CEO Compensation
in Cooperatives versus Publicly Listed Firms

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Abstract

A multiple activities principal-agent model regarding CEO compensation in cooperatives is presented, capturing that cooperatives are not publicly listed and that they have to bring the enterprise to value as well as to serve member interests. A cooperative dominates a publicly listed firm in terms of efficiency when either activities are sufficiently complementary, or additional information is considered in the performance measure.

Keywords: Compensation, performance measurement, cooperatives.

Few factors are more important for a cooperative's success than the manager.

Trechter et al, 1997

1 Introduction

Since the last decade, CEO compensation has received tremendous attention in both the business and academic community. The large number of high-publicity scandals, the enormous salaries paid to CEOs, and their celebrity status have created unprecedented public interests in corporate governance (Weisbach, 2007). Inasmuch as the agency approach captures the inherent divergence between the interests of the firm's investors and the professional management (Bebchuk and Fried, 2003), CEO compensation is often cited as a real-world example of a principal–agent problem. A partial solution to this problem is to utilize an incentive contract designed to pay the agent more when he performs better. The incentive contract is based on a performance measurement system, creating incentives that align the goal of the agent with that of the organization.

A substantial amount of research has focused on how executive compensation schemes can help rectify the agency problem in IOFs (Investor Oriented Firms), especially publicly listed companies, whereas the CEO compensation in other governance structures, for example cooperatives, has received hardly attention. This can be justified to a certain extent because the members-CEO relationship in cooperatives is similar to the investors-CEO relationship in IOFs. Traditionally, the cooperative board of directors, democratically chosen by and from the membership, was the main body governing the activities and investments of the cooperative firm (Bijman, Hendrikse & van Oijen, 2008). As the cooperative grows, the tasks facing the cooperative management call for strategies or judgment far beyond the experience and competence of most members, professional qualified management is hired to operate the firm. As a result, the members exercise their authority mainly by critically following the policies of the management, rather than by giving it directions (Trifon, 1961). Members would like to maximize their benefits derived from the cooperatives, while the management is likely to pursue objectives of organizational growth maximization, subject to continuity and employment security (Vitaliano, 1983). This is similar in an IOF.

Despite of the similarities, the situation in cooperatives is more complex than a standard principal-agent relationship. First, there is a group of principals whose interests differ. The variety of members embodies aspects like their sizes, locations, risk aversion, attitudes towards innovation, growth potential, member involvement, and financial contributions to the cooperative. Due to the heterogeneity, the cooperative does not have one locus for profit maximization but a separate locus for each member, giving rise to a host of problems that attend collective choice (Staatz, 1987). Problems are manifested in debates not only about pricing, financing and pooling policies, but also in the difficulty to achieve consensus regarding specific performance targets (Hueth & Marcoul, 2008). When colliding interests exist among principals, the agent's tasks involve devising workable compromises and acting as a neutral guardian of everybody's priorities (Trifon, 1961).

Secondly, the tasks of CEO is not one-dimensional because of "a cooperative's goal of jointly maximizing member and cooperative returns" (Peterson & Anderson, 1996, p376). Members are users in addition to owners of the firm. They have at least two sets of concerns: owner concerns and user concerns. Owner concerns revolve around the security and overall profitability of their investments in the cooperative. User concerns include issues of the pricing and quality of product and services, which influence the profitability of their individual farm enterprise (Staatz, 1987). These two concerns are reflected in the members' expectation regarding the management.

Thirdly, there are no simple indicators of cooperative managerial performance and automatic incentive systems (such as stock options) to close the gap in interests. Giving the CEO equity in the business, a common way to tie the CEO's wealth to firm performance and thus to alleviate the principal-agent interests conflict in IOFs, is not feasible. The reason is that a cooperative CEO is not eligible to hold equity in the business and receives only limited benefits from such ownership given the fact that most cooperative stock does not appreciate in value (Trechter et al, 1997).

It is difficult to assess the top manager's contributions to a company due to the complexity of his tasks (Blanchard et al, 1996). Given those additional complexities in cooperatives, designing a contract ensuring the cooperative's goals and the CEO's incentives are mutually compatible has to be even more difficult. Besides the easily measurable index stock price or ROI (Return on Investment), more dimensions of the CEO's outputs concern the members and require efforts from him. Some researchers point an accusatory finger at the efficiency of cooperatives and argue that cooperatives suffer from a host of problems unique to this specific form of governance, including the horizon problem that pushes the cooperative to pursue short-term benefits at the expense of long-term earnings. Stewart (1993, p291) even asserts that a business cannot be successfully run if its customers or suppliers are deeply involved in running it because there is too much conflict of interest. Yet, cooperatives and IOFs coexist in many sectors of most modern economies and compete for market share, especially in the agricultural sector where cooperatives have played an active role for a very long time in many countries. We aim to answer in the current paper the following question: How is the cooperative CEO compensation determined by the special features of its governance structure?

One way to position the article in terms of the principal-agent model is that it is in line with the current theoretical developments. The classic principal-agent model highlights the trade-off between the incentives (regarding one task) and risk. One development has been that nowadays a trade-off is considered between the incentives intensity and the allocation of attention among various activities. The other development is that repeated principal-agent relationships are considered. This paper is to be positioned along the first development as we consider a model where the agent allocates his attention over upstream and downstream activities. Another way of positioning is that most studies regarding contract choice in agrarian economies using the principal-agent model are geared to the relationship between a landowner and a farmer (Hayami and Otsuka, 1993). We address the relationship between farmers and the CEO of a cooperative. Finally, a

variety of corporate forms has to be considered when studying the nature of the firm. A cooperative is an informative counterfactual for the much studied publicly-listed corporation (Hansmann, 1996).

This article is organized as follows. Section 2 distinguishes cooperatives from IOFs. Section 3 uses a multi-task principal-agent model to characterize CEO compensation schemes in cooperatives and IOFs. Section 4 formulates various extensions. Section 5 provides a number of empirical implications. Finally, section 5 concludes.

2 Cooperatives versus publicly listed firms

This section compares cooperatives with publicly listed firms regarding various aspects: organizational objectives (i.e., member value in cooperatives), CEO activities, and governance structure.

2.1 Member value

Members join a cooperative to achieve certain commercial and social objectives (LeVay, 1983; Barton, 1989). The German council of cooperatives (DGRV, 2008) specifies that a cooperative has to serve joint economic, social, and cultural interests.[1] Members are owners as well as users. As the owners and investors, they want to bring the downstream stage of production to value in order to receive dividends. As input suppliers, they derive benefits from their transaction relationship with the cooperative firm. Therefore, the members are concerned with both the value added at the cooperative firm and at their own farm enterprises, and want to motivate their CEO to bring the outputs at both stages jointly to maximum value. They care not only about the financial performance of the cooperative in the same way as the investors of an IOF, but also about the impact of the cooperative on their own farm portfolios, their positions in social structure, community development, and so on. "Because of its goal to maximize value to members, a cooperative will consider its members' farm asset returns and not just its own." For example, "when the losses at the member level from abandoning the market exceed the cooperative's loss from staying in the market, then it is a rational decision for the cooperative to stay" (Peterson & Anderson, 1996, p375). Thirkell (1993, p279) argues that the use of organizational profit for measuring performance in a cooperative is not only unnecessary but also often downright misleading. If the objective is member benefit rather than financial performance of members' investment in the cooperative, then it is member benefit that should be measured, not the co-operative's conventional corporate performance. Simply examining traditional financial statement data will not be adequate (Peterson & Anderson, 1996, p376). In accordance with Hind (1997) who distinguishes corporate-oriented aspirations and member-centered goals, we categorize member value into value added at the cooperative firm and value added to the farm enterprises.

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[1] 'Allgemeines Ziel von Genossenschaften ist, gemeinsame wirtschaftliche, soziale und kulturelle Bedürfnisse zu Befriedigen' (DGRV, 2008).

Value added at the cooperative firm[2]
The financial performance of the cooperative concerns its members since they are the residual claimants. The net income of a cooperative is distributed to its members in the form of patronage refunds. On this aspect, members are happy with the cooperative's and CEO's performance in the same sense investors in an IOF are happy with their firm's performance (Staatz, 1987). They count the cooperative's financial performance on various aspects: revenues, total assets, sales, local net income, local returns on assets, local net margin, accounts receivable, ROI, production volume, or its performance relative to neighboring enterprises.

Moreover, the flow of information between patrons and the firm may be better in cooperatives than in IOFs, leading cooperatives to be more responsive to members' needs or to better product specifications. A cooperative usually has a patron list and collects a substantial amount of information about member's preference, needs, production practices, and advice about products and services through periodic member surveys. The members may be more willing to provide higher quality, more frequent, and more truthful information to the cooperative than they would to an IOF (Cook, 1994) because as owners they are more assured that the cooperative would not use the information to act opportunistically toward them (Staatz, 1987). Another reason lies in the fact that "exit" is a more expensive option for cooperative members than the patrons of IOFs (Cook, 1994). Furthermore, an IOF CEO is usually in a position of strong control over both setting and implementing company policies, while in cooperatives, the board of directors, as representatives of members, are significantly more independent and would go a long way towards monitoring the CEO. They do not feel beholden to question management decisions and to reject its recommendations (USDA, 2002, p11).

Value added to the upstream farms and their owners
Staatz (1987) observes that members are vitally interested in the cooperative's pricing of goods and services, not simply in its overall financial performance. Being users, they are able to exert a higher influence on the operation and management of the firm than the investors of an IOF, and consequently can receive more favorable prices. Members benefit from the cooperative also in terms of product quality and other technical aspects of products and services, which affect the profitability of their individual farm enterprise. For instance, when an individual farmer cannot afford to do consumer research related to characteristics of farm commodities, it might be feasible for a large cooperative to do such research. An investor-owned marketing agency has little incentive to do it because it cannot capture the benefits that accrue to farmers (Shaffer, 1987). In some cases, cooperatives provide special services, particularly technical assistance, to members, seeing the technician's role as one of education and advice as well as service. Moreover, the changes in cooperative profits can offset changes in member profits over expected market cycles. "The stability to member returns would arise because variations in member market prices are cancelled out by profit gains or loss at the cooperative level" (Peterson & Anderson, 1996, p376). Peterson & Anderson (1996) report evidence that

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[2] The value added at the downstream cooperative firm is similar to the "owner value" defined by Staatz (1987).

some cooperatives take a conservative strategy by "saving" returns in good economic times for "payout" in poor economic times. Next to that, cooperatives also prove to be an assured source of supplies (Barton, 1989) and a reliable "home" for farm produce, reducing risk to members (Lang, 1994). Members' value as users is also reflected in the cooperative's diversification behavior. A cooperative never abandons the activities concerning the majority of its members. Farmer cooperatives concentrate their investments in agribusinesss and their assets are closely tied to the assets of their members as the members might suffer substantial capital losses if their farming activities were not adequately supported. In addition to the vertical information exchange that benefit the cooperative firm, cooperatives also create a territorially based forum for information exchange (LeVay, 1983) where members can more easily communicate among each other. Shared information about safe pest control and other environmental concerns is a prime example (Peterson & Anderson, 1996, p376).

It has long been recognized that value added to the upstream farms is likely to attract more attention from the members. "The income that a stockholder derives from an IOF depends on the firm's 'bottom line', but the income of a cooperative's stockholder often depends more on the prices of the individual goods and services purchased from the cooperative than on the organization's overall profitability" (Staatz, 1987). There are various possible explanations for the dominance of user value in the perception of members. On the one hand, the limitation on dividend payments and the members' inability to capture capital gains in a cooperative may account for member's preference to direct benefits in the form of transfer prices (Staatz, 1987). On the other hand, the frequency of transactions may play a role. Cooperative members are users on an almost daily basis, while owner-investors are only several times a year (tax day, equity redemption day, dividend day). This frequent-use interface relative to the investor interface reinforces a constant message that price and quality of the cooperative's services and goods affect the members' bottom line, which is more important (in the short run and for the individual member) than the bottom line of the cooperative (Cook, 1994).

Furthermore, members derive social value from being "a member of an association". Although members join the cooperative primarily for economic reasons, they pursue some noneconomic objectives as well. "Benefits of social value include all noneconomic results or outcomes of major interest or importance to stakeholders, including the satisfaction many of them experience through the association, unity, and involvement characteristics of member-controlled organizations. Some members like being involved with others to achieve a common purpose. Some members also like electing or serving as directors" (Barton 1989, p7). Members' social value takes various forms. First, the fact of membership and the possibility of holding directorial office yield satisfaction, particularly for farmers who could not have contemplated running single-handed an extra business next to their farms but feel more secure in a shared corporate undertaking (LeVay, 1983). The pride and sense of responsibility associated with business ownership is appreciated (Key and Roberts, 2009). Second, identity preservation can be a source of member value (Lang, 1994). Identity influences economic choices and outcomes, accounting for many phenomena that go beyond a standard economic explanation.

Cooperative members have a different orientation in life than IOF shareholders. The social values shared by them constitute the cooperative ideology. Forming a community of cooperative members may appear to be a way of bolstering a sense of self or salving a diminished self-image (Akerlof and Kranton, 2000). The result is that members feel more cheerful, more confident and stronger, both in the market and in the society. Third, cooperation is known to appeal to people not merely as a means of running a business but also as an instrument of social amelioration (LeVay, 1983). Human beings have a strong need to belong, either to a society or to a profession. Through various socialization processes like member training programs and member relations programs, members work together, learn together, celebrate together, and share their experiences together, generalizing "feelings of family" to the entire membership.

2.2 CEO activities

A CEO's tasks include setting long-term goals, establishing policies and standards, determining long-term financing needs and sources, and setting strategies (Blanchard et al, 1996). According to Merchant (1990), CEOs allocates their time over eight categories of activities: 1) new product development, 2) improvement of existing products/services, 3) adjusting/improving production processes, 4) employee development, 5) capacity expansion, 6) improvement of information systems, 7) execution of current production processes, and 8) advertising and sales promotion. Of these eight categories, we classify 1 through 6 as actions attempting to build long term firm value, and categories 7 and 8 as actions aiming at short term gains.

In addition to the activities mentioned above, a cooperative CEO needs to take actions that create value for the upstream members because of the user-owner feature of cooperatives. Three extra categories are specified:

9) Improvement of member involvement and member loyalty
Compared with his IOF counterpart, the cooperative CEO is more interdependent and interactive when coping with the user-owners. As a leader of a community-based organization, he needs to be particularly effective in fostering group cohesiveness, a key component in improving member loyalty.

10) Vertical information exchange
A cooperative CEO once informed us that he spent at least half of his time communicating with member patrons. Members have different preferences as to price, cost allocation, and equity retirement polices, which affect both the cooperative and the member enterprises. They have more formal and informal channels to communicate their desires to the CEO than do patrons of an IOF and thus are able to exercise cheaper "voice" (Staatz, 1987). Meanwhile, a cooperative CEO must actively acquire useful information in discovering the optimal choice (Cook, 1994).

11) Member coordination and improvement of member relations
A cooperative CEO takes a more integrated view of the members' fixed costs when attempting to optimize the vaguely defined objective function of the firm. The more

heterogeneous the membership, the more will be the difficulty for the CEO to form consensus and viable internal coalitions. The CEOs, particularly those of large, diversified cooperatives, need to spend considerable time and effort in negotiating and meeting the expectation of members. They are required to reduce the increasingly heterogeneous interests to more homogeneous interests to capture the benefits of coordination (Cook, 1994).

2.3 Governance

Most public-listed firms mitigate principal-agent conflicts through offering the CEO incentive contracts that link pay to performance, whereas the complexity in measuring cooperative performance often creates vagueness and lack of clarity in the eyes of members (Cook, 1994). Designing and implementing an optimal incentive contract for cooperative CEOs is therefore most likely different from the contract of an CEO of an IOF.

First of all, the 'plethora of objectives' of members who differ in various aspects makes the identification of the cooperative's objective function one of the CEO's most challenging tasks (Cook, 1994). Yamay (1950) realizes that "the manager of a capitalist enterprise knows what it should try to maximize and for whom, the management of a co-operative society has a choice of what it should try to maximize (or minimize) and for whom". The shareholders of an IOF may be a diverse group as well, but capital markets with a sufficiently rich menu of assets align their interests (Dixit, 1997). They are mostly interested in the appreciation of their shares whereas the value of input suppliers is not included in the value maximization of an IOF. In a cooperative, as membership grows more heterogeneous, different groups within the organization pressure management to respond to their particular interests. Because of the broader, more diffuse scope of optimization in a cooperative (Staatz, 1987), single indicators such as ROI are less meaningful as measures of organizational and managerial performance (Cook, 1994). Consequently, evaluating whether a cooperative is achieving its objectives is far more complex and delicate an undertaking than comparing ROI for IOF performance.

Secondly, there is no objective third-party indicator (besides members and the CEO) such as secondary markets for cooperative stock to evaluate performance (Cook, 1994). Investors of IOFs want to receive the highest possible return on their investment, and this return can be expressed in the stock price. In other words, an IOF CEO's contribution to firm value is equivalent to the change in the shareholders' wealth through appreciation of the stock. Fluctuation in the stock price serves as an influential disciplining mechanism on management, indicating the extent to which the stockholders are content with current managerial policies. Many firms reinforce the potency by offering stock options to CEOs, making their earnings contingent on the stock's value.

Cooperatives lack this external mechanism for disciplining management. There is no public financial assessment of the performance of the cooperative and therefore of its CEO. Even though members are radically concerned with the prices the cooperative pays for the goods from members or it charges for its services, the prices cannot be used as the

sole performance measure, otherwise the CEO may be induced to decapitalize the firm in an attempt to increase his current earning, simply reinforcing the horizon problem (Staatz, 1987). According to Hind (1997), as time progresses and the cooperative ages, the issues of member service benefit would not be the sole goal of the business but that corporate-oriented objectives would become increasingly important. However, market requirements that best serve profitability goals of an IOF may not directly serve the immediate interests of all cooperative members due to member heterogeneity. If a pure market-driven approach is taken, members with less marketable inputs may not, compared to other members, feel their needs are well met (Lang, 1994).

Cooperatives will look therefore for alternative measure to stock price so as to evaluate how the corporate-oriented objectives are fulfilled. Accounting return measures are one of the options. They have advantages as well as disadvantages compared to stock prices. One might argue when accounting measures are used, temporary losses might be allowed to establish sustainable future gains, as the lack of a stock listing makes temporary losses less visible (Hendrikse and Veerman, 2001). However, accounting measures are often criticized for inducing costly myopic behavior. They are aggregated and summarized, and provide little indication of actions taken (Fisher, 1992). Managers can use the possibility for manipulation provided by the latitude in accounting principles to maximize compensation (Libby et al, 2002). Subsequently, any myopic actions taken to enhance current accounting performance are not easily detected. At the same time, the cautious nature of accounting rules which do not recognize uncertain gains and, in the U.S., require R&D investments to be fully expensed immediately, is also argued to cause myopia (Bushee 1998, p306). For instance, the durable impact of continued training on firm performance is not recognized as an asset by the accounting representation, and only current revenues will pay it off. That is, training expenditure will be matched immediately against them. Despite these shortcomings, accounting measures are not completely uninformative.

Trechter et al (1997) observe that cooperatives link their CEOs bonuses to accounting measures (such as accounts receivable) that are only weakly related to the cooperatives' long-term goals, while some cooperatives do not even set long-term goals or formal long-term planning procedure and goal-setting sessions. According to Cook (1995), horizon problem pushes the cooperative management to accelerate members' short-term benefits at the expense of long-term earnings. We thus expect that the cooperative CEO would give priorities to activities 7 and 8 that are specified in subsection 2.2 as actions attempting to build short-term firm value whereas activities that aiming at long-term value will be less important. We will investigate the impact of the use of accounting data for performance measurement regarding short-term firm value.

There are a few sources providing some information about performance measurement in cooperatives. First, Trechter et al. (1997) observe that some cooperatives use equity redemption as a percentage of total equity and patronage refunds per member as factors of the financial performance measure. Second, in 2008 Michael Cook has indicated to us that his experience with various cooperatives regarding the compensation contract for a CEO of a cooperative often specifies around 10 performance indicators, one of them

being member satisfaction. Third, one cooperative has been willing to provide us with the details of the determinants of the CEO bonus. On October 14, 2008 the head of the personnel department of a dairy cooperative communicated to us that the bonus of the CEO has a long run and a short run component. The long run component is exclusively related to the milk price relative to a peer group of 6 other cooperatives. It captures two features of the interests of the members. First, it captures that the price received by the dairy farmers is a crucial aspect of the relationship of the farmers with the processor. Four levels of the bonus are specified, related to ranking first, second, third, or lower in the peer group. Second, continuity of the processor is important to the dairy farmers. This is captured to a certain extent by the fact that the ranking is determined as an average over 3 years. The short run component consists of three measurable performance indicators. They are all related to the EBIT and goals formulated with respect to costs.

3 Basic model

This section develops a multi-task principal-agent model (Gibbons, 1998) to compare CEO compensation schemes in two governance structures: cooperative and IOF. Assume that the CEO in governance structure i (c for a cooperative and f for an IOF) can take two actions: a_{1i} denoting the CEO's action to advance the value of the downstream firm, and a_{2i} denoting the CEO's action to add value to the upstream suppliers.

The CEO's total contribution to firm value is denoted by y_i, where i represents governance structure (c for a cooperative and f for an IOF). The CEO takes various actions to produce output. We denote action j in governance structure i by a_{ji}, and the marginal product of a_{ji} by f_{ji}. The production function is

$$y_i = f_{1i}a_{1i} + f_{2i}a_{2i} + \varepsilon,$$

where ε is a stochastic variable representing the noise in the production process that is beyond the agent's control.[3] We assume that the expected value of ε is zero.

Given the difficulty in measuring the overall effect of the CEO's actions on firm value, no compensation contract based on y_i can be enforced in court. Therefore, an alternative performance measure p_i becomes necessary. Suppose the technology of performance measurement takes the form

$$p_i = g_{1i}a_{1i} + g_{2i}a_{2i} + \phi,$$

where g_{ji} denotes the performance measurement parameter, i.e., the weight attached to a_{ji} and ϕ denotes the noise in performance measurement. We assume the expected value of ϕ is zero.

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[3] We assume the actions taken by the CEO only have consequences for the principal, which excludes the possibility for the CEO to directly benefit from acting against the interests of the principal, i.e., the wealth transfer between the principal and the agent is zero.

Suppose the compensation contract in governance structure i specifies the wage w_i paid to the CEO as a linear function of p_i. The compensation contract takes the form

$$w_i = s_i + b_i p_i,$$

where s_i stands for the salary and b_i for the bonus rate. Notice that with this specification, the CEO's incentives are to produce a high value of p_i, not of y_i, whereas the principal does not directly benefit from increased realizations of measured performance p_i, rather, he benefits from increased realizations of the CEO's total contribution y_i. As a result, the compensation incentives may be distorted. To minimize the distortion the principal has to minimize the divergence between the CEO's incentives to increase p_i and the principal's desire for increases in y_i.

The differences between a cooperative and an IOF are formulated in terms of restrictions on the parameters in the production function and the performance measure. Firstly, the CEO's contribution to firm value depends on organizational form. In cooperatives, it is equivalent to the change in total member value. Members want to bring both upstream farms and the downstream cooperative to value, i.e., $f_{1c} \neq 0, f_{2c} \neq 0$. Investors of an IOF care only about the firm value and consequently the CEO's action that increase firm value, i.e., $f_{1f} \neq 0, f_{2f} = 0$. Secondly, the performance measures of IOFs and cooperatives differ. It is common in IOFs that the CEO's bonus is paid in the form of firm shares, i.e., $g_{1f} \neq 0, g_{2f} = 0$. However, cooperative members have no simple indicator like stock price by which they can evaluate how well management has enhanced the future earnings capacity of their cooperative firm (Staatz, 1987). Member interests are usually present in the incentive scheme for the CEO of a cooperative, e.g. by benchmarking the transfer price and production volume. This results in $g_{1c} = 0, g_{2c} \neq 0$. To summarize, members' plurality of interests is represented by $f_{2c} \neq 0$, while the absence of patron-members, and therefore serving their interests, in an IOF by $g_{2f} = 0$. The absence of public listing of a cooperative is embodied by $g_{1c} = 0$ [4], while the use of stock price in an IOF's performance measure is captured by $g_{1f} > 0$. The distinct features of both governance structures are displayed in table 1.

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[4] We are not stating that a cooperative has no information at all about the downstream activities, but our model will focus on the impact of lacking certain information.

i	f	c
f_{1i}	$\neq 0$	$\neq 0$
f_{2i}	0	$\neq 0$
g_{1i}	$\neq 0$	0
g_{2i}	0	$\neq 0$

Table 1: Marginal product and performance measure parameters

Additional details of the model and the derivation of the equilibrium results are provided in appendix 1. The efficient bonus rate is

$$b_i^* = \frac{f_{1i}g_{1i} + f_{2i}g_{2i}}{g_{1i}^2 + g_{2i}^2} = \frac{\sqrt{f_{1i}^2 + f_{2i}^2}}{\sqrt{g_{1i}^2 + g_{2i}^2}}\cos(\theta),$$

where θ is the angle between vectors $f(f_{1i}, f_{2i})$ and $g(g_{1i}, g_{2i})$ as depicted in figure 1 (Gibbons, 2004).
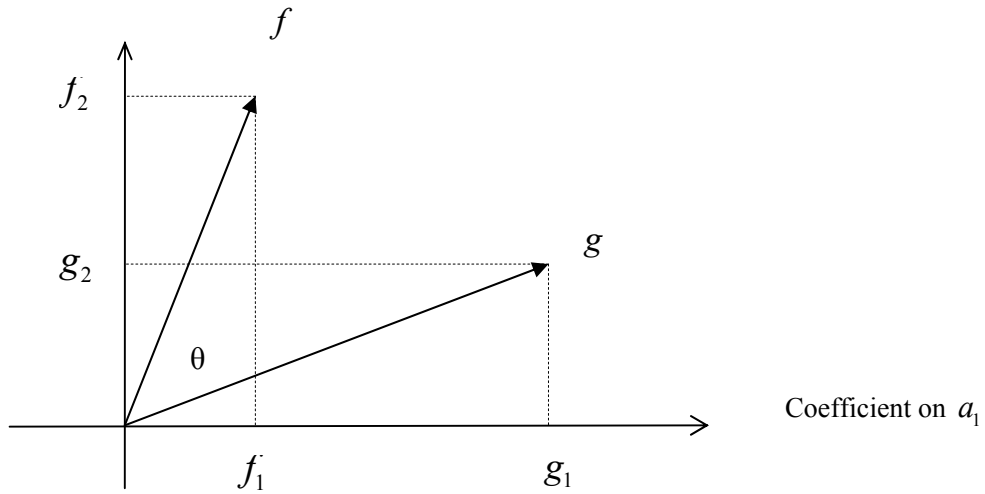
Coefficient on a_2

Figure 1: The scale and alignment effect of the performance measure

There are two important features in the expression of the efficient bonus rate, scale and alignment. More specifically, $\dfrac{\sqrt{f_{1i}^2 + f_{2i}^2}}{\sqrt{g_{1i}^2 + g_{2i}^2}}$ reflects the relative scales of the vectors $f(f_{1i}, f_{2i})$ and $g(g_{1i}, g_{2i})$. A high value of $\dfrac{\sqrt{f_{1i}^2 + f_{2i}^2}}{\sqrt{g_{1i}^2 + g_{2i}^2}}$ indicates that the weights of actions is higher in the production function than in the performance measure. As a result, the firm will optimally increase the incentive intensity based on such a performance

measure. Furthermore, $\cos(\theta)$ captures the alignment effect. To the extent that the performance measure induces CEO's actions less aligned with firm value, θ will increase, and the performance measure will distort incentives more (Baker 2002). As a result, the firm will optimally reduce the slope of the incentive contract based on such a performance measure. Decreased alignment decreases the incentive intensity, and therefore increases the fixed wage, in the compensation package of the CEO.

As shown in figure 2, the production function and performance measure are perfectly aligned in an IOF, i.e., f and g overlap, so the performance measure has no distortion. In this case the efficient bonus rate depends solely on the comparative scales of f_{1f} and g_{1f}.
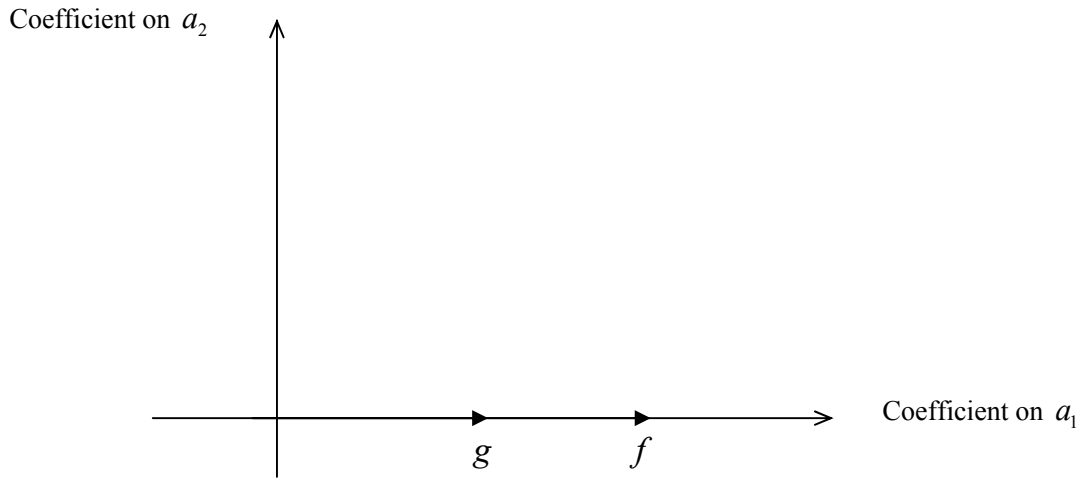
Coefficient on a_2

Coefficient on a_1

g f

Figure 2: The scale and alignment effect in an IOF

A cooperative and an IOF differ in the basic model because f and g are not aligned in a cooperative (figure 3). The production function depends on two actions while the performance measure is determined by only one of them. The formula of cooperative efficient bonus rate $b_c^* = f_{2c}/g_{2c}$ is rather interesting. Our specification of the cooperative case is equivalent to a situation where $f_{1c} = 0$ and $g_{1c} = 0$, that is, the production function and performance measure both compose of only one action, like an IOF. The implication is that the appearance of a_{1c} in the production function does not make any difference in the efficient bonus rate and consequently in the CEO's equilibrium actions. In other words, when an action increases the member value without simultaneously increasing the performance measure, the CEO has no incentives to undertake it.
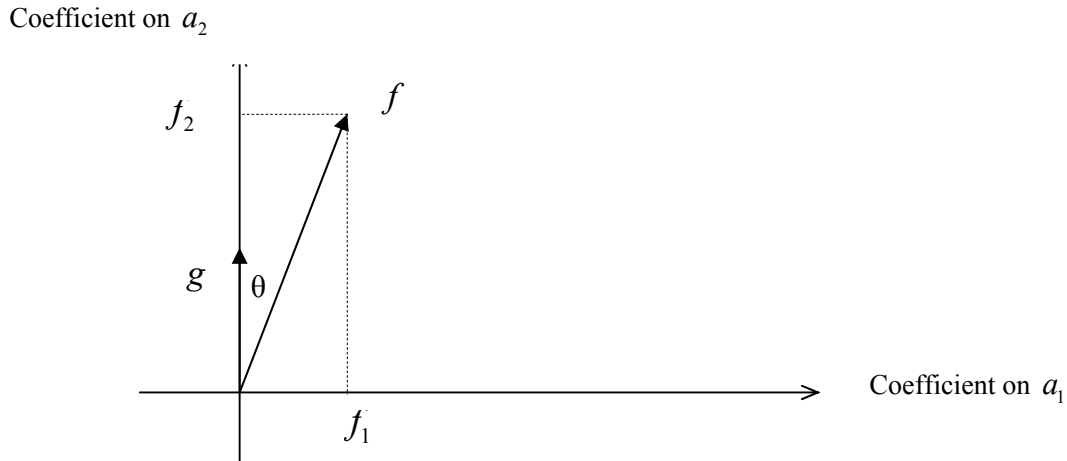
Coefficient on a_2

Figure 3: The scale and alignment effect in a cooperative

In equilibrium, an IOF CEO has incentives to undertake only a_{1f}, i.e., $a_{1f}^* > 0$, because the investors care about a_{1f} and make the CEO's pay dependent on a_{1f}. Members of cooperatives, however, appreciate the CEO's actions on both dimensions but only compensate for a_{2c}. Thus, only an incentive to increase a_{2c} is created ($a_{2c}^* > 0$) and no incentive for a_{1c} exists even though it would increase firm value.

Proposition 1: The misalignment between members' value and the cooperative CEO's interest results in the CEO's failure to add value to the downstream cooperative firm while the perfect interest alignment between the investors and the IOF CEO creates an incentive for the CEO to advance the firm value.

When the available performance measures are incomplete, the incentive contract will lead to problems of distortion, or as Kerr (1975) put it: "the folly of rewarding A while hoping for B". With the complex and sometimes ambiguous goals of cooperatives, the incentive contact may provide only a partial representation of its objectives. The misalignment between performance measure and production function persuades the CEO to pay unbalanced attention to actions that positively affect their scores on the performance measures, neglecting areas for which performance is not assessed. Therefore, we expect that a cooperative CEO would give priorities to activities 9-11 specified in section 2.2, the actions that add value to the upstream member farms.

To compare the efficiency of the two governance structures, suppose there is another upstream IOF consisting of a farmer as the principal and a CEO as agent (see appendix 1). A fair comparison entails comparing the value created by a cooperative with the joint value created by a downstream and an upstream IOF. Simple calculations show that the total surplus of a cooperative and two IOFs are $\frac{1}{2}f_2^2$ and $\frac{1}{2}(f_1^2 + f_2^2)$ respectively. The total surplus created by a cooperative is always less than the surplus created by the two

IOFs when $f_1 > 0$, i.e. the cooperative is inefficient. The behavior of the cooperative CEO is exactly the same as the behavior of the CEO of the upstream IOF. Value would be created in the cooperative by developing downstream activities because $f_{1c} > o$, but the cooperative CEO will not choose these activities because the performance measure does not put any weight on them. The difference in value creation between the two governance structures is therefore equal to the value created at the downstream IOF.

Proposition 2: A cooperative is inefficient.

Another way to explain the result is that the cooperative is supposed to serve member interests and to generate maximum value in processing. However, the organizational structures required for the upstream and downstream tasks differ. The cooperative is designed for the former task, and therefore does not always perform the latter task well. The governance structure IOF consists of two organizational structures, i.e. a downstream and an upstream IOF. It is tailored to each task separately. The next section will determine that this result depends on the two activities being independent in the above model.

4 Extensions

In this section, several extensions of the basic model are made to further contrast the CEO compensation in cooperatives versus IOFs. Section 4.1 addresses the relationship between membership composition and CEO compensation. Section 4.2 relaxes the assumption that the downstream and upstream activities are independent. Additional information in the performance measure is considered in section 4.3. Finally, section 4.4 addresses strategic aspects of the choice of performance measure.

4.1 Society of Members

The basic model have referred to members in general, but no attention has been paid to the composition of the membership. The results (regarding the effect of alignment between the CEO's production function and performance measure on the efficient bonus rate and the CEO's choice of actions) can be best understood as the extent to which the CEO's interest accords with the average member' interest. Now we turn to explore the impact of membership size (4.1.1) and member interest alignment (4.1.2) on the strength of incentives for a cooperative CEO.

4.1.1 Membership size

In the standard principal-agent model, the agent is usually assumed to be risk averse whereas the principal is assumed to be risk neutral. The assumption that the principal is risk neutral will be relaxed. Members are different from investors of an IOF because the latter are more risk preferring or diversify their portfolio to spread risks. Due to the immobility of cooperative capital, members usually exhibit financial commitment to a particular line of business, having all their eggs in one basket (Staatz, 1987).

Suppose there are n members in the cooperative who value the CEO's actions identically (Dixit, 2002). The CEO's contribution to member q is

$$y_{(q)} = \frac{1}{n} f_1 a_1 + \frac{1}{n} f_2 a_2 + \varepsilon .$$

Consequently the CEO's total contribution to the society of members is

$$\sum_n y_{(q)} = f_1 a_1 + f_2 a_2 + n\varepsilon .$$

As all members will agree on a single way of evaluating the CEO, the performance measure remains

$$p = g_1 a_1 + g_2 a_2 + \phi .$$

Assume errors are independent.

Let r denote the CEO's risk aversion, R the risk aversion of each member, v' the variance of ε, and v the variance of ϕ. It can be shown that the joint risk aversion of the members R_0 when they act collusively and pool risks is

$$\frac{1}{R_0} = \sum_n \frac{1}{R} = \frac{n}{R} ,$$

i.e., the existence of multiple members in a cooperative decreases members' joint risk aversion. The impact on the efficient bonus rate of the cooperative CEO is

$$b^* = \frac{f_2 g_2}{g_2^2 + v(r - R/n)} .$$

i.e., a larger society of members decreases the efficient bonus rate. This is in line with the results in the standard principal-agent problem regarding risk-aversion. If the agent becomes more risk-averse, then the equilibrium compensation scheme specifies a lower incentive intensity and higher base wage. In this section it is the increasing ability of a larger membership to bear risk which widens the gap with the risk aversion of the CEO.

Proposition 3: The incentive of a cooperative CEO is weakened when the number of members increases.

4.1.2 Member heterogeneity

This section varies the heterogeneity of the membership while keeping the size of the membership fixed. Hansmann (1996) stresses the importance of the interest homogeneity among members for the efficiency of decision-making. However, cooperative members do often not resemble each other in terms of interests. They differs in various dimensions, like age, location, size, their investment portfolio, amount of capital investment, social background, attitude towards risk, and being an active or retired member. Members will have therefore different preferences regarding the decisions made by the cooperative. For example, good performance for the inactive or over-invested member means the amount of returned equity, but good performance for the under-invested or new member means the competitiveness of current prices or services (Cook, 1994).

We investigate in this subsection the effect of member interest alignment, the reverse of member heterogeneity, on the strength of incentives for a cooperative CEO. Member interest alignment is defined as the extent to which the production function of each member accords with that of the average member. Suppose n cooperative members value the CEO's action a_2 differently. That is, the CEO's contribution to member q is

$$y_{(q)} = \frac{1}{n} f_1 a_1 + \frac{1}{n} f_{2(q)} a_2 + \varepsilon_{(q)},$$

where $f_{2(q)}$ denotes the value member q assigns to a_2, and consequently the CEO's total contribution to the society of members is

$$\sum_n y_{(q)} = f_1 a_1 + f_2 a_2 + \sum_n \varepsilon_{(q)}, \text{ where } f_2 = \sum_q f_{2(q)}.$$

Now the joint risk aversion of the members R_0 becomes

$$\frac{1}{R_0} = \sum_n \frac{1}{R_{(q)}},$$

where R_q denotes the risk aversion of member q.

Other conditions remain the same as in the previous subsection[5], the efficient value of b remains

$$b^* = \frac{f_2 g_2}{g_2^2 + v(r - R_0)}.$$

It can be shown that if the sum of all member's risk aversions is fixed, R_0 and the efficient bonus rate reach the maximum when members have identical risk aversions. In other words, the heterogeneity of the members' risk aversions leads to lower joint risk aversion and consequently a lower efficient bonus rate.

Proposition 4: Increasing heterogeneity in the members' risk aversions leads to impaired CEO incentives.

This proposition provides an explanation for the phenomenon that compared with investors of an IOF, members of a cooperative usually are more homogeneous with regard to their social backgrounds, investment portfolios, attitudes towards risk, and so on. This finding suggest that the negative relationship between member heterogeneity and the strength of CEO incentives might be one of the considerations regarding the evolution of membership heterogeneity in the course of time. The membership may be quite heterogeneous at the founding stage of a cooperative, but the development of cooperatives are geared towards attracting more homogeneous members and encouraging heterogeneous members to leave in subsequent stages. This reduces the impact of member heterogeneity on the incentive intensity of the CEO.

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[5] Notice that members value the actions taken by the CEO differently but have to reach a consensus on the bonus rate of the CEO's payment scheme.

4.2 Substitutable / complementary tasks

The upstream and downstream tasks of the CEO in the basic model are independent. Following Dixit (2002), we relax this assumption by analyzing the substitutes or complements effects of actions. An examples of substituting tasks of the CEO is the time he spends in communicating with the input suppliers and the time he spends on the business strategies of the downstream firm. When the workload of the CEO is fixed, the more he works with the suppliers, the less time left to spend on the firm strategies. Examples of complementary tasks can be the CEO's coordination between the upstream suppliers and the downstream enterprise. More knowledge of one side facilitates coordination with the other side. The main result is that a_{2f} and a_{1c} are not zero anymore. Their actual levels will depend on the nature and the strength of the interaction effects.

The equilibrium results with substitutable/complementary tasks are in appendix 2. Let $b_{i(k)}^*$ and $a_{ji(k)}^*$ denote respectively the equilibrium bonus rate and action on task j in governance i when the interaction between tasks in the cost function is k. The two tasks are substitutes when $0<k<1$, complements when $-1<k<0$.

In the basic model, an IOF CEO will in equilibrium take no action a_{1f}. However, the marginal cost of a_{1f} decreases with a_{2f} in the complementary case and increases in the substitutes case. If a_{2f} can make a_{1f} less costly, the CEO will optimally choose to take some actions a_{2f}, which will further increase the equilibrium level of $a_{1f(k)}$ as compared with $a_{1f(0)}^*$. The stronger is the complementary effect, the more actions will be taken on a_{2f}. If a_{2f} makes a_{1f} more costly, he will take a negative action on a_{2f} since it will decrease the marginal cost of action a_{1f}. As a result of the decreased marginal cost, the equilibrium level of $a_{1f(k)}$ increases.

Proposition 5: When tasks are complementary, the IOF's CEO will take actions to increase the upstream supplier's value, i.e., $a_{2f(k)}^* > a_{2f(0)}^* = 0$ and $a_{2f(k)}^*$ decreases with k. When tasks are substitutes, he will take actions to decrease the upstream supplier's value, i.e., $a_{2f(k)}^* < 0$. And the CEO's action advancing the downstream value increases, i.e., $a_{1f(k)}^* > a_{1f(0)}^*$, regardless the nature of the interaction between tasks.

In the basic model, a cooperative CEO will in equilibrium take no action to increase the downstream enterprise's value. However, if two actions are complementary, he will optimally choose to take positive action on a_{1c}, which in turn increases the equilibrium level of $a_{2c(k)}$ as compared with $a_{2c(0)}^*$. The stronger is the complementary effect, the higher are the equilibrium levels of $a_{1c(k)}$ and $a_{2c(k)}$.

Proposition 6: When the cooperative CEO has two complementary tasks, he will take actions to boost the value of the downstream stage and his equilibrium action to bring the upstream farm to value will also increase, i.e., $a_{1c(k)}^* > a_{1c(0)}^* = 0$, $a_{2c(k)}^* > a_{2c(0)}^*$, and both $a_{1c(k)}^*$ and $a_{2c(k)}^*$ decrease with k .

Because $f_{2f} = 0, g_{2f} = 0$, $f(f_{1f}, 0)$ and $g(g_{1i}, 0)$ are perfectly aligned, the efficient bonus rate of an IOF's CEO is determined only by the scale of $f(f_{1f}, 0)$ and $g(g_{1i}, 0)$, i.e., f_{1f} / g_{1f}. Therefore, the interaction between actions has no influence on the efficient bonus rate in an IOF, i.e., $b_{f(k)}^* = b_{f(0)}^*$.

When the cooperative CEO has complementary tasks, a high bonus rate leads to a high level of $a_{2c(k)}^*$, which will result in higher $a_{1c(k)}^*$ due to the complementation effect. Therefore, a principal valuing both actions has incentives to increase the bonus rate of a_{2c} so as to increase both actions. The stronger is the complementary effect, the larger is the efficient bonus rate. When the two tasks are substitutes, a high bonus rate on a_{2c} drives the CEO to exert as much effort as possible to a_{2c} while taking no action or even negative action on a_{1c}. Therefore, the principal will cut down the bonus rate. The stronger is the substituting effect, the smaller is the efficient bonus rate.

Proposition 7: The efficient bonus rate in a cooperative increases (decreases) when the CEO's tasks are complementary (substitutes), i.e., $b_{c(k)}^* > b_{c(0)}^*$ when -1<k<0; $b_{c(k)}^* < b_{c(0)}^*$ when 0<k<1. Furthermore, $b_{c(k)}^*$ decreases with k.

Interactions between the downstream and upstream activities may make the cooperative the unique efficient governance structure. These interactions in the cost function elicit new activities by the various CEOs. The cooperative CEO will choose a positive level of the downstream activities, downstream activities are chosen also by the CEO at the upstream IOF, and upstream activities are put forward by the CEO at the downstream IOF. It turns out that the equilibrium level of upstream activities generated by the cooperative is identical to the level of upstream activities by the two IOFs together, while the level of downstream activities generated by the cooperative is lower than the level of downstream activities by the two IOFs together. Total revenues in a cooperative are therefore lower than in the IOFs. However, the decrease in total costs in a cooperative is even higher when the complementarities are sufficiently strong. The reason is that the decrease in the downstream activities by the cooperative CEO is limited due to $f_{1c} > o$.

This makes the cooperative the unique efficient governance structure when the complementarities are sufficiently strong, despite that the downstream activities are not recognized in the performance measurement scheme facing the cooperative CEO. (The cooperative is never efficient when the downstream and upstream activities are substitutes or independent.) The cooperative internalizes externalities to a certain extent by putting positive weight on serving member interests and generating maximum value in

processing. Not having a public listing provides the cooperative with a commitment not to choose the level of the downstream activities too high.

Proposition 8: A cooperative is uniquely efficient if and only if $f_1 < \dfrac{-2k}{1-k^2} f_2$.

Another implication of this proposition is that cooperatives are expected in sectors where the marginal productivity (at the downstream stage) is below a certain level, given the strength of the complementarities and the marginal productivity at the upstream stage of production.

4.3 Additional information in the performance measure

The breath of scope in cooperative goals makes defining task achievement more difficult (Cook, 1994). The absence of stock price increases the difficulty in measuring the CEO performance. Many cooperatives try to correct for this by using more than one measure. We investigate two ways of adding extra information in the performance measure. Subsection 4.3.1 decomposes the cooperative CEO's action a_{1c} into two aspects, one aiming at long-term value and the other aiming at short-term benefits based on accounting measures. Subsection 4.3.2 introduces the use of a subjective performance measure.

4.2.1 Public versus accounting data

In order to distinguish the long-term and short-term impact of accounting measures on enterprise value, we decompose a_{1i} into two actions, a_{1il} and a_{1is}, each denoting the CEO's action to boost long-term and short-term firm value. The marginal product and performance measure parameters of actions are respectively f_{1il} and f_{1is}, g_{1il} and g_{1is}. Table 2 shows the distinctions between cooperatives with or without accounting measures in their CEO compensation measurement, where c" stands for a cooperative using accounting measures to evaluate its CEO's action. It represents that a publicly listed firm can use both long-term and short-term incentives; a cooperative using accounting data gives its CEO only short-term incentives regarding the cooperative firm, while a cooperative that does not use accounting data has neither.

i	f	c	c''
f_{1il}	$\neq 0$	$\neq 0$	$\neq 0$
f_{1is}	$\neq 0$	$\neq 0$	$\neq 0$
f_{2i}	0	$\neq 0$	$\neq 0$
g_{1il}	$\neq 0$	0	0
g_{1is}	$\neq 0$	0	$\neq 0$
g_{2i}	0	$\neq 0$	$\neq 0$

Table 2: The differences between cooperatives with (c'') or without (c) accounting measures in their CEO compensation measurement

It is straightforward that $a_{1c''s} > 0$ and $a_{2c''} > 0$. The use of accounting data helps at least motivate the cooperative CEO to pay attention to the downstream enterprise, though it is likely to overly accentuate the short-run revenue, rather than the long-run interests.

Proposition 9: By including accounting measures, the CEO's performance measure are better aligned with the production function, and the CEO has incentives to advance both the value of upstream member farms and the short-run goals of the cooperative firm.

We consider again when a cooperative is efficient. No general expression has been established yet, but various numerical examples have been identified. Proposition 10 presents an example.

Proposition 10: By including accounting measures, a cooperative is more efficient than the IOFs when $f_2 = f_l = 1, g_l = 100, f_s = g_s = g_2 = 10$.

4.3.2 Subjective performance assessment

In previous sections, we discuss only objective performance measures utilized to evaluate the CEO's contribution to the firm, which according to Gibbons (1998) are typically not sufficient to create ideal incentives. Stock price, for example, involves too much noise and external influences that are beyond the CEO's control. The uncertainty of agriculture in particular "hampers tying a bonus to easily measured performance indicators that a CEO can control and that are of value of the cooperative" (Trechter et al, 1997). Moreover, paying the management for the current earnings or profits sometimes goes at the expense of long-term firm value. Activities that do not create immediate short-term profits though redound to long-term development, like R&D, might be underinvested.

In multi-task settings, it is often helpful to use multiple instruments to provide a balanced package of incentives. For instance, many firms mitigate the effects of distortionary objective performance measures by augmenting objective measures with subjective performance assessments even where the objective aspects of an individual's contribution

to firm value are easily measured. Subjective measures refer to a judgment by the supervisor of the subordinates' performance, including a judgment of the actions taken to achieve that performance. Subjective evaluations can take different forms, such as (1) flexible weighting of objective performance measures ex-post (at the end of the evaluation period); (2) the use of subjective (qualitative) measures; (3) discretion in using additional performance criteria (Ittner, 2003). They are more useful when decisions affect results further in the future (Lambert & Larcker, 1987). Subjectivity allows the supervisor to correct for dysfunctional behavior, such as myopia, induced by incomplete performance measures (Gibbons, 1998). Valuation in the CEO's current cash compensation not explained by current performance measures (such as stock return, sales, and earnings) predicts future variation in these performance measures. Empirical evidences prove that when subjective evaluation is used to a higher degree, CEO compensation is more positively related to future earnings (Hayes & Schaefer, 2000). Furthermore, the use of subjectivity in evaluations has been found to increase with firm growth opportunities and product life cycle length (Bushman et al. 1996).

The cooperatives may use subjective performance assessment to reconcile the short-term orientation indicated earlier and motivate managers to undertake actions with longer-term managerial focus and consequences. The geographic proximity of patrons to their firm may also create stronger social ties between management and owners. The fact that the patrons are in a privileged position to observe and monitor managerial operations and there are stable long-run relationships between owners and CEOs, suggests greater reliance on subjective performance evaluation in cooperatives (Hueth & Marcoul, 2008). As a result, "the incentive and compensation system encourages good long-run performance and is not driven by favorable or unfavorable short-run fluctuations" (Trechter et al, 1997). That is, the performance of the cooperative CEO should be subjectively assessed by board of directors who are well placed to observe the subtleties of the CEO's behavior and opportunities. As discussed earlier, the board of directors in cooperatives, as representatives of members, is significantly more independent than their IOF counterparts are, and are better motivated to monitor the CEO. They interact with management both in the boardroom, and as patrons, they potentially have more information about the production environment in which the CEO operate (Hueth & Marcoul, 2008). In additional, the patrons' vested interest in the performance of the cooperative and its CEO may reduce agency problems. Because the patrons are also the owners, virtually every transaction in the cooperative involves a principal who can oversee the agent's actions(Trechter et al, 1997). So the patrons' feedback and general level of satisfaction (for instance, regarding equipment maintenance and access to desired services), and occasionally, from employees, can also be part of the subjective assessment (Trechter et al, 1997).

We provide no formal modelling regarding subjective performance assessment in this section because it is similar to modelling the impact of incorporating accounting data. The only difference is that the labels regarding short and long run have to be replaced. However, the impact on alignment is the same. Incorporating subjective performance assessments in the performance measurement will improve alignment, and therefore the

incentive intensity in the compensation scheme of the cooperative CEO.

4.4 Strategic choice of performance measure

The previous subsections have focused on determining the optimal incentive intensity in various environments, while the production function and performance measure parameters were exogenously determined. Baker (2000, p419) observes that 'The choice of which performance measure to use (and the weights to place on them) depends on how the amount of distortion and the amount of risk change as one moves from one performance measure to another'. It is obvious in our model that the weights in the performance measure have to be chosen to establish alignment with the production function parameters. However, this result may change when the enterprise is facing a competitor. This subsection argues that there may be a strategic rationale involved in the choice of the weights of a performance measure. An early contribution is Vickers (1985).

The strategic choice of performance measure can be incorporated in the two-stage game by adding an additional stage at the beginning of the game. That is, the principals decide first regarding the weight attached to each activity in the performance measure, and subsequently they choose the incentive intensity. Finally the CEO chooses his action levels. The other ingredient needed for studying strategic performance measurement choice is that there is (potential) competition between enterprises, i.e., there have to be at least two enterprises.

According to Fudenberg and Tirole (1984), three variables have to be specified in order to determine the payoff maximizing choice of performance measure in a strategic setting: the nature of investment, the nature of the competitive process, and the entry condition. First, define the investment as the extent of member focus in the performance measure. If the extent of member focus is large, i.e., g_2 is much higher than g_1, then the profits of the rival firm will increase. The reason is that the CEO of the cooperative will dedicate a larger part of his time to activities related to the interests of members when the extent of member focus changes from small (S) to large (L), which goes at the expense of activities geared towards developing the cooperative enterprise. It entails that the investment is soft, because it establishes a positive relationship between investment in the weight of member focus in the performance measure and profits of the rival firm. Second, assume that the nature of the competitive process is characterized by strategic substitutes, i.e. reaction functions are downward sloping (figure 6). Third, two cases regarding the possibilities of market entry have to be distinguished (Fudenberg and Tirole, 1984): entry is inevitable or it is not. If entry is not inevitable, then a monopoly market structure arises endogenously by the choices of the two enterprises. Otherwise it is always a duopoly.

The profit maximizing investment profile of the cooperative is to be aggressive in order to elicit a passive response by the rival, i.e. underinvestment in the weight put on member focus in the performance measure. Notice that no distinction has to be made regarding the entry condition. The payoff maximizing investment choice is the same in both cases because the market is characterized by a soft investment and strategic substitutes. This result is summarized in the next proposition.

Proposition 11: A cooperative puts a low weight on member focus in its performance measure in order to elicit passive behavior from a rival enterprise.
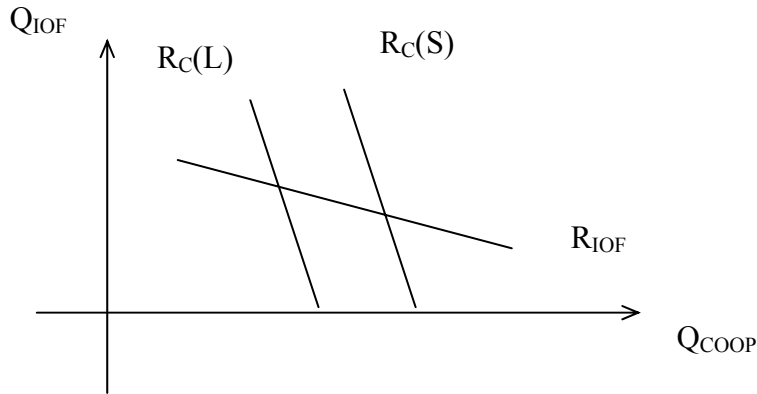

Figure 6: Performance measure choice and reaction functions

5 Empirical implications

The differences between the two governance structures, cooperatives and IOFs, entails different actions taken by their CEOs. we will translate the results of our previous analysis regarding CEO's choice of actions into their empirical implications.

5.1 Growth

Caves & Petersen (1986) observe that a local cooperative usually serves a fixed membership base. It does not compete with neighboring cooperatives, so that horizontal expansion is precluded except by merger. We hypothesize similarly that the growth in cooperatives is slower that in IOFs for the following reasons. First, proposition 1 predicts that the cooperative CEO spend less effort to advance the downstream value, leading to slower growth in cooperative enterprises than in IOFs.

Second, nonmarketability of cooperative equity implies differences in attitudes towards growth between cooperatives and IOFs. Growth is the single most important determinant of stock price (Holmström, 1999). The growth of an IOF results in appreciation of equity, which can be realized by investors through selling their shares in the secondary market. An IOF CEO has thus incentives to accelerate the firm growth when his own pay and tenure are strongly tied to the stock price (Lerman, 1991). The nonmarketability of cooperative equity, on the other hand, provides no incentives for the cooperative CEO to pursue firm growth.

Third, growth requires financing and cooperatives, because of their unique form of organization, are usually viewed as equity bound (Lerman, 1991; Vitaliano, 1983). Cooperatives acquire financial resources in two ways, externally or internally. First, it is expensive for a cooperative to obtain outside equity due to the feature that members are,

by definition, the residual claimants in a cooperative. Second, because the return obtained by a cooperative member depends on his volume of transactions, rather than how much he invested, he has an incentive to free ride by supplying as little capital as possible. A new member will seek to understate his planned transaction volume when he joins. Initially the cooperative may grow faster than an IOF since it does not pay corporation income tax on its earnings from business with members. However, when the rotation of equity begins, the cooperative's maximum growth rate might drop abruptly and continue to decline toward a steady-state level below the steady-state level that the IOF can achieve (Caves & Petersen, 1986). In contrast, IOFs have better access to new equity. They can retain earnings and raise additional equity in the stock market from any investor who is willing to take the risk. Moreover, they can use their own stock to pay for acquisitions (Hendrikse & van Oijen, 2009).

5.2 Upstream versus downstream innovation

The establishment of a cooperative contributes to both the value of the cooperative enterprise itself but also to its members. The innovation activities in a cooperative can also be distinguished into upstream and downstream innovation. The upstream innovation mainly concerns the process innovation related to the existing products while the downstream innovation concerns development of new products. Based on proposition 1 we expect that the cooperatives focus more on upstream innovation with regard to the existing products than on downstream innovation.

Cooperatives, according to many, are at a disadvantage in the innovation race with IOFs. For instance, Thirkell (1989, p14) claims that cooperatives are generally not innovative or progressive. Given the discussion in previous sections, the emphasis of a cooperative on upstream member benefits entails that the process innovation in members' close interests is not necessarily ineffective or inactive as compared with that in an IOF. A cooperative normally only processes (or markets) the products from its members, and this makes product-orientation a characteristic of the cooperative business form. Furthermore, the fact that members have expertise and will bring new ideas about their products will strengthen the cooperative's search for product related differentiation.

Yet, we agree with Thirkell (1994) when it comes to the corporate oriented downstream innovation for the following reasons. First, the hierarchical investment approval process of cooperatives with internal capital markets is an impediment to innovation within firms, resulting in less innovation in cooperatives compared with IOFs. Secondly, innovation is likely to divide opinions within the cooperative, because young members are typically more eager to invest in future activities than are the old, soon-to-retire members. As a consequence, there will be less opportunities for management to experiment and explore. Thirdly, outside investors are unwilling to provide capital needed for innovation if they can hardly control the cooperatives. Finally, stock price as a powerful measure to evaluate and reward innovative activities is missing, depriving management and employees of the most effective guide for such activities (Holmström, 1999).

5.3 Diversification

Diversification choices of an IOF aim to maximize the net returns of the investors, while the diversification choices of a cooperative are guided by bringing to value the portfolio of members (Hendrikse and van Oijen, 2009). We expect that cooperatives are less diversified than IOFs. On the one hand, lacking of financial resource as discussed in previous subsections makes it more difficult for cooperatives to carry out diversification. On the other hand, the diversification decisions in a cooperative are often biased or delayed by internal influence activities. Members have a lot in stake on what the cooperative does. They have product, technology and other firm specific knowledge, which may become valueless if the cooperative changes course and pursues new ideas and lines of business. If the transition requires entirely new knowledge, resistance to change can be enormous (Holmström, 1999). The less powerful position of the CEO in cooperatives compared to IOFs reinforces this tendency (Hendrikse & van Oijen, 2009)

When it comes to if cooperatives and IOFs differ with respect to the diversification behaviors, based on the current model we have different prediction from Hendrikse & van Oijen (2009). They show that cooperatives diversify relatively more into unrelated activities than IOFs do whereas we take the opposite position. When a cooperative diversifies into related activities, the new actions entailed by the diversification can be complementary to the existing actions of the CEO. According to proposition 6 when the CEO has complementary actions, he will exert effort on both even if one of the actions is not evaluated and compensated. Thus, we expect the members would encourage the complementary actions to balance upstream and downstream value. Caves & Petersen (1986) also argue that cooperative organizations are ill-suited to entrepreneurial tasks that entail activities far removed from the direct interests and experience of the cooperative members. In other words, its possibilities for diversifying are limited. One might say that a cooperative focus more on searching markets for sale instead of searching for market opportunities.

Cooperative members, like any other sellers, would desire brisk sales, but they are usually involved in the production of a small number of different produces, for the scale of economy reason. Consequently, the cooperatives usually focus on the products that concern most of its members, and therefore diversify within a more narrow scope of portfolio. The fact that they do not diversify widely as many IOFs do nowadays may have impact on growth.

6 Conclusions and further research

The evaluation and measurement of CEO performance is complex, especially in cooperatives where members have differing preferences and no public listing can be used as performance indicator. While regulators and shareholders of an IOF may find it beneficial to encourage the use of equity-based compensation (Bebchuk and Fried, 2003), a pay package that is very sensitive to any single performance measure will bring about distortion and inefficiency in cooperatives.

In reality, the CEO compensation schemes in cooperatives vary. Some use pre-set performance-based bonuses, some allow for bonuses paid on past performance, and others do not use bonuses (Trechter et al, 1997). However, previous research has not considered the optimal design of compensation contract for cooperative management. In the current paper, we study the principal-agent tension between a cooperative CEO and members. Different structures of the CEO compensation are identified, as well as the behavioral differences of a cooperative CEO and an IOF CEO. Results are formulated regarding the sensitivity of the optimal incentive intensity to the nature of CEO activities, to additional information, to membership composition in terms of size and heterogeneity, and strategic considerations. Circumstances are formulated when the cooperative is the unique efficient governance structure.

As far as we know, this paper is the first attempt to model the compensation scheme of cooperative CEOs. Much more is to be done. First, data regarding CEO pay composition and behavior is much needed in order to inform research regarding cooperatives. Second, further research may incorporate the internal control mechanism in cooperatives. The board of directors consisting of members is usually elected by and from the membership, and is commonly representing member interests. They have more access to information inside the organization and have more at stake in the cooperative than their counterparts in IOFs have, and are thus expected to be a more active monitor and participant. Third, Trechter et al. (1997) is right that the CEO is important for the success of a cooperative. However, enterprises have a variety of means to address coordination and motivation problems, of which CEO compensation is one. Other instruments have therefore to be considered in combination with CEO compensation.

References

Akerlof, G.A., and R.E. Kranton, Economics and Identity, Quarterly Journal of Economics, 2000, 115(3), 715-753.

Baker, G., The Use of Performance Measures in Incentive Contracting, American Economic Review, 2000, 90(2), 415-420.

Barton, D., What is a Cooperative?, In D. Cobia (eds) Cooperatives in Agriculture, Prentice Hall, 1989, 1-20.

Bebchuk, L.A., and J.M. Fried., Executive Compensation as an Agency Problem, Journal of Economic Perspectives, 2003, 17(3), 71-92.

Bijman, W.J.J., Hendrikse, G.W.J., and A.A.C.J. van Oijen, Accommodating Two Worlds in One Organization: Changing Board Roles in Agricultural Cooperatives, working paper, Rotterdam School of Management, Erasmus University, 2008.

Blanchard, K., Schewe, C., Nelson, R., and A. Hiam, Exploring the World of Business, New York, Worth Publishers, 1996.

Bushee, B.J., The Influence of Institutional Investors on Myopic R&D Investment Behavior, Accounting Review, 1998, 73, 305-333.

Bushman, R.M., Indjejikian, R.J. and A. Smith, CEO Compensation: The Role of Individual Performance Evaluation, Journal of Accounting and Economics, 1996, 21, 161-193.

Caves, R.E., and B.C. Petersen, Cooperatives' Shares in Farm Industries: Organizational and Policy Factors, Agribusiness, 1986, 2 (1), 1-19.

Cook, M.L., The Role of Management Behavior in Agricultural Cooperatives, Journal of Agricultural Cooperatives, 1994, 9, 42-58.

Cook, M.L, The Future of U.S. Agricultural Co-operatives: A Neo-institutional Approach, American Journal of Agricultural Economics, 1995 (77), 1153–1159.

DGRV, Genossenschaften in der Bundesrepublik Deutschland, www.dgrv.de, 2008.

Dixit, A., Power of Incentives in Public versus Private Organization, American Economic Review (Papers and Proceedings), 1997, 87(2), 378-382.

Dixit, A., Incentives and Organizations in the Public Sector: An Interpretative Review, Journal of Human Resources, 2002, 37(4), 696-727.

Fisher, J., Use of Nonfinancial Performance Measures, Journal of Cost Management, 1992, 6 (1), 31-38.

Fudenberg, D. and J. Tirole, The fat-cat effect, the puppy-dog ploy, and the lean and hungry look, American Economic Review 1984, 74(2): 361-366.

Gibbons, R., Incentives in Organizations, Journal of Economic Perspectives, 1998, 12, 115-132.

Gibbons, R., Agency theory, Lecture notes 1, MIT, 2004.

Gibbons, R., Incentives Between Firms (and Within), Management Science, 2005, 51(1), 2-17.

Hansmann, H., (1996) The Ownership of Enterprise. The Belknap Press of Harvard University Press, Cambridge, MA/London.

Hart, O., Financial Contracting, Journal of Economic Literature, American Economic Association, 2001, 39(4), 1079-1100.

Hayami, Y. and K. Otsuka, The Economics of Contract Choice, Clarendon Press, Oxford,

1993.

Hayes, R.M. and S. Schaefer, Implicit Contracts and the Explanatory Power of Top Executive Compensation for Future Performance, Rand Journal of Economics, 2000, 31, 273-293.

Helmberger, P., and S. Hoos, Cooperative Enterprise and Organization Theory, Journal of Farm Economics, 1962, 44, 275-290.

Hendrikse, G.W.J. and A.A.C.J. van Oijen, Governance Structure, Product Diversification, and Performance, working paper, 2009.

Hendrikse, G.W.J. and C.P. Veerman, Marketing Cooperatives and Financial Structure: a Transaction Costs Analysis, Agricultural Economics, 2001, 26, 205-216.

Hind, A.M., The Changing Values of the Cooperatives and Its Business Focus, American Journal of Agricultural Economics, 1997, 79, 1077-1082.

Holmström, B., Future of Cooperatives: A Corporate Perspective, The Finnish Journal of Business Economics, 1999, 4, 404-417.

Hueth, B., and Marcoul, P., Incentive Pay for CEOs in Cooperative Firms (November 17, 2008). Available at SSRN: http://ssrn.com/abstract=1303050

Ittner, C.D., Larcker, D.F., and M. Meyer, Subjectivity and the Weighting of Performance Measures: Evidence from a Balanced Scorecard, The Accounting Review, 2003, 78, 725-728.

Kerr, S., On the Folly of Rewarding A, while Hoping for B, Academy of Management Journal, 1975, 18, 769-783.

Key, N., and M.J. Roberts, Nonpecuniary Benefits to Farming: Implications for Supply Response to Decoupled Payments, American Journal of Agricultural Economics, 2009, 91 (1), 1-18.

Lambert, R.A., and D.F. Larcker, An Analysis of the Use of Accounting and Market Measures of Performance in Executive Compensation Contracts, Journal of Accounting Research, 1987, 25, 85-125.

Lang, M.G., The Role of Management Behavior in Agricultural Cooperatives: Discussion, Journal of Agricultural Cooperatives, 1994, 9, 61-66.

LeVay, C., Agricultural Co-operative Theory: A Review, Journal of Agricultural Economics, 1983, 34(1), 1-44.

Lerman, Z., and C. Parliament, Financing of Growth in Agricultural Cooperatives, No 13410, Staff Papers from University of Minnesota, Department of Applied Economics, 1991.

Libby, R., Bloomfield, R. and M.W. Nelson, Experimental Research in Financial Accounting, Accouting, Organizations and Society, 2002, 27, 775-810.

Merchant, K.A., The Effects of Financial Controls on Data Manipulation and Management Myopia, Accouting, Organizations and Society, 1990, 15, 297-313.

Peterson, H.C. and Anderson, B.L. Cooperative Strategy: Theory and Practice, Agribusiness, 1996, 12(4), 371-383.

Savage, J.K., Comment on Economic Nature of the Cooperative Association, Journal of Farm Economics, 1954, 36, 529-534.

Staatz, J.M., The Structural Characteristics of Farmer Cooperatives and their Behavioral Consequences, In Cooperative Theory: New Approach, ed. J. Royer, 1987, 33-60. USDA-ACS Service Report no. 18. Washington, D. C.

Stein, J.M., Efficient Capital Markets, Inefficient Firms: A Model of Myopic Corporate Behavior, The Quarterly Journal of Economics, Vol. 104, No. 4 (Nov., 1989), pp. 655-669.

Stewart, A.L.T., Have Traditional Cooperative Structures Outlived their Usefulness? Farm Management, 1993, 8(6), 287-296.

Thirkell, J.D., Attracting and Motivating Managers in U.K. Agricultural Cooperatives. In Yearbook of Cooperative Enterprise 1989, Oxford, Plunkett Foundation.

Trechter, D.D., R.P. King, D.W. Cobia, and J. G. Hartell, Case Studies of Executive Compensation in Agricultural Cooperatives, Review of Agricultural Economics, 1997, 19 (2), 492-503.

Trifon, R., The Economics of Cooperative Ventures: Further Comments, Journal of Farm Economics, 1961,43, 215-235.

Van Rinsum, M., Performance Measurement and Managerial Time Orientation, PhD dissertation, Erasmus University Rotterdam, 2006.

Vickers, J., Delegation and the theory of the firm, Economic Journal, 1985, 95 (Supplement), 138-147.

Vitaliano, P., Cooperative enterprise: an alternative conceptual basis for analyzing a complex institution, American Journal of Agricultural Economics, 1983, 65, 1078-1083.

Yamey, B.S., The Price Policy of Co-operative Societies, Economica, 1950, 17(65), 23-42.

Appendix 1

The model consists of a two-stage non-cooperative game (Gibbons, 2004). In the first stage, the principal chooses the strength of incentives while the agent (i.e., the CEO)'s optimal choice of activities is determined in the second stage of the game.

Three activities are distinguished in order to cover the cases of section 3 as well as section 4. The production function is therefore

$$y_i = f_{1i}a_{1i} + f_{2i}a_{2i} + f_{3i}a_{3i} + \varepsilon.$$

The technology of performance measurement takes the form

$$p_i = g_{1i}a_{1i} + g_{2i}a_{2i} + g_{3i}a_{3i} + \phi.$$

We assume now that both the principal and the agent are risk neutral. The principal receives the CEO's total contribution to firm value, but has to pay the CEO's wage. The principal's payoff is the difference between the value received and the wage paid:

$$\pi_i = y_i - w_i.$$

The CEO receives the wage but has to take costly actions to produce output. The cost associated with the actions a_{1i}, a_{2i}, a_{3i} is defined as

$$c_i(a_{1i}, a_{2i}, a_{3i}) = \frac{a_{1i}^{2}}{2} + \frac{a_{2i}^{2}}{2} + \frac{a_{3i}^{2}}{2}$$

The CEO's payoff is the difference between the wage received and the cost of the actions taken:

$$U_i = w_i - c_i(a_{1i}, a_{2i}, a_{3i}).$$

We use backward induction to solve the two-stage non-cooperative game. We start from the second stage of the game. The CEO's optimal action is determined by maximizing his expected utility, i.e.,

$$\max_{a_1, a_2, a_3} E(U_i),$$

where

$$E(U_i) = E[w_i - c_i(a_{1i}, a_{2i}, a_{3i})] = s_i + b_i(g_{1i}a_{1i} + g_{2i}a_{2i} + g_{3i}a_{3i}) - c_i(a_{1i}, a_{2i}, a_{3i}).$$

Setting the first derivative of the expected utility with respect to a_{ji} equal to zero results in the first order condition

$$b_i g_{ji} = \frac{\partial c_i}{\partial a_{ji}}, j = 1, 2, 3.$$

This characterizes the CEO's optimal actions $a_{ji}^{*}(b_i)$.

The payoff-maximizing reply in the second stage of the game is anticipated in the first stage when the principal determines the efficient intensity of incentives b_i. The efficient b_i is determined by maximizing the expected total surplus

$$\max_{b_i} E(\pi_i + U_i),$$

where

$$E(\pi_i + U_i) = E[y_i - c_i(a_{1i}, a_{2i}, a_{3i})] = f_{1i}a_{1i}^* + f_{2i}a_{2i}^* + f_{3i}a_{3i}^* - c_i(a_{1i}^*, a_{2i}^*, a_{3i}^*).$$

When the CEO takes only two actions, it can be shown that

$$a_{ji}^*(b_i) = b_i g_{ji}$$

and

$$b_i^* = \frac{f_{1i}g_{1i} + f_{2i}g_{2i}}{g_{1i}^2 + g_{2i}^2}.$$

The efficient bonus rates of an IOF and a cooperative are therefore

$$b_f^* = f_{1f} / g_{1f}, \ b_c^* = f_{2c} / g_{2c}.$$

Plugging these results in the expressions for the CEO's equilibrium actions results in

$$a_{1f}^*(b_f) = g_{1f}b_f = f_{1f}, \ a_{2f}^* = 0$$

and

$$a_{1c}^* = 0, \ a_{2c}^*(b_c) = g_{2c}b_c = f_{2c}.$$

In order to facilitate comparing the efficiency of a cooperative versus the IOFs, we assume that the marginal product and the performance measurement parameter of each activity remain the same across different governance structure. For example, f_1 and g_2 for a_1 for a cooperative, an upstream and a downstream IOF. Therefore the above results become

$$b_f^* = f_1 / g_1, \ b_c^* = f_2 / g_2, \ a_{1f}^* = f_1, \ a_{2f}^* = 0, \ a_{1c}^* = 0, \ a_{2c}^* = f_2.$$

Similarly, the equilibrium results for an upstream IOF are:

$$b_{uf}^* = f_2 / g_2, \ a_{1uf}^* = 0, \text{ and } a_{2uf}^* = f_2.$$

Appendix 2

Assume again that the CEO can take only two actions a_{1i} and a_{2i}, and the cost function takes the form

$$c_i(a_{1i}, a_{2i}) = \frac{a_{1i}^2}{2} + k a_{1i}a_{2i} + \frac{a_{2i}^2}{2}, \text{ where } -1 < k < 1.$$

When $0 < k < 1$, the two tasks are substitutes, i.e., more effort in a_{1i} increases the marginal cost of effort in a_{2i}, therefore enhancing the marginal incentive payment for greater output of a_{1i} draws effort away from a_{2i}. When $-1 < k < 0$, the two tasks are complements, implying that the interaction between the two tasks strengthens incentives for both.

With the new cost function, the efficient bonus rates for a firm and a cooperative are:

$$b^*_{f(k)} = \frac{f_{1f}}{g_{1f}} \text{ and } b^*_{c(k)} = \frac{(f_{2c} - kf_{1c})}{g_{2c}}.$$

Plugging these results in the expressions for the CEO's equilibrium actions results in

$$a^*_{1f(k)} = \frac{f_{1f}}{1-k^2}, \ a^*_{2f(k)} = \frac{-kf_{1f}}{1-k^2},$$

$$a^*_{1c(k)} = \frac{-k(f_{2c} - kf_{1c})}{1-k^2}, \ a^*_{2c(k)} = \frac{f_{2c} - kf_{1c}}{1-k^2}.$$

Similarly, the equilibrium results for an upstream IOF are:

$$b^*_{uf} = f_2 / g_2, \ a^*_{1uf} = \frac{-k}{1-k^2} f_2, \text{ and } a^*_{2uf} = \frac{1}{1-k^2} f_2.$$