

Unilateral Decisions to Hire Managers in Markets with Capitalist and Labor-Managed Firms

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Abstract

This paper examines the equilibrium outcomes of firms' decision games to hire managers when there is a capitalist firm competing against a labor-managed firm. The paper shows that if only the capitalist firm hires a manager, then the equilibrium coincides with the solution when neither firm hires a manager. In addition, the paper shows that if only the labor-managed firm hires a manager, then at equilibrium the capitalist firm's output and the market price are lower than when neither firm hires a manager.

Keywords: Capitalist firm, labor-managed firm, managerial delegation, mixed duopoly, Cournot model.

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Introduction

We examine an oligopoly model in which firms decide as to whether or not to hire managers. Fershtman and Judd (1987) consider a two-stage delegation game in which in the first stage, the owners of each firm simultaneously and independently determine the incentive structure for its manager, and in the second stage, each manager plays a Cournot-quantity game to maximize his utility, given his incentive scheme and his rival's behavior. They show that owners use the incentive schemes that influence their managers' behavior and alter the equilibrium outcome. Miller and Pazgal (2001) examine a two-stage duopoly model where in the second stage, managers compete either both in prices, both in quantities, or one in price and the other in quantity, and demonstrate that if owners have sufficient control over the behavior of their managers, the equilibrium is the same regardless of how the firms compete in the second stage. There are also many other excellent works (for example, see Sklivas, 1987; Fumas, 1992; Basu, 1995; Kräkel, 2002;

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Miller and Pazgal, 2002, 2005; Park, 2002). These works investigate strategic decisions of managerial incentive contracts in private oligopoly markets.

White (2001) examines managerial incentives in a quantity competition model where a state-owned firm with social welfare objectives competes with capitalist firms with profit objectives, and demonstrates that at equilibrium only capitalist firms hire managers. Fernández-Ruiz (2009) examines firms' decisions to hire managers when a state-owned firm competes against a foreign capitalist firm, and shows that at equilibrium both firms hire managers. Bárcena-Ruiz (2009) investigates a mixed duopoly market in which a state-owned firm competes on price against a capitalist firm, and shows that both firms hire managers. In addition, Ohnishi (2018) investigates a price competition model in which a state-owned firm competes against a foreign capitalist firm, and shows that there is an equilibrium in which only the foreign capitalist firm hire a manager. However, these works do not include labor-managed firms.

Only a few works consider mixed oligopoly markets in which capitalist and labor-managed firms coexist. For example, Stewart (1992) examines strategic managerial delegation in a mixed duopoly market with capitalist and labor-managed firms, and shows that there is a case in which a managerial capitalist firm that deters the labor-managed entrant may generate more profit than a non-managerial capitalist firm that does not.

We examine firms' decisions to hire managers when there is a capitalist firm competing against a labor-managed firm. We consider two games: only the capitalist firm hires a manager and only the labor-managed firm hires a manager. The main purpose of this paper is to show the equilibrium outcomes of these two games.

The Basic Model

Let us consider a model with one capitalist firm (firm C) and one labor-managed firm (firm L). Throughout this paper, subscripts C and L denote firm C and firm L, respectively. Firm i ($i = C, L$) can hire one manager to make its production decisions. There is no possibility of entry or exit. The duopolists produce perfectly substitutable commodities. The market price is determined by the inverse demand function:

$$P = a - Q \quad (1)$$

where $a > Q = q_C + q_L$.

Firm i 's profit is given by

$$\pi_i = P(Q)q_i - mq_i - f \quad (i = C, L) \quad (2)$$

where $m \in (1, \infty)$ denotes the constant marginal cost and $f \in (1, \infty)$ is the fixed cost. Firm C seeks to maximize (2).

Firm L seeks to maximize profit per worker:

$$\varphi_L = \frac{P(Q)q_L - mq_L - f}{l_L} = \frac{P(Q)q_L - mq_L - f}{q_L} \quad (3)$$

where l_i denotes the amount of labor employed by firm i . Firm L aims to maximize (3).

Firm i can hire an able manager to make its production decisions. Manager i aims to maximize a function of firm i 's profit π_i and revenue R_i :

$$\begin{aligned} M_i &= \beta_i \pi_i + (1 - \beta_i) R_i \\ &= (P - \beta_i m) q_i - \beta_i f \end{aligned} \quad (4)$$

where $\beta_i \in [0, 1]$ can be interpreted as a discount factor on costs.

We consider the following two-stage duopoly game. In the first stage, firm i ($i = C, L$) appoints a manager and selects β_i for him. In the second stage, firms compete in Cournot fashion. The equilibrium solution concept is subgame perfection by backward induction. We assume that π_C and φ_L obtained in equilibrium are non-negative.

Equilibrium Outcomes

In this section, we examine the following two games.

Game 1: Only firm C hires a manager.

Game 2: Only firm L hires a manager.

We discuss these games in order.

Game 1

In this subsection, we will find the equilibrium of the game when only firm C hires a manager. In the second stage, the manager of firm C maximizes the objective function given by (4), while firm L maximize (3). These lead to the following output functions:

$$q_C^C = \frac{a - \beta_C m - \sqrt{f}}{2} \quad (5)$$

$$q_L^C = \sqrt{f} \quad (6)$$

where the superscript C denotes that only firm C hires a manager.

In the first stage, firm C chooses β_C to maximize its own profit. This results in:

$$\beta_C^C = 1$$

Replacing this incentive parameter into (5), we obtain:

$$q_C^C = \frac{a - m - \sqrt{f}}{2}$$

$$q_L^C = \sqrt{f}$$

$$p^C = \frac{a + m - \sqrt{f}}{2}$$

$$\pi_C^C = \frac{a^2 - 2am + m^2 - 2a\sqrt{f} + 2m\sqrt{f} - 3f}{4}$$

$$\varphi_L^C = \frac{a - m - 3\sqrt{f}}{2}$$

We can present the following proposition.

Proposition 1: Suppose that only firm C hires a manager. Then the equilibrium coincides with the solution when neither firm hires a manager.

This proposition is evident from $\beta_C^C = 1$.

Game 2

In this game, only firm L hires a manager. In the second stage, the manager of firm L maximizes the objective function given by (4), and firm C maximize (2). These maximization problems lead to:

$$q_C^L = \frac{a - 2m + \beta_L m}{3} \tag{7}$$

$$q_L^L = \frac{a + m - 2\beta_L m}{3} \tag{8}$$

where the superscript L denotes that only firm L hires a manager.

In the first stage, firm L chooses β_L to maximize profit per worker. Therefore, we obtain:

$$\beta_L^L = \frac{a + m - 3\sqrt{2f}}{2m}$$

$$q_C^L = \frac{a - m - \sqrt{2f}}{2}$$

$$q_L^L = \sqrt{2f}$$

$$P^L = \frac{a + m - \sqrt{2f}}{2}$$

$$\pi_C^L = \frac{a^2 - 2am + m^2 - 2a\sqrt{2f} + 2m\sqrt{2f} - 2f}{4}$$

$$\phi_L^L = \frac{(a - m - 2\sqrt{2f})\sqrt{2f}}{2}$$

We state the following proposition.

Proposition 2: Suppose that only firm L hires a manager. Then at equilibrium, (i) $q_C^N > q_C^L$, (ii) $q_L^N < q_L^L$, and (iii) $P^N > P^L$. Here the superscript N denotes that neither firm hires a manager.

Proof: From Proposition 1, we see that $q_C^N = q_C^C$, $q_L^N = q_L^C$, and $P^N = P^C$. Therefore,

$$(i) q_C^C - q_C^L = \frac{a - m - \sqrt{f}}{2} - \frac{a - m - \sqrt{2f}}{2} = \frac{\sqrt{2f} - \sqrt{f}}{2}$$

$$(ii) q_L^C - q_L^L = \sqrt{f} - \sqrt{2f}$$

$$(iii) P^C - P^L = \frac{a + m - \sqrt{f}}{2} - \frac{a + m - \sqrt{2f}}{2} = \frac{\sqrt{2f} - \sqrt{f}}{2}$$

Since $\sqrt{f} < \sqrt{2f}$, the proposition is proved. Q.E.D.

Conclusion

We have examined firms' decisions to hire managers when a capitalist firm competes against a labor-managed firm. First, we have considered a game where only the capitalist firm hires a manager, and have shown that the equilibrium coincides with the solution when neither firm hires a manager. Next, we have considered a game where only the labor-managed firm hires a manager, and have shown that at equilibrium the capitalist firm's output and the market price are lower than when neither firm hires a manager while the labor-managed firm's output is higher than when neither firm hires a manager.

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