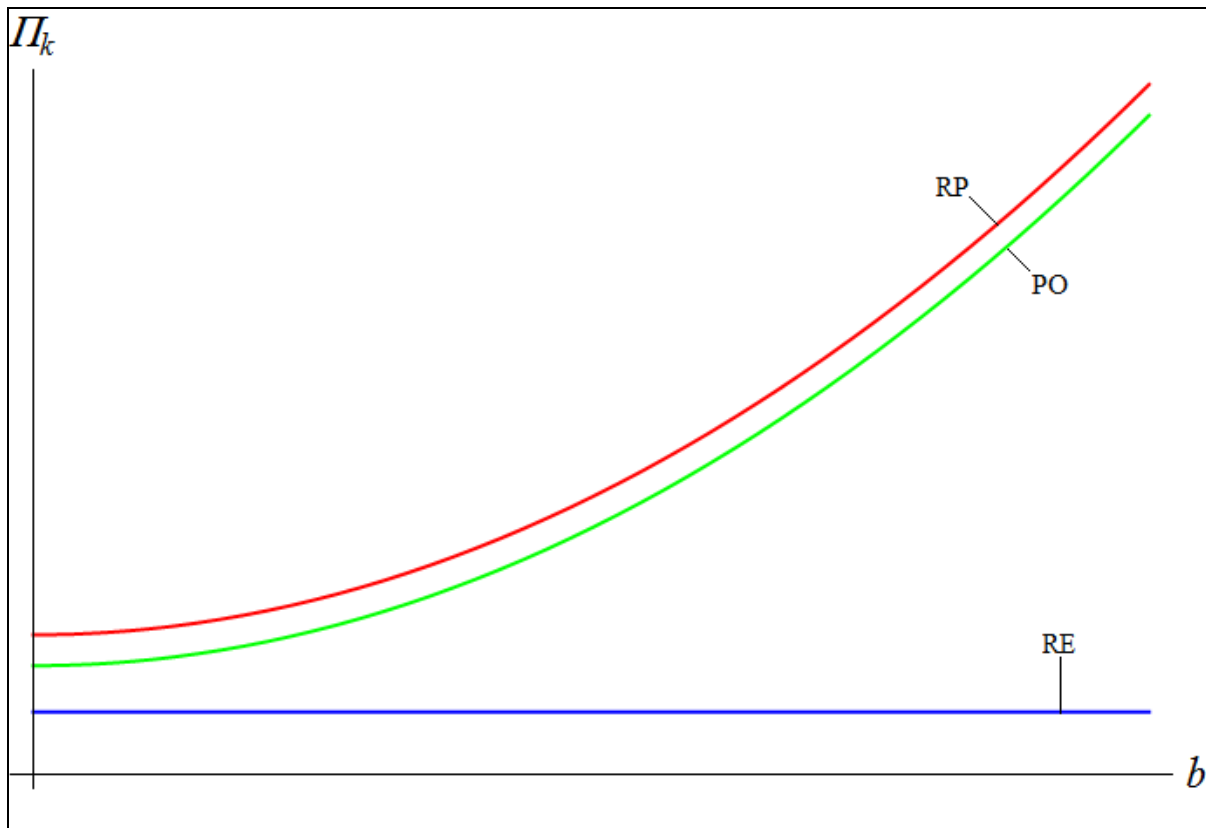
Figure 6: Reaction functions of the scenarios

The figure shows that the difference between RE and the two other systems which increase with the CEOs´ productivities. With the model-theoretic analysis we have shown that under the assumptions of the model the relative performance evaluation dominates the other payment-systems and so it could be a good option for cooperative´s business practice.

6 Summary and Outlook

According to the empirical analyses of compensation systems in cooperatives regarding advantages of an incentive-oriented payment it could be shown that there are existing deficiencies in the cooperative research agenda. This paper contributes to close the existing gap. In order to take the characteristics and the commitment of the cooperative legal form into account the relative performance payment as payment instrument for cooperatives was considered. The main advantages of the instrument were analysed and the general transferablity to the cooperative corporate practice was considered. As a major result it can be stated, that by a relative performance measurement all monetary promotion dimensions of a cooperative can be identified and a relative performance compensation can basically be used as payment instrument for the management. The existing cooperative network structures enable a practical realisation of the instrument, so that the members of the cooperatives might sustainably benefit from the adoption of this system.

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