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STRATEGIC DELEGATION IN CONSUMER COOPERATIVES UNDER MIXED OLIGOPOLY

MICHAEL KOPEL AND MARCO A. MARINI

ABSTRACT. The main aim of this paper is to study the propensity of consumer cooperatives (Coops) to use incentive schemes in situations of strategic interaction with profit-maximizing firms (PMFs). Our model provides a reason why Coops are less prone than PMFs to pay variable bonuses to their managers. We show that this occurs under price competition when in equilibrium the Coop prefers to pay a flat wage to its manager relying instead on her intrinsic motivation, whereas the profit-maximizing rival adopts a variable, high-powered incentive scheme. The main rationale is that, by recruiting a manager whose preferences are aligned with the company goals (e.g., a consumer-owner), the Coop is *per se* highly expansionary in term of output. Therefore, the Coop does not need to rely on an externally hired manager who sets prices aggressively to expand market share and quantity. Furthermore, adopting a monetary reward based on sales and profits leads to distorted incentives with respect to the Coop's goal, which after all is the welfare of its members.

Keywords: Consumer Cooperatives, Strategic Incentives, Price Competition, Oligopoly.

JEL Classification Numbers: C70, C71, D23,D43.

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1. Introduction

In this paper we contribute to the understanding of compensation practices in consumer cooperatives – a particular form of non-profit organizations – and try to shed some light on the differences to their for-profit rivals. In particular, we provide a reason why a consumer cooperative (henceforth Coop) might be less prone than a profit-maximizing firm (henceforth PMF) to pay variable bonuses to a manager and to rely on fixed wages instead. The key point here is that Coops and other nonprofit firms may have a preference to recruit managers who are intrinsically motivated to advance the firm's organizational goal (e.g., Frey 1997, Benabou and Tirole 2002 and 2003, Frey and Benz 2005, James 2005 and Murdock 2002).

Coops are enterprises operating in the retail industry which, by law or statutory rules, should act on behalf of their consumer-members.[1] Since, ultimately, customers are the main Coop's stakeholders, they are commonly entitled to democratically elect their representatives, who participate in general meetings and, directly or indirectly – usually through a board of directors – recruit the CEOs running the firm. The wide diffusion of Coops worldwide suggests that this form of organizational governance is important. In 2008 more than 3,000 Coops were active in Europe with a turnover of approximately 70 billion Euro and 25 million consumer-members (EuroCoop 2008). Also Japan reports a large number of consumer cooperatives, serving 25.8 million members and producing a turnover of approximately 30 billion Euro in 2009 (JCCU 2009). Switzerland, Finland, Italy, Spain, as well as many other European countries similarly possess well-established consumer cooperative movements. In recent years, the scale of operations of this type of firms has reached a considerable dimension and most of existing Coops can be currently portrayed as enterprises competing oligopolistically with conventional PMFs, thus giving rise to a special form of mixed oligopoly.[2]

The principal-agent relationship between Coop members, its board of directors, and the manager of the Coop has been discussed quite intensively in the literature on Coop corporate governance (see e.g. Spear 2004, Nilsson 2001, Cornforth 2004, Sykuta and Cook 2001, Richards *et al.* 1998). Concerning CEO compensation, empirical work has repeatedly shown that – in contrast to PMFs – Coops do not provide high-powered incentives to their managers. For example, Hueth and Marcoul (2009) find that "... the cooperative governance structure is likely to result in less reliance on explicit performance incentives." (p. 1220). Instead, Coops seem to rely to a much higher degree on the intrinsic motivation of its managers and workers, on implicit contracts (enforced by social ties between the CEO and board members) and on subjective performance evaluation (Leete 2000, Ittner *et al.* 2007, Tirole 1994, 2001). Colter and Nolan (2006) find that compensation in Coops is mainly related to the size of the Coop and that contingent pay and bonuses are uncommon and small compared to the base salary. Colter (2011) remarks that, "..there are managers who much prefer to have not a bonus at all." Trechter and King (1995) discover that bonuses of Coop managers were mainly related to size measures like sales or total assets and less dependent on profitability. Trechter *et al.*

[1]Note that our results in this paper also apply to agriculture cooperatives when competing with PMFs in selling inputs to farmers, who, therefore, act as consumers.

[2]In contrast with this evidence, over the last decades, with a few exceptions, the economic literature has mainly focused on a Coop's behavior under monopoly, perfect competition, or monopolistic competition. The classical contributions by Bekenstein (1943), Enke (1945), Yamey (1950), Anderson, Maurice, and Porter (1979, 1980), Ireland and Law (1983), Sexton (1983, 1990), Sexton and Sexton (1987), Farrell (1985) and, more recently, Hart and Moore (1996, 1998) and Mikami (2003, 2010), all adopt modelling approaches in which strategic interaction does not play any role.

(1997) report that Coop boards are skeptical of *ex ante* bonus programs. These observations for CEO compensation in Coops are in line with the findings in the broader literature on (other) non-profit organizations, see e.g. Frumkin and Keating (2010), Brandl and Güttel (2007), and Hallock (2002).

To motivate these findings, two main reasons have been advanced. First, from an agency perspective, using low-powered incentives for the managers in nonprofit organizations is the board's optimal response since the objectives of a NPO are difficult to quantify (Hallock 2002, Preyra and Pink 2001). Since the goals are vague and ill-defined and the danger of giving dysfunctional incentives is high, the use of pay-for-performance is restricted (Theuvsen 2004, Spear 2004). Additionally, in Coops the heterogeneity across members makes it difficult to agree on performance targets, which results in low-powered incentives for CEOs (Hueth and Marcoul 2009). Second, from a management perspective, using low-powered incentives is indicated since pay-for-performance based on financial measures does not fit with a nonprofit's mission (Frumkin and Keating 2010). Strong extrinsic financial incentives are against the principle of fairness and might crowd out intrinsic motivation of individuals who have (been) selected to work in a non-profit organization (Spear 2004, Theuvsen 2004, Brandl and Güttel 2007).

We believe that, although important, any explanation for low-powered incentives in Coops (and other nonprofit organizations) which is based only on these two perspectives provides an incomplete description of the governance and behavior of organizations competing in oligopolistic mixed markets. The argument which we pursue in this paper is that product market competition and strategic interaction between firms shape incentive contracts and governance as well. In the last years, several empirical papers have shown that this interaction plays an important role (e.g. Karuna 2007, Cunat and Guadalupe 2005, Vroom and Gimeno 2007). Furthermore, the literature on *strategic incentives* (e.g. Sengul *et al.* 2012, Kopel and Löffler 2012) has demonstrated how incentive contracts for managers or, more general, organizational governance can be used as a strategic device to obtain a competitive advantage and market leadership.[3] Therefore, the question remains why Coops would not want to use higher-powered incentive contracts to guide their managers' market behavior and to influence their rivals' expectations in oligopolistic interaction, but rather use fixed wage compensation. To the best of our knowledge, no formal work has addressed this *strategic incentive* issue. The only work worth mentioning is Feng and Hendrickse (2011), who introduce a multi-tasking agency model and argue that Coops might have efficiency advantages if interdependencies between upstream and downstream activities exist. At the end of their paper, they only briefly address strategic incentive effects, but provide no detailed analysis (see, similarly, Feng and Hendrickse 2009). In the present paper, we close this gap in the literature and analyze a strategic incentives game between a PMF and a Coop.

More precisely, we consider a Coop and a PMF interacting in a Bertrand duopoly with differentiated goods (e.g. Marini and Zevi 2011, Drivas and Giannakas 2010, Giannakas and Fulton 2005, Fulton and Giannakas 2001). Both the Coop and the PMF owners can either delegate the price choice to an externally recruited manager or, alternatively, select one of their own core stakeholders to run the firm. For the Coop, such an internally selected manager might be one of the consumer-members, for the PMF one can think of an investor-manager. Following the strategic incentives literature, we assume that if an external manager is recruited, her compensation is determined by an explicit performance contract based on

[3]See also the classic references, Fershtman and Judd (1987), Sklivas (1987), Vickers (1985).

observable and verifiable performance measures, in our case profits and sales revenues.[4] The owners of the firm (or the board) can design the manager's contract to obtain a competitive advantage in this situation of strategic interaction.[5] The results of our analysis are in line with empirical and anecdotal evidence. In equilibrium, the PMF owners distort the preferences of the external manager by means of a bonus-based incentive contract. In contrast, the owners of the Coop (the consumers) find it more beneficial in terms of member value not to use high-powered incentives via a profit-and-sales based incentive contract, but rather rely on an internal member-manager who is paid a flat wage. Summarizing, our model demonstrates that if one focuses on the strategic impact, it is not indicated for a Coop to use the same type of compensation policy for its manager as a PMF. In terms of strategic interaction, the intuition is that a Coop, by recruiting an agent (e.g., a consumer-owner) whose preferences are aligned with the organizational objective, is *per se* highly expansionary in term of output. Therefore, the Coop does not need to rely on a manager who sets prices aggressively to expand market share and quantity. Furthermore, employing an external manager only interested in monetary rewards based on sales and profits leads to distorted incentives with respect to the Coop's goal, which after all is the welfare of its members.

Summarizing, our contribution to the literature is twofold. First, we show that Coops do not have strategic reasons to use incentive contracts when they can attract and recruit intrinsically motivated agents to run the firm. This is of interest in the light of some recent trends in Coop management. For example, a research report of the Center of Cooperatives (see Lang 2002) based on responses of industry experts concluded that: "[e]xisting compensation programs are not seen as adequate to attract chief executives comparable to those of investor-oriented firms.", and, "Cooperative management must have compensation programs adequate to attract chief executives comparable to those of investor-owned firms." (p. 27). New generation Cooperatives and other hybrid organizational structures emerge and are competing head-to-head with profit-maximizing rival firms (Katz and Boland 2002, Kopel and Brand 2012), and therefore consider providing high-powered incentives to their managers as well. According to our results, the performance schemes in Coops should be adopted with great caution. Second, our paper complements a line of research which considers strategic incentives in mixed oligopolies with a public firm or hybrid organizational structures (e.g. Kopel and Brand 2012, Bárcena-Ruiz 2009, Heywood and Ye 2009, Goering 2007, 2008, and White 2001).

The paper is organized as follows. The next section introduces a mixed duopoly model with strategic delegation in which a Coop and a PMF compete in prices and supply differentiated goods to consumers. Section 3 presents the main results of our paper. Section 4 concludes.

2. The Model

There are two goods, which are assumed to be provided by two heterogeneous firms competing strategically in prices: one PMF selling good 1 and one Coop selling good 2. Both

[4]The idea that the owners can select the type of manager, who is either interested in performance measures like sales revenue and profit or whose preferences are in line with the firm's objectives is already contained, e.g., in Vickers (1985) and Williamson (1963). In this respect, our paper contributes to a better understanding of this issue for Coops in mixed markets.

[5]Since we want to focus exclusively on the question if it is beneficial for the firms to use incentive contracts for strategic reasons, we abstract from the risk-incentive trade-off under moral hazard or congruency issues in multi-tasking agency settings. However, as Fershtman and Judd (1987, 1990) demonstrate, strategic concerns are important even under moral hazard.

firms have identical unit cost c, and cost functions are given by $C(x_k) = cx_k$, $k = 1, 2$. We assume a *continuum* of identical consumers $h \in I$, with $I = [0, 1]$, possessing quasi-linear preferences over two symmetrically differentiated goods and a *numeraire* denoted by y.[6] For each h-th consumer, preferences are expressed by the following quadratic utility function $U_h : \mathbb{R}^3_+ \to \mathbb{R}_+$

$$U^h\left(x_1^h, x_2^h, y^h\right) = \alpha(x_1^h + x_2^h) - \frac{1}{2}((x_1^h)^2 + (x_2^h)^2) - \beta x_1^h x_2^h + y^h \tag{2.1}$$

where $\alpha > c$ and x_k^h (for $k = 1, 2$) denotes the individual consumption of the k-th good, and $\beta \in (0, 1)$ the degree of product differentiation (e.g. Singh and Vives, 1984). Total quantities of the two products are denoted by x_1 and x_2. If the available income of each consumer (denoted $\overline{y}^h$) is sufficiently high, the inverse demands for both goods can be obtained by aggregating all consumers' first-order conditions for the maximization of (2.1) subject to their individual budget constraint

$$p_1\left(x_1, x_2\right) x_1^h + p_2\left(x_1, x_2\right) x_2^h + y^h \leq \overline{y}^h. \tag{2.2}$$

Here $p_1\left(x_1, x_2\right)$ and $p_2\left(x_1, x_2\right)$ denote the prices of the two goods. Carrying out this derivation in the usual way yields the following inverse demand functions

$$\begin{aligned} p_1\left(x_1, x_2\right) &= \alpha - x_1 - \beta x_2, \\ p_2\left(x_1, x_2\right) &= \alpha - x_2 - \beta x_1. \end{aligned} \tag{2.3}$$

The direct demand system can be obtained by inverting (2.3) and writes as

$$\begin{aligned} x_1(p_1, p_2) &= \frac{\alpha}{1+\beta} - \frac{1}{1-\beta^2} p_1 + \frac{\beta}{1-\beta^2} p_2 \\ x_2(p_1, p_2) &= \frac{\alpha}{1+\beta} - \frac{1}{1-\beta^2} p_2 + \frac{\beta}{1-\beta^2} p_1. \end{aligned} \tag{2.4}$$

In existing works on Coop behavior a variety of *ad hoc* objective functions have been assumed (see the comprehensive survey by Soboh *et al.* 2009). However, it can be argued that the objective function of a firm should originate from microeconomic fundamentals (see Marini and Zevi 2011, Kelsey and Milne 2008, Eldenburg *et al.* 2004, Hermalin and Weisbach 2003). The starting point for the derivation of the Coop objective function is that every consumer is assumed to receive a part of the Coop net profit proportional to this consumer's share of the good purchased. In consumer cooperatives this share usually takes the form of a patronage rebate paid on the members' purchases. Since in our model the Coop is assumed to act on behalf of all potential consumers of its products, it maximizes the joint utility of all its consumer-members subject to their budget constraints. As is shown below, by aggregating for all consumers, the objective function of the Coop corresponds to the maximization of total consumer welfare subject to the collective budget constraint (see also Marini and Zevi, 2011).[7] More formally, at an interior solution where all consumers $h \in I$ are served by the two firms, we have

[6] Some of our results will be shown to hold in a more general setting for any quasilinear consumer preferences.

[7] In Marini and Zevi (2011), a Coop is assumed to maximize the utility of each representative (atomistic) consumer, and is unable, therefore, to affect the price of the rival firms.

$$\max_{p_2} \int_{h\in I} U_h\left(x_1^h\left(p_1,p_2\right),x_2^h\left(p_1,p_2\right),y^h\right)dh \qquad \text{s.t.}$$

$$\sum_{k=1,2} p_k \int_{h\in I} x_k^h\left(p_1,p_2\right)dh + \int_{h\in I} y^h dh \leq \int_{h\in I} \overline{y}^h dh + \int_{h\in I} \frac{x_2^h(p_1,p_2)dh}{x_2(p_1,p_2)}\left[p_2 x_2\left(p_1,p_2\right) - C_2\left(x_2\left(p_1,p_2\right)\right)\right]$$

Since in equilibrium the budget constraint is binding and the consumers have a mass of 1, the optimization problem can be simplified as

$$\max_{p_2} V(p_1,p_2) = \max_{p_2}\left\{U(\mathbf{p}) + \overline{y} - p_1 x_1\left(\mathbf{p}\right) - C_2\left(x_2\left(\mathbf{p}\right)\right)\right\}, \tag{2.5}$$

where the utility function $U(\mathbf{p})$ has the quadratic form given in (2.1). Thus, in this paper we will assume that the owners of the Coop make their decisions in order to maximize (2.5).[8]

Concerning the PMF, we assume, as usual, that the owners pursue to maximize profit, i.e.

$$\max_{p_1} \ \pi_1 = (p_1 - c)x_1(p_1,p_2). \tag{2.6}$$

The owners delegate the choice of prices to managers. We assume that both firms can recruit (intrinsically motivated) internal managers whose preferences are aligned with those of the firm. In the case of a Coop, we can think of a consumer-member who runs the firm. This manager receives a fixed wage and is (intrinsically) motivated to maximize member utility V. In the case of a PMF, it might be an investor-manager who has an inventive to maximize profit π. Alternatively, PMF and Coop can delegate the choice of prices to external managers. In the latter case, following the standard delegation model (e.g. Fershtman and Judd 1987, Sklivas 1987, Vickers 1985), we assume that the managers of both the PMF and the Coop are compensated on the basis of profits $\pi_k = p_k x_k - C_k(x_k)$ and revenues $R_k = p_k x_k$ $(k = 1, 2)$.[9] As is common in the strategic incentives literature, we assume that the two firms offer the following linear profit-and-sales contract

$$\begin{aligned} U_1 &= A_1 + B_1[\delta_1\pi_1 + (1-\delta_1)R_1] \\ U_2 &= A_2 + B_2[\delta_2\pi_2 + (1-\delta_2)R_2] \end{aligned} \tag{2.7}$$

with $B_k \geq 0$, where the incentive parameter δ_k is chosen endogenously by each firm's owner as part of the contract design. For $\delta_k = 1$, the contract is profit-based and for $\delta_k = 0$ the contract is sales revenue-based. The parameter A_k denotes the fixed salary component of the contract and B_k the weight which is put on the manager's variable compensation component.

Note that the manager's incentive for performance stems only from δ_k, whereas the compensation parameters A_k and B_k are only chosen here to fulfill the manager's reservation constraint $U_k \geq \underline{U}$ (the reservation utility $\underline{U}$ is obtained if the manager accepts a job outside

[8]For simplicity, in what follows we disregard the constant $\overline{y}$, since its particular value does not affect the equilibrium analysis. Notice that the objective function of a Coop corresponds to the objective of a publicly-owned firm competing with a foreign firm in a differentiated market. In a market with foreign competition, the public firm is assumed to maximize the consumers' surplus in both markets plus the producer surplus (profit) of only the domestic firm (see, for instance, Ohnishi 2010, Fernandez-Ruiz 2009, or Benabess 2011).

[9]The rationale for using such observable and verifiable indicators is, in general, that it may be rather difficult to base compensation schemes on more sophisticated performance measure involving members' "utility". See Barros (1995) or White (2001) for similar arguments in the context of public firms.

the firm). A manager will accept the contract if the reservation constraint is fulfilled and, being hired, the manager will select the price such that compensation is maximized.

The timing of the game is as follows. At the first stage, both firms decide whether to delegate (D) the price choice to an externally recruited manager with preferences captured by (2.7) or, instead, hire an internal manager who is intrinsically motivated to pursue the goals of the company. The latter case corresponds to designate one of the owners or members as manager, set a zero bonus scheme and paying her a flat compensation package and we denote it by ND. At the second stage, in case an external manager is selected, each firm determines the specific contract design offered to the manager, i.e. the optimal values of δ_k to maximize its own objective function, which is (2.5) for the Coop and (2.6) for the PMF. At the third and final stage, the firms' managers will set the prices such that their own utility is maximized. The main question which we will study with this model is if in equilibrium the Coop owners have a strategic reason to delegate the firm's control to an external manager and use an explicit incentive contract. All differences in the choice to delegate and in the compensation structure, will emerge endogenously as a result of the different governance modes and the strategic interaction of the two firms in the market. Moreover, assuming identical incentive contracts in PMFs and Coops enables us to compare the structures of the optimal compensation contracts of the two organizational modes.

3. Main Results

We organize our results in four different sections corresponding to the four different subgames (denoted $NDND$, DND, NDD and DD) of the delegation game. To obtain the main results of the paper, it is sufficient to solve the game by backward induction and analyze the decision taken by every firm at the delegation stage.

3.1. **Subgame NDND.**

It is helpful to start the analysis with the subgame in which both firms do not delegate the control to an external manager (case $NDND$) and use internal managers to run the firm. We prove that in this case a Coop will always set in equilibrium a price equal to the marginal cost. The result is rather general and it is shown to hold for any consumer's quasilinear preference and for any production technology.

Lemma 1. *In the non-delegation subgame, the Coop always adopts a marginal cost pricing strategy.*

Proof. By (2.5) and (2.3), the objective function of the Coop takes the general form of

$$V(x_1(p_1,p_2),x_2(p_1,p_2)) = U(x_1(p_1,p_2),x_2(p_1,p_2)) + \overline{y} - p_1 x_1(p_1,p_2) - C_1(x_1(p_1,p_2)).$$

The FOC for an interior solution of the maximization problem is

$$\frac{dV(x_1(p_1,p_2),x_2(p_1,p_2))}{dp_2} = \frac{\partial U}{\partial x_1}\frac{\partial x_1}{\partial p_2} + \frac{\partial U}{\partial x_2}\frac{\partial x_2}{\partial p_2} - p_1\frac{\partial x_1}{\partial p_2} - \frac{\partial C_2(x_2)}{\partial x_2}\frac{\partial x_2}{\partial p_2} = 0. \tag{3.1}$$

Since,

$$\frac{\partial U}{\partial x_k} = p_k, \quad \text{for } k = 1,2,$$

expression (3.1) can be written as

$$\frac{dV(x_1(p_1,p_2),x_2(p_1,p_2))}{dp_2} = (\frac{\partial U}{\partial x_2} - \frac{\partial C_2(x_2)}{\partial x_2})\frac{\partial x_2}{\partial p_2} = 0. \tag{3.2}$$

Given that $\partial x_2\left(p_1,p_2\right)/\partial p_2<0$, condition (3.2) implies the result, i.e.

$$\frac{\partial U}{\partial x_2}=\frac{\partial C_2(x_2)}{\partial x_2}.$$

□

The meaning of Proposition 1 is that an internal (intrinsically motivated) Coop manager will naturally push the Coop's price down to marginal costs. Therefore, if the Coop possesses a constant-returns-to-scale technology, the best-reply will be inelastic to all price changes of the PMF. More specifically, using the utility and the cost specification introduced above in (2.5), the FOC of the Coop manager at the price-setting stage can be written as:

$$\begin{aligned}\frac{dV}{dp_2}&=\alpha\frac{\partial x_1}{\partial p_2}+\alpha\frac{\partial x_2}{\partial p_2}-x_1\frac{\partial x_1}{\partial p_2}-x_2\frac{\partial x_2}{\partial p_2}-\beta(x_2\frac{\partial x_1}{\partial p_2}+x_1\frac{\partial x_2}{\partial p_2})-p_1\frac{\partial x_1}{\partial p_2}-c\frac{\partial x_2}{\partial p_2}=\\&=\frac{\partial x_1}{\partial p_2}\underbrace{(\alpha-x_1-\beta x_2-p_1)}_{=0}+\underbrace{\frac{\partial x_2}{\partial p_2}}_{=-1/(1-\beta)^2}\quad(\underbrace{\alpha-x_2-\beta x_1}_{=p_2}-c)=0.\end{aligned}$$

Hence, the Coop sets $p_2=c$, i.e. a price equal to its marginal costs, independent of the rival's price. On the other hand, the profit-maximizing firm chooses p_1 such that the profit in (2.6) is maximized. Solving the first order condition yields the reaction function

$$p_1(p_2)=\frac{\alpha-\alpha\beta+c}{2}+\frac{\beta}{2}p_2.$$

Solving the system of reaction functions yields the Bertrand-Nash equilibrium prices

$$p_1^{NDND}=\frac{\alpha+c-(\alpha-c)\beta}{2},\quad p_2^{NDND}=c,$$

with the associated payoffs

$$\begin{aligned}&\pi_1^{NDND}=\frac{(\alpha-c)^2(1-\beta)}{4(1+\beta)},V^{NDND}=\frac{(\alpha-c)^2(5+3\beta)}{8(1+\beta)},\\&\pi_2^{NDND}=0.\end{aligned}$$

It is worth mentioning that this result corresponds to the insights reported by Ohnishi (2010), who considers a mixed oligopoly with foreign competition. In his setup, the public firm maximizes the sum of consumer surplus and profit of the domestic firm. This results in an objective function similar to the Coop's objective of maximizing members' welfare subject to the budget constraint. Therefore, the two results coincide.

3.2. **Subgame DND.** Let us now turn to the subgame DND, where only the profit-maximizing firm delegates to an external manager and uses strategic incentives. Obviously, since the Coop sets its price equal to marginal costs independently of the rival's price ($p_2=c$, see above), for the profit-maximizing rival the *strategic effect of delegating* the price choice to an external manager is lost. The price of the Coop cannot be influenced. In fact, the PMF's best-reply is easily computed as

$$p_1(p_2)=\frac{\alpha+c\delta_1-\alpha\beta}{2}+\frac{\beta}{2}p_2.$$

Solving the system of best-replies yields the Bertrand-Nash equilibrium prices

$$p_1 = \frac{\alpha + c\delta_1 - (\alpha - c)\beta}{2}, \quad p_2 = c.$$

The profit of the PMF is

$$\pi_1(\delta_1) = \frac{(\alpha(1-\beta) - c(\delta_1 - \beta))(\alpha(1-\beta) - c(2 - \delta_1 - \beta))}{4(1-\beta^2)}.$$

The owners of the PMF now choose the incentive parameter δ_1 to maximize π_1. This then yields

$$\delta_1 = 1$$

and shows that the PMF offers a profit-based contract to its manager.[10] This result confirms our reasoning that the PMF cannot gain from distorting the contract if it competes against a Coop, quite in contrast to the situation where two PMFs compete (e.g. Fershtman and Judd 1987, Sklivas 1987). Using the optimal value of the incentive parameter, we can calculate the optimal prices

$$p_1^{DND} = \frac{\alpha + c - (\alpha - c)\beta}{2}, \quad p_2^{DND} = c,$$

and the profits and the member value in equilibrium

$$\pi_1^{DND} = \frac{(\alpha - c)^2(1-\beta)}{4(1+\beta)}, V^{DND} = \frac{(\alpha - c)^2(5+3\beta)}{8(1+\beta)},$$
$$\pi_2^{DND} = 0.$$

3.3. **Subgame DD.** If both firms delegate their price decisions to an external manager and use incentive schemes, then the analysis becomes more interesting. Again, using the utility specification introduced in (2.1), we can consider in detail the price choice of the managers. Rewriting the incentive-relevant parts of the compensation as $U_k = \pi_k + (1-\delta_k)cx_k$, $k = 1, 2$, the first order conditions of a manager at the price-setting stage can be written as

$$\frac{dU_k}{dp_k} = \frac{\partial \pi_k}{\partial p_k} + (1 - \delta_k)c \underbrace{\frac{\partial x_k}{\partial p_k}}_{=-1/(1-\beta^2)} = 0. \tag{3.3}$$

Solving the first order conditions leads to the price reaction functions

$$p_1(p_2) = \frac{\alpha + c\delta_1 - \alpha\beta}{2} + \frac{\beta}{2}p_2$$
$$p_2(p_1) = \frac{\alpha + c\delta_2 - \alpha\beta}{2} + \frac{\beta}{2}p_1, \tag{3.4}$$

which shows that the best-replies have the usual form, are upward-sloping, and hence prices are strategic complements. Although the slope of the reaction functions remains unchanged,

[10] This is due to our duopoly setting. If rival PMFs are active on the market, there is a strategic incentive to influence their price choices. The result for the triopoly case with two PMFs is given in the final section of this paper.

the owners of the firms can use the incentive contract to shift the reaction function inwards ($\delta_k < 1$) or outwards ($\delta_k > 1$). Solving (3.4) yields

$$p_1 = \frac{2\alpha - \alpha\beta - \alpha\beta^2 + 2c\delta_1 + c\beta\delta_2}{4-\beta^2}, p_2 = \frac{2\alpha - \alpha\beta - \alpha\beta^2 + 2c\delta_2 + c\beta\delta_1}{4-\beta^2}. \tag{3.5}$$

Both firms can use the managers as a commitment to increase prices. However, while this is in the interest of the owners of a profit-maximizing firm, the owners of the Coop try to maximize the welfare of its members and therefore try to keep the prices low. These conflicting incentives of the owners can be seen as follows. Write the prices in (3.5) in the general form $p_1(\delta_1, \delta_2)$ and $p_2(\delta_1, \delta_2)$. Then first focus on the profit-maximizing firm and write $\pi_1(p_1(\delta_1, \delta_2), p_2(\delta_1, \delta_2)) = (p_1 - c)x(p_1, p_2)$. The owners of firm 1 select δ_1 such that the profit π_1 is maximized which yields the first order condition

$$\frac{d\pi_1}{d\delta_1} = \underbrace{\frac{\partial \pi_1}{\partial p_1}}_{(1-\delta_1)c/(1-\beta^2)} \frac{\partial p_1}{\partial \delta_1} + \underbrace{\frac{\partial \pi_1}{\partial p_2}}_{>0} \underbrace{\frac{\partial p_2}{\partial \delta_1}}_{c\beta/(4-\beta^2)}$$

where we have used the first order condition (3.3) of the manager in the first term. Since for $\delta_1 = 1$ the first term vanishes, but the second term is positive, the owners can increase the profit of firm 1 by choosing a $\delta_1 > 1$. Considering the manager's compensation, this corresponds to putting a higher weight on profit and a negative weight on sales revenue, which provides incentives for the manager to keep the price high. Now let us focus on the Coop. The owners of firm 2 select the incentive contract for the manager to maximize the welfare of all members subject to the budget constraint which, as demonstrated above, is equal to maximizing the objective function $V(x_1(p_1(\delta_1, \delta_2), p_2(\delta_1, \delta_2)), x_2(p_1(\delta_1, \delta_2), p_2(\delta_1, \delta_2)))$ given in (2.5). The first order condition can be written as

$$\begin{aligned}\frac{dV}{d\delta_2} = &\Big(\frac{\partial x_1}{\partial p_1}\frac{\partial p_1}{\partial \delta_2} + \frac{\partial x_1}{\partial p_2}\frac{\partial p_2}{\partial \delta_2}\Big)\underbrace{(\alpha - x_1 - \beta x_2 - p_1)}_{=0} + \\ &+ \Big[\underbrace{\frac{\partial x_2}{\partial p_1}\frac{\partial p_1}{\partial \delta_2} + \frac{\partial x_2}{\partial p_2}\frac{\partial p_2}{\partial \delta_2}}_{=-c(2-\beta^2)/(1-\beta^2)(4-\beta^2)}\Big](\underbrace{\alpha - x_2 - \beta x_1}_{=p_2} - c) - \underbrace{\frac{\partial p_1}{\partial \delta_2}}_{=c\beta/(4-\beta^2)} x_1.\end{aligned}$$

Obviously, the first term vanishes. Recall that in the case where the owners of the Coop do not delegate the price choice to an external manager (subgames DND and $NDND$), they set the price equal to marginal cost, $p_2 = c$. In the expression above this would mean that also the second term vanishes. However, since the third term is negative and the expression in the brackets is also negative, in the case of delegation to an external manager the owners will choose the price below marginal cost. In other words, the Coop sets prices even more aggressively in the case of delegation. The resulting best-replies at the contracting stage are given by

$$\begin{aligned}\delta_1(\delta_2) &= \frac{\alpha\beta^2(2 - \beta - \beta^2) + c(8 - 6\beta^2 + \beta^4)}{4c(2-\beta^2)} + \frac{\beta^3}{4(2-\beta^2)}\delta_2, \\ \delta_2(\delta_1) &= \frac{(2-\beta^2)c - \alpha(1-\beta^2)}{c}.\end{aligned}$$

Observe that the Coop best-reply is independent of the rival's choice of contract, whereas

the profit-maximizing firm choice depends positively on the other firm's contract parameter. Solving the first order condition at the contracting stage yields the following equilibrium bonus rates,

$$\delta_1 = 1 + \frac{(\alpha - c)\beta^2(1-\beta)}{4c} > 1$$
$$\delta_2 = \frac{(2-\beta^2)c - \alpha(1-\beta^2)}{c} < 1.$$

The resulting prices and payoffs in equilibrium are

$$p_1^{DD} = \frac{\alpha + c - (\alpha - c)\beta}{2}, \quad p_2^{DD} = c - \frac{(1-\beta)\beta(\alpha - c)}{4},$$
$$\pi_1^{DD} = \frac{(\alpha - c)^2(1-\beta)(2-\beta^2)}{8(1+\beta)}, \quad V^{DD} = \frac{(\alpha - c)^2(20 + \beta(12 - (1-\beta)\beta))}{32(1+\beta)},$$
$$\pi_2^{DD} = -\frac{(\alpha - c)^2(1-\beta)\beta(4+3\beta)}{16(1+\beta)}.$$

Note that $p_2^{DD} < c$ and therefore $\pi_2^{DD} < 0$. The Coop uses the manager to set its price under marginal costs and this results in negative profits.[11]

3.4. ***Subgame* NDD.** Lastly, consider the case where only the consumer cooperative delegates the price choice to a manager. The price reaction functions and the prices at the price setting stage have the same form as in the case where both firms delegate, but here with $\delta_1 = 1$. Since the owners of the cooperative selects their manager's contract independent of the other firm's contract in the case where both firms delegate their price choice, we obtain the same incentive rate for the contract as above, i.e. $\delta_2 = \frac{(2-\beta^2)c - \alpha(1-\beta^2)}{c} < 1$.

This yields the following prices and payoffs in equilibrium

$$p_1^{NDD} = \frac{\alpha(1-\beta)(2-\beta^2) + c(2 + 2\beta - \beta^3)}{4 - \beta^2}, \quad p_2^{NDD} = c - \frac{(\alpha - c)\beta(1-\beta)}{4 - \beta^2},$$
$$\pi_1^{NDD} = \frac{(\alpha - c)^2(1-\beta)(2-\beta^2)^2}{(1+\beta)(4-\beta^2)^2}, \quad V^{NDD} = \frac{(\alpha - c)^2(5 + 3\beta - \beta^2 - \beta^3)}{2(4 + 4\beta - \beta^2 - \beta^3)},$$
$$\pi_2^{NDD} = -\frac{(\alpha - c)^2\beta(4 - \beta(1 + 4\beta - \beta^3))}{(1+\beta)(4-\beta^2)^2}.$$

Recall that in the DD-subgame the profit-maximizing firm tries to keep the price high and selects $\delta_1 > 1$. Since in the present subgame this countervailing effect is missing, the Coop prices even more aggressively. It is easy to see that $p_2^{NDD} < p_2^{DD}$ and consequently the loss is even higher than in the previous case.

[11]The Coop could impose a fee to all its consumer-members to repay the loss caused by such equilibrium low-price policy.

3.5. **The equilibrium of the game.** At the first stage the Coop and the PMF are deciding if they want to hire an external manager who makes the price choice or use an internal (intrinsically motivated) manager instead. Using the payoffs we have obtained for the four subgames yields the following payoff matrix:

		Coop	
		ND	D
PM	ND	$\pi_1^{NDND} = \frac{A(1-\beta)}{4(1+\beta)}, V^{NDND} = \frac{A(5+3\beta)}{8(1+\beta)}$	$\pi_1^{NDD} = \frac{A(1-\beta)(2-\beta^2)^2}{(1+\beta)(4-\beta^2)^2}, V^{NDD} = \frac{A(5+3\beta-\beta^2-\beta^3)}{2(4+4\beta-\beta^2-\beta^3)}$
	D	$\pi_1^{DND} = \frac{A(1-\beta)}{4(1+\beta)}, V^{DND} = \frac{A(5+3\beta)}{8(1+\beta)}$	$\pi_1^{DD} = \frac{A(1-\beta)(2-\beta^2)}{8(1+\beta)}, V^{DD} = \frac{A(20+12\beta+\beta^3-\beta^2)}{32(1+\beta)}$

Figure 1 - The first stage subgame with the corresponding payoffs for the two firms.

where $A = (\alpha - c)^2$. It is easy to see that $\pi_1^{DD} > \pi_1^{NDD}$ for $\beta \in (0, 1)$. Hence, in the mixed duopoly case the profit-maximizing firm will always weakly prefer to delegate to an external manager. However, as we show at the end of this subsection, if there is another PMF rival active in the market, then the preference would be strict. This is in line with the literature on strategic incentive contracts. On the other hand, given that the profit-maximizer delegates, the cooperative will always prefer not to delegate the price choice to an external manager since $V^{DND} > V^{DD}$ for $\beta \in (0, 1)$. Since $V^{NDND} < V^{NDD}$, the unique non-trivial equilibrium of our game is DND. In this equilibrium, the price of the profit-maximizing firm is higher, $p_1^{DND} > p_2^{DND} = c$, and consequently the sales of the Co-op are higher, $x_2(p_1^{DND}, p_2^{DND}) > x_1(p_1^{DND}, p_2^{DND})$. It turns out that the profit-maximizing firm nevertheless makes a higher profit than the consumer cooperative, $\pi_1^{DND} > \pi_2^{DND}$. These results are summarized in the following proposition.

Proposition 1. *For $\beta \in (0, 1)$ the subgame perfect equilibrium outcome of the strategic delegation game played by a PMF and a Coop can be characterized as follows: (i) the PMF delegates the price choice to an external manager and writes an incentive contract based on profits ($\delta_1 = 1$) whereas the Coop prefers to pay an internal (intrinsically motivated) manager a flat wage; (ii) the PMF charges a higher price (and sells a lower output) than the Coop; (iii) the PMF also earns a higher profit than the Coop.*

Proof. By straightforward manipulation of prices and payoffs in equilibrium. □

In Figure 1 we provide a graphical illustration of the two cases, internal manager for the Coop versus external managers and pay-for-performance for both firms. The lines denoted by $p_1^{DD}(p_2)$ and $p_2^{DD}(p_1)$ represent the price best-replies in the case where both firms use incentive contracts. In this case the equilibrium price pair is $\mathbf{p}^{DD}$. The lines denoted by $p_1^{DND}(p_2)$ and $p_2^{DND}(p_1)$ represent the price best-replies in the case where the Coop uses an internal (intrinsically motivated) manager. Note that in the latter case, the manager sets the Coop's price equal to marginal costs independent of the PMF's price. The intersection point $\mathbf{p}^{DND}$ of the two lines gives the optimal price pair. The figure also shows the corresponding iso-profit curves for the PMF (π_1^{DD} and π_1^{DND}) and the iso-utility curves for the Coop (V^D and V^{DND}) in the price space. Note that the PMF's iso-profit curves have the usual convex shape, whereas the Coop's iso-utility curves are concave. Moreover, note that the profit level

is increasing if iso-profit curves are further away from the origin ($\pi_1^{DD} < \pi_1^{DND}$), whereas lower iso-utility curves correspond to higher utility levels for consumers ($V^{DD} < V^{DND}$).

[FIGURE 1 APPROXIMATELY HERE]

In the case where the Coop recruits an internal manager, the iso-utility curve V^{DND} has a maximum along the vertical price reaction function $p_2^{DND}(p_1)$. Likewise, the iso-profit curve π_1^{DND} has a maximum at the location where it intersects the best-reply $p_1^{DND}(p_2)$ (recall that $\delta_1^{DND} = 1$). In the case where both firms use variable incentive pay, this is different. To understand this, note that a manager's price reaction function only depends on the firm's own incentive parameter δ_k, but does not depend on the rival's incentive parameter (see (3.4)). Therefore, in choosing the contract design for their own manager, the owners of each firm takes the price best-reply of the rival as given and maximizes with respect to their firm's objective function. Hence, the owner's maximization problem is akin to the optimization problem of a Stackelberg leader. Consequently, the iso-profit curve π_1^{DD} and the iso-utility curve V_2^{DD} are tangent to the rival's reaction curves $p_2^{DD}(p_1)$ and $p_1^{DD}(p_2)$, respectively. If both firms use incentive contracts, the owners use the contracts to manipulate the manager to choose a price so that the most favorable iso-curve compatible with the rival's best reply is obtained. For the Coop this occurs at a price level lower than its marginal cost. For the PMF, the selected price coincides with the price chosen in a situation where the Coop pays a flat wage ($p_1^{DD} = p_1^{DND}$).

From a practical point of view, it seems surprising that the Coop does not benefit from using an incentive contract, whereas the PMF does. To understand this better, note that there is perfect alignment between the goals of the owners and the manager for $\delta_1 = 1$ and any deviation from this value would be made only for strategic reasons (see, in particular, the triopoly case below). In a Coop, the situation is different. Any explicit incentive contract has to rely on verifiable performance measures like (e.g.) profit and sales revenue, and this makes it impossible to obtain perfect goal congruence between the manager and the Coop by selecting the contract parameter δ_2. In other words, the incentive contract used for compensating an external Coop manager immediately drives a wedge between the interest of the owners of the Coop and the external manager. As a consequence, the parameter δ_2 in the performance measure of a profit-and-sales-based incentive contract has to balance two goals: first, to align the interests of the two parties like in an agency setting and, second, to strategically influence the rival's price choices. It is worth mentioning that the outcome would change, if the Coop could somehow make the explicit contract contingent on different performance measures like the members' value (Kopel and Brand 2012, Bárcena-Ruiz 2009). Since this is hard to implement in practice, the Coop prefers to pay its internal manager a flat wage and relies on the manager's intrinsic motivation which achieves perfect alignment with the Coop's goal.

As a second point for the Coop's preference for recruiting an internal manager, observe that the equilibrium price levels of the PMF are identical in both subgames, i.e. $p_1^{DD} = p_1^{DND}$. In case the Coop pays a fixed compensation to its manager, this price level is obtained as a response to the Coop manager setting the price equal to marginal costs. In contrast, if the Coop uses an incentive contract, the external manager's price best-reply is upward-sloping (see (3.4) and Figure 1). The owners of the Coop now select the incentive parameter δ_2 such

that the resulting equilibrium price level of the rival is the same as with fixed compensation. This choice of δ_2 shifts the manager's price best-reply inwards (since $\delta_2^{DD} < 1$) and causes a decrease of the Coop's price below marginal cost. As a consequence, the consumption bundle of the members of the Coop changes. The demand for the PMF's product decreases whereas the demand for the Coop's product increases. However, overall this results in a lower member value V^{DD} (and negative profit).

Before concluding this section, we briefly analyze the mixed triopoly case in which two PMFs use strategic incentive contracts while a Coop either pays its manager a flat wage or uses a variable bonus scheme (like the PMFs). Comparing the payoffs, it is easy to see that for the Coop paying a flat wage constitutes a subgame perfect equilibrium strategy of the two-stage game. Moreover, we show that in this equilibrium every PMF selects an incentive parameter of $\delta > 1$ to manipulate the rival PMF's price upward. We include the main results obtained for the case of two PMFs and one Coop in the following proposition. The proof is given in the Appendix.

Proposition 2. *For $\beta \in (0, 1)$, the subgame perfect equilibrium outcome of strategic delegation game played by two PMFs and one Coop can be characterized as follows: (i) the PMFs $k = 1, 2$ write a bonus contract for their managers with $\delta_k > 1$, whereas the Coop offers the internal manager a fixed wage; (ii) the PMFs charge a higher price (and sell a lower output) than the Coop; (iii) the PMFs earn a higher profit than the Coop.*

4. Concluding Remarks

In research and practice it has been a major issue to find the optimal structure of the compensation package for a firm's management. Previous work has adopted a shareholder view and the profit-maximizing motive and has studied optimal incentive contracts which align the interest of the management with the firm's shareholders. In recent years the focus in corporate governance has shifted and researchers are now trying to understand the relationship between the structure of optimal compensation packages, the characteristics of a firm, and a firm's performance (e.g. Matolcsy and Wright 2011, Eldenburg *et al.* 2004). For example, recent work has shown that socially concerned firms, enterprises which also pursue non-profit motives, and other hybrid organizational forms (optimally) compensate their managers in a different way than their profit-maximizing rivals (e.g. Cai *et al.* 2011, Frye et al. 2006, Jegers 2009, Mahoney and Thorne 2005, 2006, Berrone and Gomez-Mejia 2009, Deckop *et al.* 2006). In this paper we have taken a theoretical approach and have presented a simplified model of strategic incentives for traditional consumer cooperatives competing in a mixed duopoly against a profit-maximizing firm. Competition was assumed *à la* Bertrand and goods were assumed to be differentiated. The conclusion obtained by our model is that while for a pure profit-maximizing firm it is optimal to hire an external manager interested in monetary compensation and rely on bonus-based incentive contracts to manipulate the manager's preferences, for the Coop it is optimal to employ a consumer-manager and pay her a flat wage, just relying on the consumer-manager's propensity to pursue the company goal. We believe that our findings are of interest in the light of more recent trends to re-organize Coop management and to move away from the traditional Coop orientation on member value to a more investor-focused hybrid Coop structure with a different objective (e.g. Katz and Boland 2002). In such type of organizational structures, the use of incentive contracts of the type considered here might be more suitable since this type shares some features with a PMF. We leave this issue as a topic for future research.

5. Appendix

Proof of Proposition 2: The direct demands functions for the two PMFs ($k = 1, 2$) and the Coop ($k = 3$) competing in prices can be written as follows

$$x_k(\mathbf{p}) = \frac{\alpha\,(1-\beta) - (1+\beta)p_k + \beta\mathbf{p}_{-k}}{(2\beta+1)\,(1-\beta)},$$

where $\mathbf{p}_{-k}$ denotes the prices charged by firm's k rivals. Let us first consider the subgame in which the Coop decides to recruit an internal manager while the PMFs recruit external managers. From Proposition 1 in the main text we know that in this case the Coop will always set a price equal to the marginal cost, i.e.

$$p_3(p_1, p_2) = c.$$

On the other hand, each PMF manager ($k = 1, 2$) selects the price to maximize compensation, which yields the following Bertrand-Nash equilibrium prices:

$$\begin{aligned}
p_1 &= \frac{2\,(\alpha + c\beta + c\delta_1) + \alpha\beta + c\beta\,(\delta_2 + 4\delta_1) + \beta^2\,(3c - 3\alpha + c\delta_2 + 2c\delta_1)}{(3\beta+2)\,(\beta+2)} \\
p_2 &= \frac{2\,(\alpha + c\beta + c\delta_2) + \alpha\beta + c\beta\,(\delta_1 + 4\delta_2) + \beta^2\,(3c - 3\alpha + c\delta_1 + 2c\delta_2)}{(3\beta+2)\,(\beta+2)} \\
p_3 &= c.
\end{aligned}$$

Solving backwards, at the first stage the owners of the k-th PMF maximize the reduced-form profits

$$\pi_k\,(\delta_1, \delta_2) = (p_k\,((\delta_1, \delta_2)) - c)x_k(p_1\,(\delta_1, \delta_2)\,, p_2\,(\delta_1, \delta_2)\,, p_3\,(\delta_1, \delta_2))$$

by selecting the contract parameter δ_k optimally. Solving the first-order conditions simultaneously yields

$$\delta_1^{DDND} = \delta_2^{DDND} = \frac{(4c + \alpha(\beta^2 - \beta^3) + 2\beta c\,(5 + 3\beta + \beta^2)}{(6\beta + \beta^2 + 4)\,(\beta+1)\,c} \geq 1$$

for $\beta \in (0, 1)$, where $DDND$ denotes the fact that firms 1 and 2 delegate and firm 3 does not. Final market prices are given by

$$\begin{gathered}
p_1^{DDND} = p_2^{DDND} = \frac{2\,(\alpha + c) + 3\beta c\,(2+\beta) - 2\beta^2\alpha}{(6\beta + \beta^2 + 4)} > c \\
p_3^{DDND} = c
\end{gathered}$$

and firm payoffs are

$$\begin{gathered}
\pi_1^{DDND} = \pi_2^{DDND} = \frac{2\,(\alpha - c)^2\,(4\beta + \beta^2 + 2)\,(1 - \beta^2)}{(2\beta+1)\,(6\beta + \beta^2 + 4)^2} > 0 \\
V^{DDND} = \frac{(\alpha - c)^2\,(104\beta + 148\beta^2 + 76\beta^3 + 11\beta^4 + 24)}{2\,(6\beta + \beta^2 + 4)^2\,(2\beta+1)\,.}
\end{gathered}$$

Moreover, for the Coop we have $\pi_3^{DDND} = 0$.

Now, let us assume that the Coop decides to pay its manager via a variable incentive scheme. In this case, all three managers set prices to maximize their own compensation. As a result, the following prices are obtained,

$$p_1 = \frac{\alpha\left(2+\beta-3\beta^2\right)+c\left(2\delta_1+3\beta\delta_1+\beta\left(\delta_2+\delta_3\right)+\beta^2\left(\delta_1+\delta_2+\delta_3\right)\right)}{2\left(3\beta+2\right)}$$
$$p_2 = \frac{\alpha\left(2+\beta-3\beta^2\right)+c\left(2\delta_2+3\beta\delta_2+\beta\left(\delta_1+\delta_3\right)+\beta^2\left(\delta_1+\delta_2+\delta_3\right)\right)}{2\left(3\beta+2\right)}$$
$$p_3 = \frac{\alpha\left(2+\beta-3\beta^2\right)+c\left(2\delta_3+3\beta\delta_3+\beta\left(\delta_1+\delta_2\right)+\beta^2\left(\delta_1+\delta_2+\delta_3\right)\right)}{2\left(3\beta+2\right)}$$

At the first stage, the two PMFs ($k=1,2$) and the Coop ($k=3$) simultaneously determine δ_k to maximize $\pi_1\left(\delta_1,\delta_2,\delta_3\right)$, $\pi_2\left(\delta_1,\delta_2,\delta_3\right)$ and $V\left(\delta_1,\delta_2,\delta_3\right)$ respectively. Solving the first-order conditions yields the solutions

$$\delta_1^{\mathbf{D}} = \delta_2^{\mathbf{D}} = \frac{\alpha\left(2\beta^2-2\beta^3\right)+c\left(4+8\beta+3\beta^2+3\beta^3\right)}{\left(\beta+2\right)^2\left(\beta+1\right)c} > 1$$
$$\delta_3^{\mathbf{D}} = \frac{\alpha\left(5\beta^2+7\beta^3-4-8\beta\right)+c\left(8+16\beta-6\beta^3\right)}{\left(\beta+2\right)^2\left(\beta+1\right)c} < 1$$

for $\beta \in (0,1)$. The above expressions show that if there is more than one PMF, each of the PMFs has an incentive to distort the incentive contract away from pure profit-based contracts in order to keep the market price high. Final equilibrium prices are

$$p_1^{\mathbf{D}} = p_2^{\mathbf{D}} = \frac{\alpha(1-\beta)+c(1+2\beta)}{(\beta+2)} > c$$
$$p_3^{\mathbf{D}} = \frac{2\alpha(\beta^2-\beta)+c\left(4+6\beta-\beta^2\right)}{\left(\beta+2\right)^2} < c,$$

and payoffs are given by

$$\pi_1^{\mathbf{D}} = \pi_2^{\mathbf{D}} = \frac{\left(\alpha-c\right)^2\left(\beta-1\right)\left(\beta^2-3\beta-2\right)}{\left(2\beta+1\right)\left(\beta+2\right)^3}$$
$$V^{\mathbf{D}} = \frac{\left(\alpha-c\right)^2\left(80\beta+86\beta^2+42\beta^3+11\beta^4+24\right)}{2\left(\beta+2\right)^4\left(2\beta+1\right)}$$

Moreover, for the Coop we have

$$\pi_3^{\mathbf{D}} = -\frac{2(\alpha-c)^2(1-\beta)\beta(4+10\beta+5\beta^2)}{\left(\beta+2\right)^4\left(2\beta+1\right)} < 0.$$

Considering our mixed price triopoly, a comparison of the Coop payoffs in the two subgames reveals that non-delegation represents the optimal choice for the Coop, since

$$\left(V^{DDND}-V^{\mathbf{D}}\right) = \frac{\left(\alpha-c\right)^2\left(44\beta+32\beta^2+5\beta^3+16\right)\left(1-\beta\right)\beta^3}{\left(\beta+2\right)^4\left(6\beta+\beta^2+4\right)^2\left(2\beta+1\right)} > 0.$$

This difference reaches its maximum for intermediate degrees of product differentiation β. Moreover, a comparison of the PMFs optimal bonus schemes yields

$$\left(\delta_k^{DND}-\delta_k^{DD}\right) = \frac{\left(\alpha-c\right)\left(8\beta+\beta^2+4\right)\left(\beta-1\right)\beta^2}{\left(\beta+2\right)^2\left(6\beta+\beta^2+4\right)\left(\beta+1\right)c} < 0.$$

for $k=1,2$. Consequently, if the Coop recruits an internal manager, both PMFs are less

aggressive when setting the variable incentive scheme for their managers. □

References

[1] Anderson R.K., S. C. Maurice and P. K. Porter (1979) "The Economics of Consumer-Managed Firms", *Southern Economic Journal*, July, 119-130.

[2] Anderson R.K., S. C. Maurice and P. K. Porter (1980) "Factor Usage by Consumer-Managed Firms", *Southern Economic Journal,* 522-528.

[3] Bekenstein A. L. (1943) "A Theoretical Analysis of Consumer Cooperatives: The Managerial Problem", *The Journal of Political Economy*, 51, 251-257.

[4] Bárcena-Ruiz, J. C. (2009)."The decision to hire managers in mixed markets under Bertrand competition", *The Japanese Economic Review*, 60(3): 376-88.

[5] Barros, F. (1995). "Incentive schemes as strategic variables: An application to a mixed duopoly", *International Journal of Industrial Organization*, 13(3): 373-86.

[6] Benabess, N. (2011), "Delegations in the Presence of Foreign Competition", *Global Journal of Management and Business Research*, 11(5), 54-58.

[7] Bénabou, R. and J. Tirole (2002), "Self-Confidence and Personal Motivation", *Quarterly Journal of Economics*, vol. CXVII, Issue 3, pp. 871-915.

[8] Bénabou, R. and J. Tirole (2003), "Intrinsic and Extrinsic Motivation", *Review of Economic Studies*, vol. 70(3), no. 244, pp. 489-520.

[9] Berrone, P. and L.R. Gomez-Mejia (2009), "The Pros and Cons of Rewarding Social Responsibility at the Top", *Human Resource Management*, 48(6), 959-971.

[10] Brandl, J. and W.H. Güttel (2007), "Organizational Antecendents of Pay-for-Performance Systems in Nonprofit Organizations", *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 18(2), 176-199.

[11] Cai, Y., H. Jo, and C. Pan (2011), "Vice or Virtue? The Impact of Corporate Social Responsibility on Executive Compensation", *Journal fo Business Ethics*, 104, 159-173.

[12] Colter, C. (2011), "Updating Trends in General Manager Compensation", *Cooperative Grocer*, September-October 2011.

[13] Colter, C. and P. Nolan (2006), "Manager Compensation, Cooperative Grocer, #124 May-June 2006.

[14] Cornforth, C. (2004), "The Governance of Cooperatives and Mutual Associations: a Paradox Perspectives", *Annals of Public and Cooperative Economics*, 75(1), 11-32.

[15] Cunat, V. and M. Guadalupe (2005), How Does Product Market Competition Shape Incentive Contracts?" *Journal of the European Economic Association*, 3(5), 1058-1082.

[16] Deckop, J.R., K.K. Merriman, and S. Gupta (2006), "The Effects of CEO Pay on Corporate Social Performance", *Journal of Management*, 32(3), 329-342.

[17] Drivas, K. and K. Giannakas. 2010. "The Effect of Cooperatives on Quality-Enhancing Innovation." Journal of Agricultural Economics, 61(2): 295-317.

[18] Eldenburg, L, B.E. Hermalin, M.S. Weisbach, and M. Wosinska (2004), "Governance, Performance Objectives amd Organizational Form: Evidence From Hospitals", *Journal of Corporate Finance*, 10, 527-548.

[19] Enke, S. (1945), "Consumer Cooperatives and Economic Efficiency", *American Economic Review*, March, 148-155.

[20] EuroCoop (2008), *Activity Reports*. European Association of Consumer Cooperatives, Bruxelles.

[21] Farrell, J. (1985), "Owner-Consumers and Efficiency", *Economics Letters*, 19, 303-306.

[22] Feng, L. and G. Hendrikse.(2011) "Chain Interdependencies, Measurement Problems, and Efficient Governance Structure: Cooperatives versus Publicly Listed Firms", *European Review of Agricultural Economics*, 1-15.

[23] Feng, L. and G. Hendrikse.(2009), "CEO Compensation in Cooperatives versus Publicly Listed Firms", *European Review of Agricultural Economics,* 39(2), 241-255.

[24] Fernandez-Ruiz, J. (2009), "Managerial Delegation in a Mixed Duopoly with a Foreign Competitor", *Economics Bulletin*, 29(1), 90-99.

[25] Fershtman C. and K. L. Judd (1987), "Equilibrium Incentives in Oligopoly", *The American Economic Review*, 77 927-940.
[26] Fershtman C. and K. L. Judd (1990), "Strategic Incentive Manipulation in Rivalrous Agency" *Working Paper*.
[27] Frumkin, P. and E.K. Keating (2010), "The Price of Doing Good: Executive Compensation in Nonprofit Organizations", *Policy and Society*, 29 (3), 269–282.
[28] Frey, B. S. (1997), "On the Relationship Between Intrinsic and Extrinsic Work Motivation", *International Journal of Industrial Organization*, vol. 15, no. 4, pp. 427-440.
[29] Frey, B. S. and M. Benz (2005), "Can Private Learn from Public Governance?", *Economic Journal*, vol. 115, no. 507, pp. F377-F396.
[30] Frye, M.B., E. Nelling, and E. Webb (2006), "Executive Compensation in Socially Responsible Firms", *Corporate Governance*, 14(5), 446-455.
[31] Fulton, Murray and Konstantinos Giannakas. 2001. "Organizational Commitment in a Mixed Oligopoly: Agricultural Cooperatives and Investor-Owned Firms." *American Journal of Agricultural Economics*, 83(5): 1258-65.
[32] Giannakas, K., and M. Fulton. 2005. "Process Innovation Activity in a Mixed Oligopoly: The Role of Cooperatives." *American Journal of Agricultural Economics*, 87(2): 406-22.
[33] Goering, G. E. (2008), "Welfare impacts of a non-profit firm in mixed commercial markets", *Economic Systems*, 32, 326–334.
[34] Goering, G.E. (2007) "The Strategic Use of Managerial Incentives in a Non-profit Firm Mixed Duopoly", *Managerial and Decision Economics*, 28, 2, 83–91.
[35] Hallock, K.F. (2002), Managerial Pay and Governance in American Nonprofits", *Industrial Relations*, 41(3), 377-406.
[36] Hart, O. and J. Moore (1996), "The Governance of Exchanges: Members' Cooperatives versus Outside Ownership", *Oxford Review of Economic Policy*, 12, 4, 53-69.
[37] Hart, O. and J. Moore (1998), "Cooperatives vs. Outside Ownership", *Harvard Institute of Economic Research Working Papers* 1816, Harvard, Institute of Economic Research.
[38] Hermalin, B.E. and M.S. Weisbach (2003), "Boards of Directors as an Endogenously Determined Institution: A Survey of the Economic Literature", *Economic Policy Review*, 7-26.
[39] Heywood, J.S. and G. Ye (2009), "Delegation in a Mixed Oligopoly: The Case of Multiple Private Firms", *Managerial and Decision Economics*, 30, 71-82.
[40] Hueth, B. and P. Marcoul (2009). "Incentive Pay for CEOs in Cooperative Firms", *American Journal of Agricultural Economics*, 91 (5), 1218-1223.
[41] Ireland N. and P. J. Law (1983), "A Cournot-Nash Model of the Consumer Cooperative", *Southern Economic Journal,* 49, 706-716.
[42] Ittner, C.D., D.F. Larcker, and M. Pizzini (2007), "Performance-based Compensation in Member-owned Firms: An Examination of Medical Group Practices", *Journal of Accounting and Economics,* 44, 300-327.
[43] James, Harvey S. (2005), "Why did you do that? An Economic Examination of the Effect of Extrinsic Compensation on Intrinsic Motivation and Performance", *Journal of Economic Psychology*, vol. 26, pp. 549-566.
[44] JCCU (2009), Coop 2009, Facts & Figures. *Japanese Consumers' Cooperative Union*, Tokio.
[45] Jegers, M. (2009), "Corporate" Governance in Nonprofit Organizations – A Nontechnical Review of the Economic Literature", *Nonprofit Management & Leadership*, 20(2), 143-164.
[46] Karuna, C. (2007), "Industry Product Market Competition and Managerial Incentives", *Journal of Accounting and Economics*, 43, 275-297.
[47] Katz, J.P. and M.A. Boland (2002), "One for All and All for One? A New Generation of Cooperatives Emerges", *Long Range Planning*, 35, 73-89.
[48] Kelsey, D. and F. Milne (2008), "Imperfect Competition and Corporate Governance", *Journal of Public Economic Theory*, 10, 1115-1141.
[49] Kopel, M. and B. Brand (2012), "Socially Responsible Firms and Endogenous Choice of Strategic Incentives", *Economic Modeling*, 29, 982-989.
[50] Kopel, M. and C. Löffler (2012), "Organizational governance, leadership, and the influence of competition", *Journal of Institutional and Theoretical Economics*,168, 362-392.

[51] Lang, (2002), "Strengthening Agricultural Cooperatives: An Inquiry Into Expert Beliefs", *Research Report*, No. 43, Center for Cooperatives, University of California, Davis.
[52] Leete, L. (2000) Wage Equity and Employee Motivation in Nonprofit and For-profit Organizations, *Journal of Economic Behavior and Organizations*, 43(4), 423-446.
[53] Mahoney, L.S. and L. Thorne (2005), "Corporate Social Responsibility and Long-Term Compensation: Evidence from Canada", *Journal of Business Ethics*, 57, 241-253.
[54] Mahoney, L.S. and L. Thorne (2006), "An Examination of the Structure of Executive Compensation and Corporate Social Responsibility: A Canadian Investigation", *Journal of Business Ethics*, 69, 149-162.
[55] Marini, M.A. and A. Zevi (2011), "Just One of Us: Consumers Playing Oligopoly in Mixed Markets", *Journal of Economics*, 104, 3, 239-263.
[56] Matolcsy, Z. and A. Wright (2011), "CEO Compensation Structure and Firm Performance", *Accounting and Finance*, 51, 745-763.
[57] Mikami, K. (2003), "Market Power and the Form of Enterprise: Capitalist Firms, Worker-owned Firms and Consumer Cooperatives", *Journal of Economic Behaviour and Organization*, 52, 4, December, 533-552.
[58] Mikami, K. (2010) "Capital Procurement of a Consumer Cooperative: Role of the Membership Market", *Economic Systems*, 34, 2, 178-197.
[59] Murdock, Kevin (2002), "Intrinsic Motivation and Optimal Incentive Contracts", *Rand Journal of Economics*, vol. 33, pp. 650-71.
[60] Nilsson, J. (2001) "Organisational Principles for Cooperative Firms", *Scandinavian Journal of Management*, 17, 329-56.
[61] Ohnishi, K. (2010), "Domestic and International Mixed Models With Price Competition", *International Review of Economics*, 57, 1-7.
[62] Preyra, C. and G. Pink (2001), "Balancing Incentives in the Compensation Contracts of Nonprofit Hospital CEOs", *Journal of Health Economics*, 20, 509-525.
[63] Richards, T.J., K.K. Klein, and A. Walburger (1998), "Principal-Agent Relationships in Agricultural Cooperatives: An Empirical Analysis from Rural Alberta", *Journal of Cooperatives*, 21-34.
[64] Sengul, M., J. Gimeno and J. Dial (2012), "Strategic Delegation: A Review, Theoretical Integration, and Research Agenda", *Journal of Management*, 38(1), 375-414.
[65] Sexton, R. (1983), "Economic Considerations in Forming Cooperatives and Establishing Pricing and Financing Policies", *The Journal of Consumer Affairs*, 17, 2, 290-314.
[66] Sexton, R. I. and A. Sexton (1987), "Cooperatives as Entrants", *Rand Journal of Economics*, 18, 581-95.
[67] Sexton, R. J. (1990), "Imperfect Competition in Agricultural Markets and the Role of Cooperatives: a Spatial Analysis", *American Journal of Agricultural Economics*, 72, 709-20.
[68] Singh, N., X. Vives (1984), "Price and Quantity Competition in a Differentiated Oligopoly", *Rand Journal of Economics*, 15, 4, 546-554.
[69] Sklivas, S.D. (1987) "The Strategic Choice of Managerial Incentives", *Rand Journal of Economics*, 18, 452-458.
[70] Soboh, Rafat A. M. E., A. O. Lansink, G. Giesen, and G.van Dijk. (2009) "Performance Measurement of the Agricultural Marketing Cooperatives: The Gap between Theory and Practice", *Review of Agricultural Economics*, 446-69.
[71] Spear, R. (2004) "Governance in democratic member-based organisations", *Annals of Public and Cooperative Economics*, 75(1), 33-59.
[72] Sykuta, M. E. and M. L. Cook. (2001) "A New Institutional Economcs Approach to Contracts and Cooperatives", *American Journal of Agricultural Economics*, 83(5), 1273-79.
[73] Theuvsen, L. (2004) "Doing Better While Doing Good: Motivational Aspects of Pay-for-Performance Effectiveness in Nonprofit Organizations", *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 15(2), 117-136.
[74] Tirole, J. (1994) "The Internal Organization of Government", *Oxford Economic Papers*, 46, 1, 1-29.
[75] Tirole, J. (2001) "Corporate Governance", *Econometrica*, 69, 1, 1-35.
[76] Trechter, D.D. and R.P. King (1995), "Executive Compensation Patterns and Practices in Minnesota and Wisconsin Cooperatives", *Journal of Cooperatives*, 49-63.
[77] Trechter, D.D., R.P. King, D.W. Cobia, and J.G. Hartell (1997), "Case Studies of Executive Compensation in Agricultural Cooperatives", *Review of Agricultural Economics*, 19 (2), 492-503.

[78] Vickers, J. (1985) "Delegation and the Theory of the Firm", *Economic Journal*, 95, 138-147.
[79] Yamey, B.S. (1950) "The Price Policy of Cooperative Societies", *Economica*, February, 23-42.
[80] Vroom, G. and J. Gimeno (2007), "Ownership Form, Managerial Incentives, and the Intensity of Rivalry", *Academy of Management Journal*, 50(4), 901-922.
[81] White, M. D. (2001) "Managerial Incentives and the Decision to Hire Managers in Markets with Public and Private Firms", *European Journal of Political Economy*, 17(4): 877-96.
[82] Williamson, E. O. (1963) "Manager Discretion and Business Behavior", *American Economic Review*, 53, 5, 1032-1057.