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**Optimal Compensation Structure in Consumer
Cooperatives under Mixed Oligopoly**

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OPTIMAL COMPENSATION STRUCTURE IN CONSUMER COOPERATIVES UNDER MIXED OLIGOPOLY

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ABSTRACT. The main aim of this paper is to derive properties of an optimal compensation scheme for consumer cooperatives (Coops) 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 straight salary to its manager whereas the profit-maximizing rival adopts a variable, high-powered incentive scheme. The main rationale is that, due to consumers' preferences, a Coop is *per se* highly expansionary in term of output and, therefore, does not need to provide strong strategic incentives to their managers to expand output aggressively by undercutting its rival.

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 its manager, relying on a straight salary instead.¹ Coops are enterprises operating in the retail industry which, by law or statutory rules, act on behalf of their consumer-members. 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 not a negligible phenomenon. 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 very 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 firm 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 a PMF – Coops avoid providing 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 rely to a much higher degree on monitoring, implicit contracts (enforced by social ties between the CEO and board members) and subjective performance evaluation (see also Ittner *et al.* 2007). 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.* (1997) report that Coop boards are skeptical of *ex ante* bonus programs. The empirical findings for CEO compensation in Coops are in line with the findings for other non-profit organizations, see e.g. Frumkin and Keating (2010),

¹Note 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.

²In contrast with this evidence, over the last decades 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.

Brandl and Güttel (2007), and Hallock (2002). To understand these observations, two main reasons have been advanced. First, from an agency perspective, using low-powered incentives for the managers in NPOs is the board's optimal response since the objectives 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 non-profit'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).

We believe that, although important, any explanation for low-powered incentives in Coops (and other nonprofit organizations for that matter) which is based only on these two perspectives provides an incomplete description of the governance and behavior of organizations competing in oligopolistic 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, Kopel and Löffler 2008) 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 straight salaries and rely on implicit contracts and subjective performance evaluation. 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, delegate the price choice to managers. Following the strategic incentives literature, we assume that each manager's compensation is determined by an explicit performance contract based on 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

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

⁴Our setting could be equivalently interpreted in a different way, namely 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 (e.g. Vickers 1985 and, for the managerial preference approach, e.g. Williamson 1963). Using this interpretation, our paper contributes to a better understanding of the issue of matching of manager types for Co-ops in mixed markets.

advantage in this situation of strategic interaction. Following the evidence above, we also assume that the Coop can abstain from offering a bonus contract to its manager and use a straight salary for compensation instead. In this case, the Coop relies on monitoring and implicit contracts to ensure that the Coop's objective function is maximized.⁵ What we find is in line with empirical and anecdotal evidence. In equilibrium, the PMF owners offer their manager a bonus incentive contract. In contrast, the owners of the Coop find it more beneficial in terms of member value not to use high-powered incentives via a profit-and-sales based incentive contract, but instead compensate the manager using a straight salary. Summarizing, our model shows that if one focuses on the strategic impact, it is not indicated for a Coop to use the same type of compensation for its manager as a PMF. The intuition is that a Coop, due to its focus on consumers' preferences, is *per se* highly expansionary in terms of output and, therefore, does not need to rely on a manager who sets prices aggressively to expand market share and quantity. Furthermore, employing a manager who is interested in sales and profit 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 threefold. First, we start from micro-economic fundamentals and *endogenously derive* a consumer Coop's objective function. This is worth pointing out since in existing work on Coop behavior a variety of exogenously given objectives have been considered (see the comprehensive survey by Soboh et al. 2009). However, the objective function of a firm should be endogenously derived (see Kelsey and Milne 2008, Eldenburg et al. 2004, Hermalin and Weisbach 2003). Second, we show that Coops do not have strategic reasons to use incentive contracts. 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. Third, 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, Barcena-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 in which a Coop and a PMF compete in prices and supply differentiated goods to consumers. The two firms delegate the choice of prices and determine the optimal compensation structure. 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 i and one Coop selling good j . Both

⁵Since 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 bear an identical unit cost c , so that cost functions are given by $C(x_k) = cx_k$, $k = i, j$. 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 $U_h : \mathbb{R}_+^3 \rightarrow \mathbb{R}_+$

$$(2.1) \quad U_h(x_i^h, x_j^h, y^h) = \alpha(x_i^h + x_j^h) - \frac{1}{2}((x_i^h)^2 + (x_j^h)^2) - \beta x_i^h x_j^h + y^h$$

where x_k^h , for $k = i, j$ 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_i and x_j . If the available income of each consumer (denoted \bar{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

$$(2.2) \quad p_i(x_i, x_j) x_i^h + p_j(x_i, x_j) x_j^h + y^h \leq \bar{y}^h.$$

Here $p_i(x_i, x_j)$ and $p_j(x_i, x_j)$ denote the prices of the two goods. Carrying out this derivation in the usual way yields the following inverse demand functions

$$(2.3) \quad \begin{aligned} p_i(x_i, x_j) &= \alpha - x_i - \beta x_j, \\ p_j(x_i, x_j) &= \alpha - x_j - \beta x_i. \end{aligned}$$

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

$$(2.4) \quad \begin{aligned} x_i(p_i, p_j) &= \frac{\alpha}{1 + \beta} - \frac{1}{1 - \beta^2} p_i + \frac{\beta}{1 - \beta^2} p_j \\ x_j(p_i, p_j) &= \frac{\alpha}{1 + \beta} - \frac{1}{1 - \beta^2} p_j + \frac{\beta}{1 - \beta^2} p_i. \end{aligned}$$

The starting point for the endogenous 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 corresponds to the maximization of total consumer welfare subject to the collective budget constraint (see also Marini and Zevi, 2011). More formally, at an interior solution where all consumers $h \in I$ are served by the two firms, we have

$$\begin{aligned} \max_{p_j} \int_{h \in I} U_h(x_i^h(p_i, p_j), x_j^h(p_i, p_j), y^h) dh \quad \text{s.t.} \\ \sum_{k=j,i} p_k \int_{h \in I} x_k^h(p_i, p_j) dh + \int_{h \in I} y^h dh \leq \int_{h \in I} \bar{y}^h dh + \int_{h \in I} \frac{x_j^h(p_i, p_j) dh}{x_j(p_i, p_j)} [p_j x_j(p_i, p_j) - C_j(x_j(p_i, p_j))] \end{aligned}$$

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

Since in equilibrium the budget constraint is binding and the consumers have a mass of 1, this implies

$$\max_{p_j} U(x_i(p_i, p_j), x_j(p_i, p_j)) + y \quad \text{s.t.}$$

$$\sum_{k=j,i} p_k x_k(p_i, p_j) + y = \bar{y} + [p_j x_j(p_i, p_j) - C_j(x_j(p_i, p_j))],$$

with

$$U(p_i, p_j) = (\alpha(x_i(\mathbf{p}) + x_j(\mathbf{p})) - (1/2)(x_i^2(\mathbf{p}) + x_j^2(\mathbf{p})) - \beta x_i(\mathbf{p})x_j(\mathbf{p})),$$

and $\mathbf{p} = (p_i, p_j)$.

This optimization problem can be simplified as

$$(2.5) \quad \max_{p_j} V(p_i, p_j) = \max_{p_j} \{U(\mathbf{p}) + \bar{y} - p_i x_i(\mathbf{p}) - C_j(x_j(\mathbf{p}))\},$$

and by (2.1) and the linear cost specification, (2.5) simply becomes:

$$(2.6) \quad \max_{p_j} \{\alpha(x_i(\mathbf{p}) + x_j(\mathbf{p})) - (1/2)(x_i^2(\mathbf{p}) + x_j^2(\mathbf{p})) - \beta x_i(\mathbf{p})x_j(\mathbf{p}) + \bar{y} - p_i x_i(\mathbf{p}) - c x_j(\mathbf{p})\}.$$

Hence, the constrained optimization problem of the Coop can be transformed into an unconstrained optimization problem with objective function (2.6).⁷ In this paper, we will assume that the owners of the Coop make their decisions in order to maximize (2.6).

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

$$(2.7) \quad \max_{p_i} \pi = (p_i - c)x_i(p_i, p_j).$$

We assume that both firms delegate the choice of prices to their managers. Following the standard delegation model (e.g. Fershtman and Judd 1987, Sklivas 1987, Vickers 1985), we assume that the manager of the PMF is compensated on the basis of profits $\pi_i = p_i x_i - C_i(x_i)$ and revenues $R_i = p_i x_i$.⁸ Likewise, the manager of the Coop can be compensated based on the Coop's profit π_j and sales revenue R_j .⁹ Alternatively, the Coop can use a straight salary to compensate its manager and rely on other incentive measures to ensure goal alignment between the Coop and its manager. In particular, the managers' compensation is given by

$$(2.8) \quad \begin{aligned} U_i &= A_i + B_i[\delta_i \pi_i + (1 - \delta_i)R_i] \\ U_j &= A_j + B_j[\delta_j \pi_j + (1 - \delta_j)R_j]. \end{aligned}$$

In case of profit-and-sales-based contracts, the incentive parameter δ_k is chosen endogenously

⁷For simplicity, in what follows we disregard the constant \bar{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).

⁸Note that it is a (weakly) dominant strategy for a PMF to write such an incentive contract. That is, no matter what the other firm chooses, a PMF would never prefer to offer its manager a straight salary.

⁹The 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.

by each firm's owners as part of the contract design. Further, 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. For $\delta_k = 1$, the contract is profit-based and for $\delta_k = 0$ the contract is sales revenue-based. In case of a straight salary, the Coop sets $B_j = 0$. It is important to note, that the compensation parameters A_k and B_k are just chosen 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 the firm), and only the part in the brackets is relevant for providing incentives to the manager. A manager will accept the contract if the reservation constraint is fulfilled. For notational simplicity, we set $\underline{U} = 0$, but note that this assumption does not alter our results in any way.

The timing of the game is as follows. At the first stage, the Coop determines the compensation structure, either a straight salary or an incentive contract. In case incentive contracts are chosen, both firms determine the contract design, i.e. the optimal values of the fixed and incentive components of the corresponding contract, to maximize its own objective function, which is (2.7) for the PMF and (2.6) for the Coop. In case the Coop chooses a straight salary, only the PMF chooses the contract parameters. At the third and final stage, the firms' managers will set the prices such that the manager's compensation is maximized, taking the strategic interaction with the rival firm into account. If the Coop's manager receives a fixed salary, we assume that prices are chosen to maximize (2.6). The main question which we will study with this model is if the Coop owners have a strategic reason to use an explicit incentive contract. All differences in the compensation structure – e.g. more reliance on fixed components and less weight on variable compensation – 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 two different subsections corresponding to the two different subgames we want to analyze. We solve each subgame by backward induction and subsequently determine the optimal decision taken by the Coop at stage one.

3.1. Only the PMF uses an incentive contract. It is helpful to start the analysis with the subgame in which only the PMF uses a strategic incentive contract, whereas the Coop relies on a straight salary. For this subgame, we can prove that, under consumers' quasilinear preferences and price competition, in equilibrium a Coop will always set a price equal to its marginal cost.

Proposition 1. *If the Coop manager is compensated by a straight salary, in equilibrium the manager will always set a price equal to marginal costs.*

Proof. According to our results in the previous subsection (see (2.6)), the objective function of the Coop takes the general form of

$$V(x_i(p_i, p_j), x_j(p_i, p_j)) = U(x_i(p_i, p_j), x_j(p_i, p_j)) + \bar{y} - p_i x_i(p_i, p_j) - C_j(x_j(p_i, p_j)).$$

Since the manager in this case determines the price to maximize V , the FOC for an interior solution is given by

$$(3.1) \quad \frac{dV(x_i(p_i, p_j), x_j(p_i, p_j))}{dp_j} = \frac{\partial U}{\partial x_i} \frac{\partial x_i}{\partial p_j} + \frac{\partial U}{\partial x_j} \frac{\partial x_j}{\partial p_j} - p_i \frac{\partial x_i}{\partial p_j} - \frac{\partial C_j}{\partial x_j} \frac{\partial x_j}{\partial p_j} = 0.$$

Since, under quasilinear preferences

$$\frac{\partial U}{\partial x_k} = p_k, \quad \text{for } k = i, j,$$

expression (3.1) can be written as

$$(3.2) \quad \frac{dV(x_i(p_i, p_j), x_j(p_i, p_j))}{dp_j} = \left(\frac{\partial U}{\partial x_j} - \frac{\partial C_j}{\partial x_j} \right) \frac{\partial x_j}{\partial p_j} = 0.$$

Given that $\partial x_j(p_i, p_j) / \partial p_j < 0$, condition (3.2) implies

$$\frac{\partial U}{\partial x_j} = \frac{\partial C_j}{\partial x_j}.$$

□

The meaning of Proposition 1 is that the 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 specification introduced above in (2.6), the FOC of the Coop manager at the price-setting stage can be written as:

$$\begin{aligned} \frac{dV}{dp_j} &= \frac{\partial x_i}{\partial p_j} + \frac{\partial x_j}{\partial p_j} - x_i \frac{\partial x_i}{\partial p_j} - x_j \frac{\partial x_j}{\partial p_j} - \beta \left(x_i \frac{\partial x_i}{\partial p_j} + x_j \frac{\partial x_j}{\partial p_j} \right) - p_i \frac{\partial x_i}{\partial p_j} - c \frac{\partial x_j}{\partial p_j} = \\ &= \frac{\partial x_i}{\partial p_j} \underbrace{(\alpha - x_i - \beta x_j - p_i)}_{=0} + \underbrace{\frac{\partial x_j}{\partial p_j}}_{=-1/(1-\beta)^2} \underbrace{(\alpha - x_j - \beta x_i - c)}_{=p_j} = 0. \end{aligned}$$

Hence, the Coop manager in our linear-quadratic setting sets $p_j = c$, i.e. a price equal to marginal costs. The important point here is that the price-setting behavior becomes independent of the rival's price. Consequently, for the profit-maximizing rival the *strategic effect of delegating* the price choice to a manager is lost. The price of the Coop cannot be influenced. Therefore, we can already conclude that the profit-maximizing owners have no incentive to strategically distort the incentive contract for its manager.¹⁰ More formally, the PMF's manager chooses p_i such that compensation U_i is maximized. Solving the first order condition yields the reaction function

$$p_i(p_j) = \frac{\alpha + c\delta_i - \alpha\beta}{2} + \frac{\beta}{2}p_j.$$

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

$$p_i^N = \frac{\alpha + c\delta_i - (\alpha - c)\beta}{2}, \quad p_j^N = c.$$

¹⁰This is due to our duopoly setting. If rival PMFs are active on the market, there is a strategic incentive to influence their price choices. Detailed derivations are provided for the triopoly case in the Appendix of this paper.

The profit of the PMF is

$$\pi_i^N(\delta_i) = \frac{(\alpha(1-\beta) - c(\delta_i - \beta))(\alpha(1-\beta) - c(2 - \delta_i - \beta))}{4(1-\beta^2)}.$$

The owners of the PMF now choose the incentive parameter δ_i to maximize π_i^N . This then yields

$$\delta_i^* = 1,$$

and shows that the PMF offers a profit-based contract to its manager. 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

$$p_i^* = \frac{\alpha + c - (\alpha - c)\beta}{2}, \quad p_j^* = c,$$

and the profits and the member value in equilibrium

$$\pi_i^* = \frac{(\alpha - c)^2(1 - \beta)}{4(1 + \beta)}, \quad V_j^* = \frac{(\alpha - c)^2(5 + 3\beta)}{8(1 + \beta)},$$

$$\pi_j^* = 0.$$

3.2. PMF and Coop use incentive contracts. If both firms write incentive contracts, then the analysis becomes even 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 each manager's compensation U_k as $\pi_k + (1 - \delta_k)cx_k$, $k = i, j$, the first order conditions of a manager at the price-setting stage can be written as

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

Solving the first order conditions leads to the price reaction functions

$$(3.4) \quad p_i(p_j) = \frac{\alpha + c\delta_i - \alpha\beta}{2} + \frac{\beta}{2}p_j$$

$$p_j(p_i) = \frac{\alpha + c\delta_j - \alpha\beta}{2} + \frac{\beta}{2}p_i,$$

which shows that they have the usual form and are upward-sloping. Hence, prices are strategic complements. Although the slope of the reaction functions remains unchanged, the owners of the firms can use the incentive parameter to shift the reaction function inwards ($\delta_k < 1$) or outwards ($\delta_k > 1$) with respect to the case of undistorted, profit-based incentive contracts ($\delta_k = 1$). Solving (3.4) yields

$$(3.5) \quad p_i = \frac{2\alpha - \alpha\beta - \alpha\beta^2 + 2c\delta_i + c\beta\delta_j}{4 - \beta^2}, \quad p_j = \frac{2\alpha - \alpha\beta - \alpha\beta^2 + 2c\delta_j + c\beta\delta_i}{4 - \beta^2}.$$

Both firms can use the managers as a commitment to increase prices. However, while this is in the interest of the owners of a PMF (e.g. Fershtman and Judd 1987, Sklivas 1987), the owners of the Coop try to maximize the welfare of its members. Therefore, they 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 $p_i(\delta_i, \delta_j)$ and $p_j(\delta_i, \delta_j)$. Then first focus on the PMF and write $\pi_i(p_i(\delta_i, \delta_j), p_j(\delta_i, \delta_j)) = (p_i - c)x(p_i, p_j)$. The owners of firm i select δ_i such that the profit π_i is maximized which yields the first order condition

$$\frac{d\pi_i}{d\delta_i} = \underbrace{\frac{\partial \pi_i}{\partial p_i}}_{(1-\delta_i)c/(1-\beta^2)} \frac{\partial p_i}{\partial \delta_i} + \underbrace{\frac{\partial \pi_i}{\partial p_j}}_{>0} \underbrace{\frac{\partial p_j}{\partial \delta_i}}_{c\beta/(4-\beta^2)}$$

where we have used the first order condition (3.3) of the manager in the first term. Since for $\delta_i = 1$ the first term vanishes, but the second term is positive, the owners can increase the profit of firm i by choosing a $\delta_i > 1$. 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 j 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 $V(x_i(p_i(\delta_i, \delta_j), p_j(\delta_i, \delta_j)), x_j(p_i(\delta_i, \delta_j), p_j(\delta_i, \delta_j)))$ given in (2.6). The first order condition can be written as

$$\begin{aligned} \frac{dV}{d\delta_j} = & \left(\frac{\partial x_i}{\partial p_i} \frac{\partial p_i}{\partial \delta_j} + \frac{\partial x_i}{\partial p_j} \frac{\partial p_j}{\partial \delta_j} \right) \underbrace{(\alpha - x_i - \beta x_j - p_i)}_{=0} + \\ & + \left[\underbrace{\frac{\partial x_j}{\partial p_i} \frac{\partial p_i}{\partial \delta_j} + \frac{\partial x_j}{\partial p_j} \frac{\partial p_j}{\partial \delta_j}}_{=-c(2-\beta^2)/(1-\beta^2)(4-\beta^2)} \right] \underbrace{(\alpha - x_j - \beta x_i - c)}_{=p_j} - \underbrace{\frac{\partial p_i}{\partial \delta_j}}_{=c\beta/(4-\beta^2)} x_i. \end{aligned}$$

Obviously, the first term vanishes. Recall that in the case where the manager is compensated by a straight salary, the price is set equal to marginal costs, $p_j = c$. 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 present case where the Coop manager is compensated by an incentive contract, the price will be below marginal cost (so that $dV/d\delta_j = 0$ holds). In other words, the Coop manager selects the price point even more aggressively if an incentive contract is written. The resulting reaction functions at the contracting stage are given by

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

Observe that the Coop's reaction function is independent of the rival's choice of contract, whereas the PMF's 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,

$$\begin{aligned} \delta_i^{**} &= 1 + \frac{(\alpha-c)\beta^2(1-\beta)}{4c} \geq 1 \\ \delta_j^{**} &= \frac{(2-\beta^2)c - \alpha(1-\beta^2)}{c} \leq 1. \end{aligned}$$

The resulting prices and payoffs in equilibrium are

$$\begin{aligned} p_i^{**} &= \frac{\alpha + c - (\alpha - c)\beta}{2}, & p_j^{**} &= c - \frac{(1 - \beta)\beta(\alpha - c)}{4}, \\ \pi_i^{**} &= \frac{(\alpha - c)^2(1 - \beta)(2 - \beta^2)}{8(1 + \beta)}, & V_j^{**} &= \frac{(\alpha - c)^2(20 + \beta(12 - (1 - \beta)\beta))}{32(1 + \beta)}, \\ \pi_j^{**} &= -\frac{(\alpha - c)^2(1 - \beta)\beta(4 + 3\beta)}{16(1 + \beta)}. \end{aligned}$$

Note that $p_j^{**} \leq c$ and therefore $\pi_j^{**} \leq 0$. The Coop uses the manager to set its price under marginal costs and this results in negative profits.

3.3. The equilibrium of the game. At the first stage the Coop chooses the compensation structure for its manager. It can either use a straight salary and obtain member value and profit of

$$V_j^* = \frac{(\alpha - c)^2(5 + 3\beta)}{8(1 + \beta)} \quad \text{and} \quad \pi_j^* = 0,$$

or use a profit-and-sales-based incentive contract and obtain

$$V_j^{**} = \frac{(\alpha - c)^2(20 + \beta(12 - (1 - \beta)\beta))}{32(1 + \beta)} \quad \text{and} \quad \pi_j^{**} = -\frac{(\alpha - c)^2(1 - \beta)\beta(4 + 3\beta)}{16(1 + \beta)}.$$

Since $V_j^{**} < V_j^*$, the owners of the Coop strictly prefer to pay its manager a straight salary for all $\beta \in (0, 1)$. Note that since $\pi_j^{**} < 0$, this conclusion would even hold if the Coop owners keep an eye on profit. In this equilibrium, the price of the profit-maximizing firm is higher, $p_i^* > p_j^* = c$, and consequently the sales of the Coop are higher, $x_j(p_i^*, p_j^*) > x_i(p_i^*, p_j^*)$. It turns out that the PMF nevertheless makes a higher profit than the Coop, $\pi_i^* > \pi_j^* = 0$.

These results are also expressed in the following proposition.

Proposition 2. *For $\beta \in (0, 1)$, the equilibrium outcome of the strategic incentive game played by a PMF and a Coop can be characterized as follows: (i) the PMF writes a bonus contract based on profits for its manager ($\delta_i = 1$), whereas the Coop offers its manager a straight salary; (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. \square

In Figure 1 we provide a graphical illustration of the two cases, straight salary versus pay-for-performance. The lines denoted by $p_i^*(p_j)$ and $p_j^*(p_i)$ represent the (equilibrium) price reaction functions of the PMF and the Coop, respectively, in the case where the Coop pays a straight salary to its manager. Note that the manager sets the Coop's price equal to marginal costs independent of the PMF's price. The intersection point \mathbf{p}^* of the two lines gives the optimal price pair. The lines denoted by $p_i^{**}(p_j)$ and $p_j^{**}(p_i)$ represent the (equilibrium) price reaction functions in the case where both firms use incentive contracts. In this case the optimal price pair is \mathbf{p}^{**} . The figure also shows the iso-profit curves for the PMF (π_i^* and π_i^{**}) and the iso-utility curves for the Coop (V_j^* and V_j^{**}) in the price space. Note that the

PMF iso-profit curves have the usual convex shape, whereas the Coop iso-utility curves are concave. Moreover, note that the profit level is increasing if iso-profit curves are further away from the origin ($\pi_i^* > \pi_i^{**}$), whereas lower iso-utility curves correspond to higher utility levels for consumers ($V_j^* > V_j^{**}$).

[FIGURE 1 APPROXIMATELY HERE]

In the case where the Coop pays a straight salary, the iso-utility curve V_j^* has a maximum along the vertical reaction function $p_j^*(p_i)$. Likewise, the iso-profit curve π_i^* has a maximum at the location where it intersects the reaction curve $p_i^*(p_j)$ (recall that $\delta_i^* = 1$). In the case where both firms use incentive contracts, this is different. To understand this, note that a manager's price reaction function only depends on the firm's own incentive parameter, 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 reaction function of the rival as given and maximize 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_i^{**} and the iso-utility curve V_j^{**} are tangent to the rival's reaction curves $p_j^{**}(p_i)$ and $p_i^{**}(p_j)$, respectively. If both firms use incentive contracts, the owners use the contracts to manipulate prices in order to reach the most favorable iso-curve compatible with their rival's best reply. 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 straight salary.

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 $\delta_i = 1$ and any deviation from this value would be made only for strategic reasons. 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 parameter δ_j . In other words, the incentive contract used for compensating the Coop manager drives a wedge between the interest of the owners of the Coop and the manager. Consequently, the bonus rate δ_j in 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. 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, Barcena-Ruiz 2009). Since this is hard to implement in practice and balancing the two goals stated above is costly, the Coop prefers to pay its manager a straight salary and relies on implicit contracts and subjective performance evaluation of its manager.

As a second point for the Coop's preference for paying a straight salary, observe that the equilibrium price level of the PMF is identical under both subgames, i.e. $p_i^* = p_i^{**}$. In case the Coop pays a straight salary 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 manager's price reaction function is upward-sloping (see (3.4) and Figure 1). The owners of the Coop now select the incentive parameter δ_j such that the resulting equilibrium price level of the rival is the same as with fixed compensation. This

choice of δ_j shifts the manager's price reaction function inwards (since $\delta_j^{**} \leq 1$) 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_j^{**} (and lower profit).

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, Mahoney and Thorn 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 the profit-maximizing firm it is optimal to rely on high-powered incentive contracts for its manager, for the Coop it is optimal to pay its manager a straight salary. 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

In this appendix we briefly analyze the mixed triopoly case in which two PMFs (denoted i and h) use strategic incentive contracts while a Coop (firm j) either pays its manager a flat wage or (like the PMFs) uses a variable bonus scheme. Comparing the payoffs, we prove 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 note that the same result would hold for the case with two Coops and one PMF or with three Coops, but for brevity we do not report the derivation of the results here. We include the main results obtained for the case of two PMFs and one Coop in the following proposition.

Proposition 3. *For $\beta \in (0, 1)$, the equilibrium outcome of the strategic incentive game played by two PMFs and one Coop can be characterized as follows: (i) the PMFs $k = i, h$ write a bonus contract for their managers with $\delta_k > 1$, whereas the Coop j offers the manager a straight salary; (ii) the PMFs charge a higher price (and sells a lower output) than the Coop; (iii) the PMFs earn a higher profit than the Coop.*

Proof. The direct demands for the three firms ($k = i, h, j$) 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 $\mathbf{p} = (p_i, p_h, p_j)$ and \mathbf{p}_{-k} denotes the sum of the prices charged by firm k 's rivals. Let us first consider the subgame in which the Coop decides to pay the manager a fixed wage. 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.

$$p_j(p_i, p_h) = c.$$

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

$$\begin{aligned} p_i^N &= \frac{2(\alpha + c\beta + c\delta_i) + \alpha\beta + c\beta(\delta_h + 4\delta_i) + \beta^2(3c - 3\alpha + c\delta_h + 2c\delta_i)}{(3\beta + 2)(\beta + 2)} \\ p_h^N &= \frac{2(\alpha + c\beta + c\delta_h) + \alpha\beta + c\beta(\delta_i + 4\delta_h) + \beta^2(3c - 3\alpha + c\delta_i + 2c\delta_h)}{(3\beta + 2)(\beta + 2)} \\ p_j^N &= c. \end{aligned}$$

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

$$\pi_k^N(\delta_i, \delta_h) = (p_k^N((\delta_i, \delta_h)) - c)x_k(p_i^N(\delta_i, \delta_h), p_h^N(\delta_i, \delta_h), p_j^N(\delta_i, \delta_h))$$

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

$$\delta_i^* = \delta_h^* = \frac{(4c + \alpha(\beta^2 - \beta^3) + 2\beta c(5 + 3\beta + \beta^2))}{(6\beta + \beta^2 + 4)(\beta + 1)c} \geq 1$$

for $\beta \in [0, 1)$. Final market prices are given by

$$\begin{aligned} p_i^* = p_h^* &= \frac{2(\alpha + c) + 3\beta c(2 + \beta) - 2\beta^2\alpha}{(6\beta + \beta^2 + 4)} > c \\ p_j^* &= c \end{aligned}$$

and firm payoffs are

$$\begin{aligned} \pi_i^* = \pi_h^* &= \frac{2(\alpha - c)^2(4\beta + \beta^2 + 2)(1 - \beta^2)}{(2\beta + 1)(6\beta + \beta^2 + 4)^2} > 0 \\ V_j^* &= \frac{(\alpha - c)^2(104\beta + 148\beta^2 + 76\beta^3 + 11\beta^4 + 24)}{2(6\beta + \beta^2 + 4)^2(2\beta + 1)}. \end{aligned}$$

Moreover, for the Coop we have $\pi_j^* = 0$.

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,

$$\begin{aligned}
 p_i^N &= \frac{\alpha(2 + \beta - 3\beta^2) + c(2\delta_i + 3\beta\delta_i + \beta(\delta_h + \delta_j) + \beta^2(\delta_i + \delta_h + \delta_j))}{2(3\beta + 2)} \\
 p_h^N &= \frac{\alpha(2 + \beta - 3\beta^2) + c(2\delta_h + 3\beta\delta_h + \beta(\delta_i + \delta_j) + \beta^2(\delta_i + \delta_h + \delta_j))}{2(3\beta + 2)} \\
 p_j^N &= \frac{\alpha(2 + \beta - 3\beta^2) + c(2\delta_j + 3\beta\delta_j + \beta(\delta_i + \delta_h) + \beta^2(\delta_i + \delta_h + \delta_j))}{2(3\beta + 2)}
 \end{aligned}$$

At the first stage, the two PMFs ($k = i, h$) and the Coop ($k = j$) simultaneously determine δ_k to maximize $\pi_i(\delta_i, \delta_h, \delta_j)$, $\pi_h(\delta_i, \delta_h, \delta_j)$ and $V_j(\delta_i, \delta_h, \delta_j)$ respectively. Solving the first-order conditions yields the solutions

$$\begin{aligned}
 \delta_i^{**} = \delta_h^{**} &= \frac{\alpha(2\beta^2 - 2\beta^3) + c(4 + 8\beta + 3\beta^2 + 3\beta^3)}{(\beta + 2)^2(\beta + 1)c} \geq 1 \\
 \delta_j^{**} &= \frac{\alpha(5\beta^2 + 7\beta^3 - 4 - 8\beta) + c(8 + 16\beta - 6\beta^3)}{(\beta + 2)^2(\beta + 1)c} \leq 1
 \end{aligned}$$

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

$$\begin{aligned}
 p_i^{**} = p_h^{**} &= \frac{\alpha(1 - \beta) + c(1 + 2\beta)}{(\beta + 2)} > c \\
 p_j^{**} &= \frac{2\alpha(\beta^2 - \beta) + c(4 + 6\beta - \beta^2)}{(\beta + 2)^2} < c,
 \end{aligned}$$

and payoffs are given by

$$\begin{aligned}
 \pi_i^{**} = \pi_h^{**} &= \frac{(\alpha - c)^2(\beta - 1)(\beta^2 - 3\beta - 2)}{(2\beta + 1)(\beta + 2)^3} \\
 V_j^{**} &= \frac{(\alpha - c)^2(80\beta + 86\beta^2 + 42\beta^3 + 11\beta^4 + 24)}{2(\beta + 2)^4(2\beta + 1)}
 \end{aligned}$$

Moreover, for the Coop we have

$$\pi_j^{**} = -\frac{2(\alpha - c)^2(1 - \beta)\beta(4 + 10\beta + 5\beta^2)}{(\beta + 2)^4(2\beta + 1)} < 0.$$

Considering our mixed price triopoly, a comparison of the Coop payoffs in the two subgames reveals that paying a fixed wage instead of a variable bonus scheme for the manager represents the optimal choice for the Coop, since

$$(V_j^* - V_j^{**}) = \frac{(\alpha - c)^2(44\beta + 32\beta^2 + 5\beta^3 + 16)(1 - \beta)\beta^3}{(\beta + 2)^4(6\beta + \beta^2 + 4)^2(2\beta + 1)} > 0.$$

This difference reaches its maximum for intermediate degrees of product differentiation β .

Moreover, a comparison of the PMF optimal bonus schemes yields

$$(\delta_i^* - \delta_i^{**}) = \frac{(\alpha - c)(8\beta + \beta^2 + 4)(\beta - 1)\beta^2}{(\beta + 2)^2(6\beta + \beta^2 + 4)(\beta + 1)c} < 0.$$

Consequently, if the Coop pays its manager a straight salary, both PMFs are less aggressive when setting the variable incentive scheme for their managers. \square

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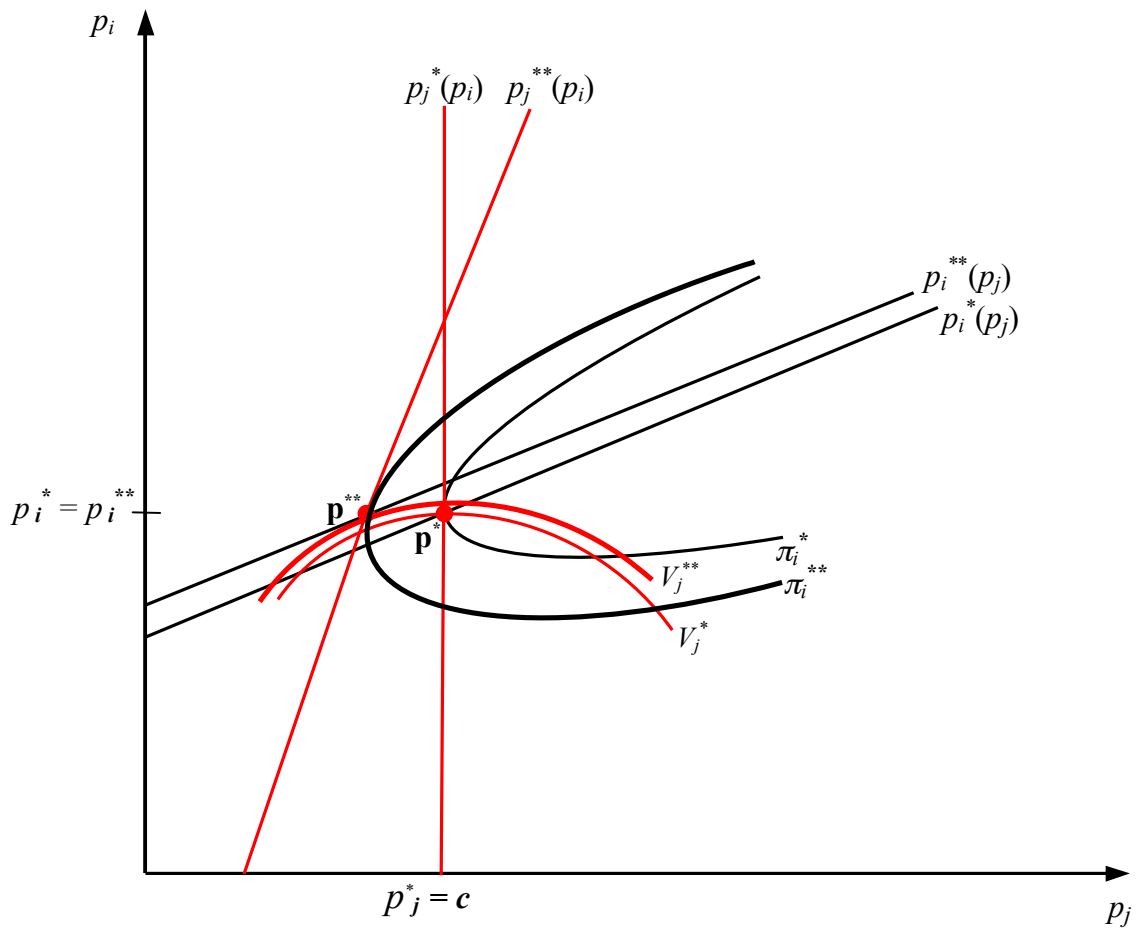


Figure 1 – Best replies and contour lines for both firms if (i) only the PMF adopts an incentive contract; (ii) both firms use an incentive contract.