Cooperative CEO Identity and Efficient Governance: Member or Outside CEO?

Qiao Liang   George Hendrikse

November 22, 2012

Abstract

A principal-agent model is formulated to capture the efficiency of cooperatives with a member CEO and cooperatives with an employed outsider as CEO. Results of the model show that the incentive strength regarding the member CEO is stronger compared to that of the outside CEO in order to shift some effort of the member CEO from individual farming into the task of adding value to the cooperative enterprise. A cooperative with a member CEO is uniquely efficient when upstream and downstream tasks are substitutes to a certain extent, or complements. When the tasks are substitutes, the efficient CEO identity depends on the strength of the substitution effect and the difference of the marginal productivities between the two tasks. The scope of cooperatives with a member CEO being efficient becomes smaller when the substitution effect is at an intermediate level or the productivity difference between the two tasks is limited.

ERIM Report Series *Research in Management*	
ERIM Report Series reference number	ERS–2012–019
Date of publication	2012–11–22
Version	22–11–2012
Number of pages	31
Persistent URL for paper	`http://hdl.handle.net/1765/37879`
Email address corresponding author	ghendrikse@rsm.nl
Address	Erasmus Research Institute of Management (ERIM) RSM Erasmus University / Erasmus School of Economics Erasmus University Rotterdam PO Box 1738 3000 DR Rotterdam, The Netherlands Phone: +31104081182 Fax: +31104089640 Email: info@erim.eur.nl Internet: `http://www.erim.eur.nl`
Availability	The ERIM Report Series is distributed through the following platforms: RePub, the EUR institutional repository Social Science Research Network (SSRN) Research Papers in Economics (RePEc)
Classifications	The electronic versions of the papers in the ERIM Report Series contain bibliographic metadata from the following classification systems: Library of Congress Classification (LCC) Journal of Economic Literature (JEL) ACM Computing Classification System Inspec Classification Scheme (ICS)

Cooperative CEO Identity and Efficient Governance:

Member or Outside CEO?

Qiao Liang

George Hendrikse[1]

(*Forthcoming in Agribusiness*)

Abstract: A principal-agent model is formulated to capture the efficiency of cooperatives with a member CEO and cooperatives with an employed outsider as CEO. Results of the model show that the incentive strength regarding the member CEO is stronger compared to that of the outside CEO in order to shift some effort of the member CEO from individual farming into the task of adding value to the cooperative enterprise. A cooperative with a member CEO is uniquely efficient when upstream and downstream tasks are substitutes to a certain extent, or complements. When the tasks are substitutes, the efficient CEO identity depends on the strength of the substitution effect and the difference of the marginal productivities between the two tasks. The scope of cooperatives with a member CEO being efficient becomes smaller when the substitution effect is at an intermediate level or the productivity difference between the two tasks is limited. [EconLit Classification; D210; Q130].

---

[1] School of Economics, Zhejiang University, Zheda Road 38, 310007, Hangzhou, China, and Rotterdam School of Management, Erasmus University, Office T8-52, P.O. Box 1738, 3000DR Rotterdam, The Netherlands. E-mail: Liangqiao2323@126.com; Rotterdam School of Management, Erasmus University, Office T8-56, P.O. Box 1738, 3000DR Rotterdam, The Netherlands. E-mail: Ghendrikse@rsm.nl

1 INTRODUCTION

The changing economic environment has led many farmer cooperatives in both developed and developing countries to undertake substantial governance structure changes. Cooperatives adopt various strategies to adapt to different environments and situations. Among these various strategies, the management of cooperatives is regarded as an important tool affecting the economic performance of cooperatives (Fama, 1980; Cook, 1994). Cooperative management differs from the management of investor-owned firms (IOFs) due to the user-owner relationship. The management of an IOF focuses on the objective to maximize the capital investment return for investors, whereas the management of a cooperative has to take into consideration members' interests. Members' interests are more complex than those of owners of IOFs. Owners or members of cooperatives may have not only monetary interests in marketing, but also expectations like utilizing the cooperative services and finding a home for products. Another aspect of the management difference between cooperatives and IOFs is that managers in a cooperative may also be owners of the cooperative enterprise. A cooperative has therefore to choose as a manager either a member who has residual claim rights of the cooperative or an outsider who is purely employed without residual claim rights. These differences and possibilities will be reflected in the incentives facing the manager in the model presented in this article.

Cooperatives in different countries differ in the CEO identity. The management of most cooperatives in China is executed by members (Liang & Hendrikse, 2012). Very few cooperatives in China employ outsiders as CEOs. The reverse holds for cooperatives in western countries. Most cooperatives employ outside CEOs as well as outside directors. For example, Burress and Cook (2010) identified only one cooperative with a member CEO in their sample of

1000 cooperatives. This situation is more mixed in Spain and Brazil. These countries have cooperatives with member CEOs as well as cooperatives with outside CEOs.

Member CEOs usually have substantial capabilities in physical capital, marketing, management, or social relations, etc, compared to other common members. A member CEO has multiple roles: a member or supplier of the cooperative, a member of the management, a member of the board of directors, and/or a member of the board of supervisors of the cooperative[2], while other members are mainly producers, inputs suppliers, and residual claimants of the cooperative.

The identity and composition of the management and the board can have an impact on the performance of the cooperative (Cook, 1994; Lang 2002; Dunn et al., 2002). However, little is known about the influence of cooperative CEO identity on the efficiency of the coopertive. We examine the efficient CEO identity of the cooperative. A member CEO is incentivized by ownership and residual claim rights, while an outside CEO receives a fixed salary and a payment based on measured performance. An outside CEO is incentivized to care about member interests and the value of the cooperative enterprise, whereas a member CEO, as both input supplier and an agent, is in addition concerned with the value of his or her individual farm.

This paper addresses the following questions: 1) When is it efficient for a cooperative to delegate the management of the enterprise to a member instead of an outside CEO? 2) What is the optimal incentive intensity regarding each CEO in order to maximize the value of the cooperative enterprise? and 3) What is the optimal effort devoted to tasks by each CEO?

The paper is organized as follows. Theories regarding the management in cooperatives and differences of CEOs in cooperatives and in IOFs are addressed in section 2. Section 3 is

---

[2] Besides the member CEOs who are both farmers and managers, another type of member CEOs is also observed in cooperatives in China. This latter type of member CEO discards individual farming and focuses on the management of cooperatives. We focus on the former type of member CEO in this study.

dedicated to the model. Section 4 presents the equilibrium results. Efficient CEO identity and

task interdependencies are analyzed in section 5. Managerial productivity differences are

highlighted in section 6. Section 7 concludes.

2 THEORY

This section addresses the impact of the management and the board of an enterprise on its

performance (2.1) and identifies the differences between CEOs in cooperatives and IOFs (2.2).

2.1 Impact of The Management and The Board on Performance

The impact of the management and the board on enterprise performance is addressed in various

studies (Daily & Dalton, 1993; Haleblian & Finkelstein, 1993; Adams et al, 2008; Hillman et al,

2007). Board characteristics taken into account are size, composition, CEO duality, and the size

of the enterprise. Jensen (1993) suggests that smaller boards have a positive impact on

performance due to more effective monitoring. Haleblian and Finkelstein (1993) establish

empirically that firms with a large management team perform better. Moreover, firms with

dominant CEOs perform worse in a turbulent environment than in a stable environment. Board

composition refers to the distinction between inside and outside directors. Studies regarding the

relationship between the ratio of outside directors and firm performance vary from positive to

zero, to negative. Outside directors may extract and provide important sources from the

environment that are unavailable to inside directors (Daily & Dalton, 1993), while inside

directors have more information about their firm operation and may perform better when their

ownership stake is larger (Jensen & Meckling, 1976; Pearce, 1983). Daily and Dalton (1993)

address CEO duality, i.e. the CEO is also the chairperson of the board. They examine two forms

of management, i.e. entrepreneurial management and professional management, and find that

most founder-managed firms or firms with entrepreneurial management are likely to be

characterized by CEO duality. They establish that there is no significant relationship between CEO duality and firm performance. The size of the enterprise is also relevant. The management and the board of directors may be able to more directly influence organizational processes and outcomes in small firms than in large firms (Eisenhardt & Schoonhoven, 1990).

Attention has also been paid to specify management issues in farmer cooperatives (Cook, 1994; Lang 2002; Dunn et al., 2002; Bond, 2009, Burress et al., 2011; Burress & Cook, 2010 and so on). Examples are the role of the management, the compensation of the management, and the impact of the management on the performance of cooperative enterprise. Characteristics of the management and the board that have an effect on performance of cooperatives are size and composition of the board. Bond (2009) establishes that board size exerts a limited influence on the cooperative financial performance. Yet Lang (2002) points out that a reduction in board size can lead to greater accountability, less anonymity, and more efficient board meetings. A negative relationship between size and performance is also indicated by some empirical analyses (Burress & Cook, 2010; Burress et al., 2011). Agricultural cooperatives are restructuring towards more entrepreneurial organizations (Bijman & Doorneweert, 2008), as the market competition between enterprises is becoming more and more fierce.

Bond (2009) argues that cooperatives' boards may suffer from more severe governance problems than their corporate counterparts like IOFs due to the identity of directors. Identity of directors refers to inside directors who are members and outside directors who are non-members. Therefore inside directors and outside directors are also called owner-directors and non-member directors respectively. Owner-directors of cooperatives are often professionals in agricultural production technique and management. However, they are not always sufficiently professional in making sound decisions and firm management. Lang (2002) observes that even capable member

directors lack the range of skills needed on the board. In addition, owner-directors may use power to make decisions that benefit the individual at the expense of the cooperative enterprise (Dunn et al., 2000). The employment of full-time and professional board members therefore is recommended (Dunn et al., 2000; Bond, 2009). However, Burress and Cook (2010) think owner directors are more likely to make value-maximizing decisions because they bear the wealth effects of their actions. Besides, an active and engaged board contributes to higher performance of the cooperative. Burress et al. (2011) find no support for a relationship between board equity holdings and performance.

Ownership is an important factor in influencing job design and incentive contracting. The idea that stock ownership by management can reduce the underlying agency problem follows directly from agency theory. More stock owned by the management provides stronger motivation to work and raises the value of the firm's stock (Hermalin & Weisbach, 1991). When the agent owns the asset returns, he or she will be more motivated to pursuing the value of the asset (Holmström & Milgrom, 1991). Therefore low-powered incentives may be sufficient to motivate the agent. Holmström and Milgrom (1991) further elaborate the favorable conditions for an agent to own the assets, i.e. that the agent is not too risk averse, the variance of asset returns is low, and the variance of measurement error in other aspects of the agent's performance is low.

2.2 CEOs in Cooperatives Versus Investor-Owned Firms

CEOs play a significant role in the performance of an organization (Thomas, 1988). CEOs' behavior, compensation, and their relationship with performance are studied frequently by applying the principal-agent model (Tosi Jr. & Gomez-Mejia, 1989; Garen, 1994; Haubrich, 1994; Wang 1997). Agency relationships exist whenever an individual or organization (the agent) acts on behalf of another (the principal) (Ortmann & King, 2007). Principal-agent problems arise

because the interests of the agent are usually not the same as the interests of the principal. The agent may therefore not completely pursue the interests of the principal (Royer, 1999; Sykuta & Chaddad, 1999).

Most principal-agent studies focus on CEOs in corporations or investor-owned firms, rather than user-owned cooperatives. The relationship in cooperatives is more complex than that in IOFs (Staatz, 1987; Cook, 1994; Royer, 1999; Huang, 2008). There are various reasons, like memberships in cooperatives are more heterogeneous than shareholders in an IOF (Staatz, 1987; Royer, 1999); sometimes a CEO in a cooperative has dual identities, an agent and meanwhile a member (Huang, 2008); cooperatives have to take the interests of two stages of production into account (Feng & Hendrikse, 2012), and so on. CEOs in cooperatives and in IOFs are different in terms of several dimensions. Firstly, CEOs of a cooperative and an IOF have different objectives. CEOs in a cooperative maximize returns to patron members, while CEOs in IOFs try to maximize returns to investors (Hueth & Marcoul, 2009). Members are users and in the meantime owners of the cooperative enterprise. Members therefore have at least two sets of concerns, i.e. owner concerns and user concerns (Feng & Hendrikse, 2012). Owner concerns involve the security and overall profitability of their investments in the cooperative, while user concerns are issues of the pricing and quality of product and services. CEOs in cooperatives therefore bring the downstream enterprise to value and in the meantime serve upstream member interests.

Secondly, incentive mechanisms between the CEOs' performance in a cooperative and in an IOF are different. The distinguishing feature of a cooperative's residual rights, their restriction to the patron agents, prevents them from being publicly listed, which leads to the absence of marketable common stock in cooperatives (Staatz, 1987; Royer, 1999; Hendrikse, 2007; Feng & Hendrikse, 2012). Therefore the value of cooperative enterprises is not easy to be measured and

subsequently designing incentive contracts for a cooperative CEO seems not easy. The compensation for CEOs in cooperatives is expected to be less reliant on performance incentives (Hueth & Marcoul, 2009). Feng and Hendrikse (2012) examine the different roles of a CEO in a cooperative and a CEO in an IOF, taking into account the absence of public listing of a cooperative. They determine the circumstances where cooperatives and IOFs are respectively efficient in a multi-task principal-agent model. There are two concerns that a CEO of a cooperative cares about, bringing the downstream enterprise to value and serving upstream member interests. They consider only the case of a cooperative with an outsider as CEO. However, many cooperatives, especially in China, Spain, and Brazil, have one of the members as a CEO, rather than employing an outsider. A member CEO not only devotes attention to member interests and enterprise value, but also dedicates effort to his or her individual farm. Out model is geared towards the implication of the distinction between a member CEO and an outside CEO.

3 MODEL

A principal-agent model is formulated to capture the efficiency of cooperatives with different CEOs: a member CEO and an outside CEO. A member CEO has a dual identity in being a CEO as well as a member of the cooperative. We assume that members are on the one hand independent input suppliers and on the other hand residual claimants of the enterprise. Members therefore receive incomes of both individual farming and allocated revenue of the downstream enterprise's profits.

A cooperative either has a member CEO or an outside CEO. They are distinguished by their activities. A member CEO allocates efforts between the two tasks of individual farming and enterprise's value adding activities, while an outside CEO has no farming activities and focuses

therefore only in value adding activities at the cooperative enterprise. [3] Assume that the membership size of a cooperative is n. Let n^m be the number of members not being CEO. Therefore $n^m = n - 1$ in the cooperative with a member CEO, while $n^m = n$ in the cooperative with an outside CEO. A member not being CEO devotes all his or her effort to individual farming. Both the member CEO and the outside CEO are assumed to be risk-neutral.

The production function of the CEO is

$$y^c = f_U a_U^c + f_D a_D^c,$$

where a_U^c and a_D^c are the CEO's effort in the upstream farming task and effort in the downstream value adding activities respectively, and f_U and f_D are the marginal productivities of the upstream farming activity and downstream value adding activity. Each activity is nonnegative.

A member not being CEO devotes all his or her effort to individual farming. The production function of member j is

$$y^j = f_U a_U^j,$$

where a_U^j is the upstream production activity of member j, $j = 1, 2, \ldots, n^m$.

Assume that the function of personal cost related to each player's activities is:

$$c(i) = \frac{\left(a_U^i\right)^2}{2} + k a_U^i a_D^i + \frac{\left(a_D^i\right)^2}{2},$$

where $-1 < k < 1$ (Dixit, 2002; Feng & Hendrikse, 2012) and $i = c, j$, $c = out, in$ and $j = 1, 2, \ldots, n$. The parameter k captures the interdependencies between upstream farming and downstream value adding activities. If k is positive (negative), then the two activities are substitutes (complements). When the two activities are substitutes, more effort in one activity increases the marginal cost of the other. An example is that the more time spent on farming, the

---

[3] An extended model may distinguish three tasks for a member CEO and two tasks for an outside CEO. The three tasks of the member CEO are individual farming, advancing upstream members' interests, and downstream value adding. The outside CEO does not have the individual farming task. We do not present this extended model because the equilibrium results of the model with extended tasks are the same as in the current model.

less time a CEO spends on marketing. When the two activities are complements, more effort in one activity benefits the other activity. An example is the coordination between production and processing. Production according to standardized quality may one the one hand reduce the cost of grading and on the other hand enhance value-added processing.

Assume that the wage paid to the CEO is a linear function, i.e. $w = s + bf_D a_D^c$, where s refers to the fixed salary and b captures the bonus rate based on measured performance of the CEO. The payoff (utility) function of member j consists of his or her farm payoff and the residual claim payoff, that is

$$\pi^j = f_U a_U^j + (\frac{1-b}{n} f_D a_D^c - \frac{s}{n}) - \frac{\left(a_U^j\right)^2}{2}.$$

The payoff (utility) function of the outside CEO is

$$\pi^{out} = s + b^{out} f_D a_D^{out} - \frac{\left(a_D^{out}\right)^2}{2}.$$

The payoff (utility) function of the inside member CEO consists of his or her income from being a member and his or her wage as CEO, that is

$$\pi^{in} = f_U a_U^{in} + (\frac{1-b^{in}}{n} f_D a_D^{in} - \frac{s}{n}) + s + b^{in} f_D a_D^{in} - \left[\frac{\left(a_U^{in}\right)^2}{2} + k a_U^{in} a_D^{in} + \frac{\left(a_D^{in}\right)^2}{2}\right].$$

The total surplus of the n^m members is

$$\pi^m = \Sigma_{j=1}^{n^m}\left[f_U a_U^j + \frac{1-b}{n} f_D a_D^{in} - \frac{s}{n} - \frac{\left(a_U^j\right)^2}{2}\right].$$

Total surplus, i.e. the payoff of the CEO and the n^m members, is

$$\pi_T^c = \pi^c + \pi^m,$$

where $c = out, in$. We have therefore

$$\pi_T = \Sigma_{j=1}^{n^m} f_U a_U^j + f_U a_U^c + f_D a_D^c - \left[\Sigma_{j=1}^{n^m} \frac{\left(a_U^j\right)^2}{2} + \frac{\left(a_U^c\right)^2}{2} + k a_U^c a_D^c + \frac{\left(a_D^c\right)^2}{2}\right].$$

The game consists of two stages. In the first stage, incentives of the CEO are determined. In the second stage, the CEO and the members choose simultaneously activities that maximize their payoff.

4 EQUILIBRIUM

The backward induction method is used to solve the game. First, the payoff maximizing activities of the players are determined, given the incentive strength. The equilibrium incentive strength in the CEOs' compensation is determined next.

Each member chooses the effort to $max_{a_U^j} \pi^j$ and simultaneously the CEO chooses his or her optimal effort by maximizing his or her payoff, i.e. $max_{a_U^c, a_D^c} \pi^c$. In the cooperative with an outsider as CEO, the payoff maximizing activity of the CEO is $a_D^{out^*} = b^{out} f_D$, while in the cooperative with a member CEO, the payoff maximizing activities of the member CEO are

$$a_U^{in^*} = \left[f_U - \frac{(1+nb^{in}-b^{in})}{n} k f_D \right] / (1-k^2) \quad \text{and} \quad a_D^{in^*} = \left[\frac{(1+nb^{in}-b^{in})}{n} f_D - k f_U \right] / (1-k^2) .$$ The

payoff maximizing activity of member j in both the cooperative with an outside CEO and the cooperative with a member CEO is $a_U^{j^*} = f_U$.

Neither the activities of the outside CEO nor the activities of each member is influenced by the membership size. However, the activities of the member CEO are affected by the membership size. The surplus produced by the member CEO's downstream task is distributed to the whole membership. The larger the membership size, the less effort the member CEO puts into the downstream task, given the level of bonus rate. However, if all the surplus from the downstream task is allocated to the member CEO, then the activities of the member CEO are independent of the membership size.

The members are the principals. They choose the bonus rate that maximizes their total payoff.

Anticipating the activities of the CEO, the principals chooses a bonus rate to motivate the CEO. Suppose that b^{c^*}, where $c = out, in$, is the bonus rate that maximizes the payoff of the membership. The identity of the principals differs between the two cooperatives. Consider first the cooperative with an outside CEO. The equilibrium bonus rate is $b^{out^*} = 1/2$. Activities of both the CEO and each member are independent of the membership size. The bonus rate is therefore independent of the membership size as well.

In the cooperative with a member CEO, both the member CEO and members are the principals. The equilibrium bonus rate in the cooperative with a member CEO is $b^{in^*} = 1$. Since the payoff of the member CEO is included as part of the total payoff of the members and the CEO has the rights to choose the bonus rate for himself as well, a stronger incentive leads to a higher surplus of the cooperative.

The incentive intensity regarding the member CEO is stronger compared to the outside CEO. This result is distinct from, but closely related to, the observation of Holmstrom and Milgrom (1991) that the incentives offered to employees in firms are lower than that offered to independent contractors. Employees in their model have no ownership rights over the asset, while contractors use and develop their own assets and they shoulder risks of the asset. The member CEO therefore needs a higher incentive. In addition, the member CEO's farming task is regarded by the membership as an outside or private activity of the member CEO, whereas the surplus produced by the downstream task belong to the cooperative. A higher bonus rate therefore is needed to motivate the member CEO to devote effort to the downstream task over the upstream task.

The total surplus, and its composition, is determined by plugging the equilibrium value of the

various activities in the surplus expression.[4] The total surplus when the cooperative has an outsider as CEO is

$$\pi_T^{out} = \frac{n f_U^2}{2} + \frac{3 f_D^2}{8}.$$

The total surplus when the cooperative has a member CEO is

$$\pi_T^{in} = \frac{f_U^2 + f_D^2 - 2k f_U f_D}{2(1-k^2)} + \frac{(n-1) f_U^2}{2}.$$

5 EFFICIENT CEO IDENTITY AND TASK INTERDEPENDENCIES

Let $\Delta\pi = \pi_T^{in} - \pi_T^{out}$, i.e. $\Delta\pi$ captures the difference in surplus between the cooperative with a member CEO and the cooperative with an outside CEO in equilibrium. We have therefore

$$\Delta\pi = \frac{\left(4 f_U^2 + 3 f_D^2\right) k^2 - 8k f_U f_D + f_D^2}{8(1-k^2)}.$$

If there is no interdependency between the upstream farming activity and the downstream value adding activity, i.e. $k = 0$, the payoff difference $\Delta\pi = \frac{f_D^2}{8}$ is non-negative. Therefore the cooperative with a member CEO is always efficient, if there is no interdependency between the member CEO's upstream farming task and downstream value adding task. When the two tasks are complements, i.e. $-1 < k < 0$, the cooperative with a member CEO is the unique efficient governance structure, i.e. $\Delta\pi > 0$.

When the two tasks are substitutes, i.e. $0 < k < 1$, the efficient CEO identity depends on both the substitution effect between tasks and the marginal productivity of tasks. There are two reasons why a cooperative with a member CEO may become inefficient when tasks are substitutes: the size of the substitution effect and productivity differences between tasks. The first reason is a high level of k. This increases the cost level. The effort that the member CEO puts in one task will increase the cost of the other task, which is disadvantageous to the cooperative with

---

[4] The surpluses of the various players are presented in the Appendix.

a member CEO. The disadvantageous substitution effect is compensated for by the stronger

incentive for the member CEO when k is small. In addition, the member CEO tends to put most

effort in one task when k is quite large to eliminate the disadvantage caused by the substitution

effect. Therefore when the two tasks are substitutes, the cooperative with a member CEO is

efficient if $0 < k < \dfrac{4f_U f_D - \sqrt{12(f_U f_D)^2 - 3f_D{}^4}}{4f_U{}^2 + 3f_D{}^2}$ or $\dfrac{4f_U f_D + \sqrt{12(f_U f_D)^2 - 3f_D{}^4}}{4f_U{}^2 + 3f_D{}^2} < k < 1$, whereas the

cooperative with an outside CEO is efficient at intermediate levels, i.e.

$k \in \left(\dfrac{4f_U f_D - \sqrt{12(f_U f_D)^2 - 3f_D{}^4}}{4f_U{}^2 + 3f_D{}^2}, \dfrac{4f_U f_D + \sqrt{12(f_U f_D)^2 - 3f_D{}^4}}{4f_U{}^2 + 3f_D{}^2} \right)$, subject to $f_D/f_U < 2$.

The second reason for the inefficiency of a cooperative with a member CEO is the productivity

difference between alternative tasks. The cooperative with a member CEO may be efficient when

the productivity difference between tasks is large because the CEO can devote most effort to the

task with higher productivity. Besides, the stronger incentive for the member CEO creates an

advantageous impact. To be more specific, if the ratio of the value adding task's marginal

productivity to the farming task's marginal productivity, f_D/f_U, is larger than $\dfrac{4k + 2k\sqrt{3(1-k^2)}}{1+3k^2}$ or

smaller than $\dfrac{4k - 2k\sqrt{3(1-k^2)}}{1+3k^2}$, then a cooperative with a member CEO is efficient. However, if the

ratio f_D/f_U is between $\dfrac{4k - 2k\sqrt{3(1-k^2)}}{1+3k^2}$ and $\dfrac{4k + 2k\sqrt{3(1-k^2)}}{1+3k^2}$, then a cooperative with an outsider as

CEO is uniquely efficient.

Efficient governances as a function of the level of the task interdependencies and the

productivity differences are depicted in Figure 1. A cooperative with an outside CEO is efficient

in the grey area, while a cooperative with a member CEO is efficient outside the gray area.

15

The complementarity between tasks provides an advantage to the cooperative with a member CEO. The effort that the member CEO devotes to one task reduces the cost of the other task, which determines the attractiveness of the cooperative with a member CEO. Cooperatives with member CEOs are therefore uniquely efficient when $k < 0$.

All the members, in both the cooperative with a member CEO and the cooperative with an outside CEO, devote the same effort f_U to their farming. The member CEO receives a stronger bonus incentive than the outside CEO. The member CEO therefore provides more effort than the outside CEO, both on the individual farming task and on the enterprise's value adding task. The cooperative with a member CEO is also efficient when $k = 0$.

The substitution effect creates additional cost of one task by devoting effort to the other task. Tasks being substitutable therefore have an unfavorable impact on the cooperative with a member CEO since the member CEO has multiple tasks while the outside CEO focuses on one task. The cooperative with a member CEO therefore is still desirable when the substitution effect is very small because the stronger incentive effect more than compensates for the disadvantageous substitution effect. As the substitution effect increases, the cooperative with an outside CEO is likely to become an efficient governance structure due to the disadvantage in the costs of the member CEO. However, if the substitution effect increases to such an extent that the member CEO would devote most effort in one task and little or no effort in another, the cooperative with a member CEO is desirable again.

When the productivity of the downstream task is more than double the productivity of the upstream task, the cooperative with a member CEO is always efficient. There are two reasons.

16

First, the effort allocation of the member CEO would be skewed to the downstream task because of its high productivity. Second, the stronger incentive motivates the member CEO to devote more effort to the downstream task. However, the cooperative with a member CEO may become inefficient due to the productivity difference between alternative tasks is limited. It elicits similar levels of activity, and therefore a high level of the interaction term in the cost function. Another way of formulating this argument is that the disadvantage of the substitution effect is prevented in a cooperative with a member CEO by allocating effort to only one task, the one with the higher marginal productivity. This occurs when the difference of the marginal productivity between the two tasks is sufficiently large. For example, if the marginal productivity of the value adding business activities is much higher than that of farming, then the member CEO would devote most of his or her effort to the value adding task and little effort to the farming task. If the marginal productivity of farming is much higher than that of the downstream value adding activities, the member CEO would invest as much effort as possible in his or her individual farming task and little effort in the value adding task. As a consequence, the disadvantage derived from the two tasks being substitutable would be counterbalanced by allocating most of the effort to the task with the high marginal productivity.

6 MANAGERIAL PRODUCTIVITY DIFFERENCES

The efficiency of enterprises with different identities of managers as well as directors of cooperatives has always been discussed. LeVay (1983) argues that farmer directors of farmer cooperatives are more production-oriented, while outside experts are more market-oriented. Outside directors have more information regarding the external market environment (Burress et al., 2011). In addition, Lind (2011) thinks that farmer directors lack knowledge regarding markets as well as product development. Therefore, we may have to consider the case when the

member CEO and the outside CEO differ regarding the marginal productivity of the value-adding task. According to Hermalin and Weisbach (1991), outside directors do a better job of acting in shareholders' interests than insiders when it comes to certain aspects of their jobs such as external information acquisition, whereas insiders are more likely to be preferred in other aspects such as information about the enterprise. Cook (1994) maintains that technical industry skills must be balanced with exceptional communication skills (such as conflict resolution, resource allocation, and information spokesperson) and the ability to develop group cohesiveness. This section addresses how the equilibrium results and the efficient governance structure depend on productivity differences between a member CEO and an outside CEO regarding the downstream task. The current model assumes that the member CEO and the outside CEO have the same marginal product with regard to the downstream value adding activity. However, a member CEO may be not as capable as a specialized outside CEO in the value-adding task. Denote the marginal productivities of the downstream value adding activities of the member CEO and the outside CEO to be f_D^{in} and f_D^{out} respectively. Then the equilibrium total payoff of the cooperative with a member CEO is $\pi_T^{in} = \frac{f_U^2 + (f_D^{in})^2 - 2kf_U f_D^{in}}{2(1-k^2)} + \frac{(n-1)f_U^2}{2}$, while the total payoff of the cooperative with an outside CEO is $\pi_T^{out} = \frac{nf_U^2}{2} + \frac{3(f_D^{out})^2}{8}$. As previously defined, $\Delta\pi = \pi_T^{in} - \pi_T^{out}$. Therefore when $f_D^{out} > \left| \frac{2}{\sqrt{3(1-k^2)}}(f_D^{in} - kf_U) \right|$, the cooperative with an outside CEO is efficient, and vice versa.[5]

The relationship between efficient CEO identity and downstream marginal productivity differences are investigated now. Distinguish the cases no interdependency, complementarity, and substitution between the upstream and downstream tasks. Figure 2 depicts the relationship

---

[5] The Appendix provides the expressions for the total payoffs when the downstream maginal productivities differ.

when tasks are independent. When $k=0$, we have $f_D^{out} = \frac{2}{\sqrt{3}} f_D^{in}$. The cooperative with an outside

CEO is efficient if $f_D^{out} > \frac{2}{\sqrt{3}} f_D^{in}$, while the cooperative with a member CEO is efficient if

$f_D^{out} < \frac{2}{\sqrt{3}} f_D^{in}$. A cooperative with an outside CEO is efficient if it is located in the grey area

above the line $f_D^{out} = \frac{2}{\sqrt{3}} f_D^{in}$. It is located above the dotted line $f_D^{out} = f_D^{in}$. This is in line with

Figure 1, i.e. when $k=0$ and CEOs have identical marginal productivity of the downstream task,

the cooperative with a member CEO is efficient.

Insert Figure 2 about here

Figure 3 depicts the relationship when tasks are complements. When $-1<k<0$, the cooperative

with an outside CEO is efficient if $f_D^{out} > \frac{2}{\sqrt{3(1-k^2)}} f_D^{in} - \frac{2kf_U}{\sqrt{3(1-k^2)}}$, i.e. if it is located in the grey

area above the line $f_D^{out} = \frac{2}{\sqrt{3(1-k^2)}} f_D^{in} - \frac{2kf_U}{\sqrt{3(1-k^2)}}$. It becomes steeper as k decreases. The value

of the slope is between $\left(\frac{2}{\sqrt{3}}, \infty\right)$. The line $f_D^{out} = \frac{2}{\sqrt{3(1-k^2)}} f_D^{in} - \frac{2kf_U}{\sqrt{3(1-k^2)}}$ is located above the

dotted line $f_D^{out} = f_D^{in}$. This result is consistent with Figure 1, i.e. when $k<0$ and CEOs are

identical in marginal productivity of downstream task, the cooperative with a member CEO is

uniquely efficient.

Insert Figure 3 about here

Figure 4 depicts the relationship when tasks are substitutes. When $0<k<1$, the cooperative with

an outside CEO is efficient if $f_D^{out} > (kf_U - f_D^{in}) \frac{2}{\sqrt{3(1-k^2)}}$ subject to $f_D^{in} < kf_U$, while the

cooperative with an outside CEO is efficient if $f_D^{out} > \frac{2}{\sqrt{3(1-k^2)}}(f_D^{in} - kf_U)$ subject to $f_D^{in} >$

kf_U. The cooperative with an outside CEO is therefore efficient if it is located in the grey area

above the two lines. Both lines will be steeper as k increases. The intercept increases as k

increases. There are two intersection points between the line $f_D^{out} = \left| \frac{2}{\sqrt{3(1-k^2)}}f_D^{in} - \frac{2kf_U}{\sqrt{3(1-k^2)}} \right|$

and the dotted line $f_D^{out} = f_D^{in}$. The intersection point A is characterized by $f_D^{out} = f_D^{in} =$

$\frac{4k - 2k\sqrt{3(1-k^2)}}{1+3k^2} f_U$, while point B is characterized by $f_D^{out} = f_D^{in} = \frac{4k + 2k\sqrt{3(1-k^2)}}{1+3k^2} f_U$. This is in

line with figure 1.

Insert Figure 4 about here

The relationship between efficient CEO identity, task interdependence, and the downstream

productivity differences is summarized in Figure 5. The cooperative with an outside CEO is

efficient when it is located in the grey area above the curve. Given f_D^{out}/f_D^{in}, there is more scope

for cooperatives with member CEOs being efficient when the upstream and downstream tasks

are complementary, interdependent, or when the substitution effect is small or large. Given k,

there is more scope for cooperatives with member CEOs being efficient when the difference

between the marginal productivities of outsiders and member CEOs is small.

When $\frac{f_D^{out}}{f_D^{in}} = 1$, the efficient governance structure depends on both k and the productivity

difference between upstream and downstream tasks. If $f_D > 2f_U$, then the cooperative with a

member CEO is uniquely efficient. If $f_D < 2f_U$, then the cooperative with a member CEO is

efficient when k is small or large. Otherwise the cooperative with an outside CEO is efficient.

This is in line with observations from Figure 1. Suppose that dotted line C reflects $\frac{f_D^{out}}{f_D^{in}} = 1$ when $f_D < 2f_U$, while the dotted line D reflects $\frac{f_D^{out}}{f_D^{in}} = 1$ when $f_D > 2f_U$. The curve $\Delta\pi = 0$ therefore has two intersection points with the line $\frac{f_D^{out}}{f_D^{in}} = 1$ when $f_D < 2f_U$ and has no intersection point with the line $\frac{f_D^{out}}{f_D^{in}} = 1$ when $f_D > 2f_U$.

Insert Figure 5 about here

Take cooperatives in China as an example to illustrate the results of the model. Cooperatives in China are generally in the start-up stage and most cooperative enterprises are characterized by small membership size and locality. Most cooperatives only have the first-stage processing such as packing rather than further processing. There is either no significant interaction, or a small negative (substitute) interdependency effect between the upstream farming and the downstream value adding activities. Cooperatives in China therefore favor member CEOs over outside CEOs. However, when cooperatives have been developing for many decades or even more than a century, they have a highly advanced and complicated value adding business. Most cooperatives in the Western world belong to this type. Given the limited time of a member CEO, the substitution effect between alternative businesses is large and a professional management therefore is necessary.

In addition, it is difficult for farmer cooperatives in China to sufficiently motivate outside professionals due to the under-development of cooperative enterprises. Professionals with high productivity would like to choose large companies rather than farmer cooperatives. Outside professionals willing to work in cooperatives may not be characterized by high productivity. The

difference in productivities between member CEOs and outside professionals is small. Hence, cooperatives in China benefit from member CEOs. Nevertheless, as cooperatives in China develop in terms of member heterogeneity and enterprise size, and as the intensity of marketing competition increases, more and more member CEOs who lack professionalized training in marketing and management feel it beyond their capabilities to take charge of the marketing or the running of cooperative enterprises. Outside CEOs may become a good choice.

7 CONCLUSIONS

Management behavior in cooperatives is different from that in investor-owned firms. One of the distinctive features is that the manager in a cooperative can meanwhile be a member, and therefore an owner, of the cooperative enterprise. We compare the efficiency of a cooperative with a member as CEO and a cooperative with an outsider as CEO. Results of the model show that CEO identity, either a member of the cooperative or an employed outsider, affects the economic performance of the cooperative. The condition in which a member CEO or an outside CEO is efficient depends on marginal productivities of the upstream and downstream tasks, as well as the relationship between upstream farming and downstream value adding tasks.

When the tasks are complementary and when alternative CEOs have the same marginal productivity regarding the downstream value adding activity, a cooperative with a member CEO is always efficient, compared to a cooperative with an outside CEO. The efficiency of CEO identity depends on the marginal productivities as well as the size of the substitution effect between upstream and downstream tasks. In cases where the difference of the marginal productivity between upstream and downstream tasks are sufficiently large and/or where the substitution effect of upstream and downstream tasks is sufficiently small or large, cooperatives with member CEOs are efficient. Otherwise, cooperatives with outside CEOs are efficient.

CEOs with different identities may differ in marginal productivity regarding the downstream value-adding activities. Outside CEOs tend to be more professional in management and marketing, while member CEOs are likely to be more production-oriented. Therefore, the scope for cooperatives with member CEOs being uniquely efficient becomes smaller when the marginal productivity of outside CEOs' value adding activity is larger than that of member CEOs' value adding activity, and vice versa. The interdependency between upstream and downstream tasks matters to the efficiency of alternative governance structures as well. When the two tasks are complements, as the interdependence becomes stronger, the scope that cooperatives with member CEOs being efficient becomes larger. Yet when the effect of the substitution effect between the two tasks is small or large, the scope that cooperatives with member CEOs being efficient is relatively large.

REFERENCES

Adams, R., Hermalin B., & Weisbach, M. (2008). The role of boards of directors in corporate governance: A conceptual framework and survey. National Bureau of Economic Research Cambridge, Mass., USA.

Bijman, J. & Doorneweert, B. (2008, August). Entrepreneurship, Collective Entrepreneurship and the Producer-Owned Firm. Paper presented at the 12th Congress of the European Association of Agricultural Economists, Ghent, Belgium.

Bond, J.K. (2009). Cooperative financial performance and board of director characteristics: A quantitative investigation. Journal of Cooperatives, 22: 22-44.

Burress, M.J. & Cook, M.L. (2010). Director development and board-CEO relations: Do recommendations from corporate governance apply to the agribusiness cooperative? Working paper, Missouri University.

Burress, M.J., Cook, M.L., & O Brien, D.J. (2011). Governing agribusiness: The impact of board structure and process on performance of producer-owned agribusinesses. Working paper, Missouri University.

Cook, M.L. (1994). The role of management behavior in agricultural cooperatives. Journal of Agricultural Cooperation, 9: 42-58.

Daily, C.M. & Dalton D.R. (1993). Board of directors leadership and structure: Control and performance implications. Entrepreneurship Theory and Practice, 17: 65-65.

Dixit, A. (2002). Incentives and organizations in the public sector: An interpretative review. Journal of Human Resources, 37(4): 696-727.

Dunn, J.R. (2002). Agricultural cooperatives in the 21st century. Report, US Dept. of Agriculture, Rural Business--Cooperative Service.

Eisenhardt, K.M. & Schoonhoven, C.B. (1990). Organizational growth: Linking founding tem, strategy, environment, and growth among U.S. semiconductor ventures, 1978-1988. Administrative Science Quarterly, 35(3): 504-529.

Fama, E.F. (1980). Agency Problems and the theory of the firm. The Journal of Political Economy, 88(2): 288-307.

Feng, L. & Hendrikse, G.W.J. (2012). Chain interdependencies, measurement problems and efficient governance structure: Cooperatives versus publicly listed firms. European Review of Agricultural Economics, 39(2): 241-255.

Garen, J.E. (1994). Executive compensation and principal-agent theory. Journal of Political Economy, 102(6): 1175-1199.

Haleblian, J. & Finkelstein, S. (1993). Top management term size, CEO dominance, and firm performance: The moderating roles of environmental turbulence and discretion. The Academy of Management Journal, 36(4): 844-863.

Haubrich, J.G. (1994). Risk aversion, performance pay, and principal-agent problem. Journal of Political Economy, 102(2): 258-276.

Hendrikse, G.W.J. (2007). Two vignettes regarding boards in cooperatives versus corporations: Irrelevan and Incentives. In K. Karantininis & J. Nilsson (Eds.), Vertical Markets and Cooperative Hierarchies (pp.137-150). Springer.

Hermalin, B.E. & Weisbach, M.S. (1991). The effects of board composition and direct incentives on firm performance. Financial Management, 20 (4): 101-112.

Hillman, A.J., Shropshire, C., & Cannella, A.A. (2007). Organizational predictors of women on corporate boards. The Academy of Management Journal ARCHIVE, 50(4): 941-952.

Holmström, B. & Milgrom, P. (1991). Multitask principal-agent analyses: incentive contracts,

asset ownership, and job design. Journal of Law, Economics, and organization, 7 (special issue): 24-52.

Huang, S. (2008). Analysis on the behavior of farmer cooperatives in transforming time in China. Zhejiang University Press.

Hueth, B. & Marcoul, P. (2009). Incentive pay for CEOs in cooperative firms. American Journal of Agricultural Economics, 91(5): 1218-1223.

Jensen, M.C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. Journal of Finance, 48(3): 831-880.

Jensen, M.C. & Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of financial economics, 3(4): 305-360.

Lang, M.G. (2002). Strengthening agricultural cooperatives: An inquiry into expert beliefs. Report, Center for Cooperatives, University of California.

LeVay, C. (1983). Agricultural co-operative theory: A review. Journal of Agricultural Economics, 34(1): 1-44.

Liang, Q. & Hendrikse, G.W.J. (2012). Core and common members in the genesis of farmer cooperatives in China. Managerial and Decision Economics, forthcoming.

Lind, L.W. (2011). Market orientation of the Swedish pork sector. Diss. Uppsala: Swedish Universtity of Agricultural Sciences.

Ortmann, G.F. & King, R.P. (2007). Agricultural cooperatives I: History, theory and problems. Agrekon, 46(1): 40-68.

Pearce, J.A. (1983). The relationship of internal versus external orientations to financial measures of strategic performance. Strategic Management Journal, 4(4): 297-306.

Royer, J.S. (1999). Co-operative organisational strategies: A neo-institutional digest. Journal of

Cooperatives, 14(1): 44-67.

Staatz, J.M. (1987). The structural characteristics of farmer cooperatives and their behavioral consequences. In J.S. Royer (Ed.), Cooperative theory: New approaches (pp.87-107). ACS Service Report No. 18, USDA, Washington D.C.

Sykuta, M.E. & Chaddad, F.R. (1999). Putting theories of the firm in their place: A supplemental digest of the new institutional economics. Journal of Cooperatives, 14: 68-76.

Thomas, A. (1988). Does leadership make a difference to organizational performance? Administrative Science Quarterly, 33(3): 388-400.

Tosi Jr., H.L. & Gomez-Mejia, L.R. (1989). The decoupling of CEO pay and performance: An agency theory perspective. Administrative Science Quarterly, 34(2): 169-189.

Wang, A. (1997). Incentives, CEO compensation, and shareholder wealth in a dynamic agency model. Journal of Economic Theory, 76(1): 72-105.

Appendix

Expressions for the surplus of the players

The equilibrium payoff of the outside CEO is

$$\pi^{out} = s + \frac{f_D{}^2}{8}.$$

The equilibrium payoff of the members in the cooperative with an outside CEO is

$$\pi^m = \frac{n}{2} f_U{}^2 + \frac{f_D{}^2}{4} - s.$$

The total surplus when the cooperative has an outsider as CEO is

$$\pi_T^{out} = \frac{n f_U{}^2}{2} + \frac{3 f_D{}^2}{8}.$$

The equilibrium payoff of the member CEO is

$$\pi^{in} = \frac{n-1}{n} s + \frac{f_U{}^2 + f_D{}^2 - 2k f_U f_D}{2(1-k^2)}.$$

The equilibrium payoff of the members in the cooperative with a member CEO is

$$\pi^m = \frac{(n-1) f_U{}^2}{2} - \frac{n-1}{n} s.$$

The total surplus when the cooperative has a member CEO is

$$\pi_T^{in} = \frac{f_U{}^2 + f_D{}^2 - 2k f_U f_D}{2(1-k^2)} + \frac{(n-1) f_U{}^2}{2}.$$

Total payoffs when the downstream marginal productivities differ

The total payoff of the cooperative with a member CEO is

$$\pi_T^{in} = \frac{f_U{}^2 + (f_D^{in})^2 - 2k f_U f_D^{in}}{2(1-k^2)} + \frac{(n-1) f_U{}^2}{2},$$

while the total payoff of the cooperative with an outside CEO is

$$\pi_T^{out} = \frac{n f_U{}^2}{2} + \frac{3(f_D^{out})^2}{8}.$$

As previously defined, $\Delta\pi = \pi_T^{in} - \pi_T^{out}$. Therefore

$$\Delta\pi = \pi_T^{in} - \pi_T^{out} = \frac{(f_D^{in})^2 - 2kf_U f_D^{in} + f_U{}^2}{2(1-k^2)} - \frac{f_U{}^2}{2} - \frac{3(f_D^{out})^2}{8}.$$

We rewrite $\Delta\pi$ as

$$\Delta\pi = \frac{(f_D^{in} - kf_U)^2}{2(1-k^2)} - \frac{3(f_D^{out})^2}{8}.$$

Let $\Delta\pi = 0$. We have $\frac{(f_D^{in} - kf_U)^2}{2(1-k^2)} - \frac{3(f_D^{out})^2}{8} = 0$, i.e. $f_D^{out} = \left|\frac{2}{\sqrt{3(1-k^2)}}(f_D^{in} - kf_U)\right|$.

Hence, when $f_D^{out} > \left|\frac{2}{\sqrt{3(1-k^2)}}(f_D^{in} - kf_U)\right|$, the cooperative with an outside CEO is efficient,

and vice versa.