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Viewpoint

Corporate Social Responsibility and Reaction Functions of Labor-Managed Firms with Lifetime Employment as Strategic Commitment

Kazuhiro Ohnishi[1]
Department of Economics, Institute for Economic Sciences, Osaka, Japan

Abstract

This paper examines an oligopoly game model with a concave demand function where labor-managed firms compete in quantities with each other. There is no possibility of entry or exit. The timing of the game is as follows. In the first stage, each labor-managed firm simultaneously and independently chooses the level of social concern. In the second stage, each labor-managed firm simultaneously and independently chooses whether to offer lifetime employment as a strategic commitment device. In the third stage, quantity competition takes place. This paper examines the reaction functions of labor-managed firms in the model. First, the paper presents the reaction functions of labor-managed firms in the game model. It is shown that the reaction functions of labor-managed firms have both upward and downward sloping cases. Next, the paper provides a simple example to support the above result. This example shows a case in which the reaction functions of labor-managed firms are downward-sloping.

Keywords: Corporate social responsibility, Cournot model, labor-managed firms, lifetime employment, reaction functions.

[1] *Corresponding author's Email: ohnishi@e.people.or.jp*

Introduction

Corporate social responsibility (CSR) has become a growing topic in the areas of business and economics over the past few decades. For example, nearly 90 percent of the 250 largest global companies issued CSR reports in 2015 (KPMG, 2015). More than half of American consumers say that more information on a company's ethical and social behavior would influence their purchasing decision (Ipsos MORI, 2003; Kitzmueller and Shimshack, 2012). Many major companies, such as Google, Microsoft, General Electric, Exxon Mobil, Walmart, and Walt Disney, use an internal price on carbon as an incentive and strategic planning tool (CDP, 2013).

The theoretical analysis of economic models that incorporate CSR firms has been investigated by many researchers (see Goering, 2007; Lambertini and Tampieri, 2012; Xu, 2014; Cracau, 2015; Flores and García, 2016; Fanti and Buccella, 2018; Planer-Friedrich and Sahm, 2018; García, Leal and Lee, 2019; Han, 2019; Leal, Garcia and Lee, 2019). For example, Lambertini and Tampieri (2012) examine an oligopoly market with pollution where $n(\geq 2)$ private firms compete with each other, and show that the presence of a CSR firm improves social welfare if the market is large. Kopel and Brand (2012) consider the managerial incentive contract when a profit-maximizing firm and a CSR firm compete in a Cournot fashion, and demonstrate that there is a subgame perfect Nash equilibrium in which both firms hire managers. Kopel (2015) considers the endogenous choice of a price or quantity contract in a mixed duopoly consisting of a profit-maximizing firm and a CSR firm, and demonstrates that quantity competition might lead to higher economic welfare than price competition. Han (2019) uses a quantity-setting mixed oligopoly model to examine effects of firms' CSR activities on privatization of a public firm, and shows that the optimal degree of privatization decreases with the firms' CSR activities. In addition, Leal, García and Lee (2019) examine the environmental policy mix of tradable emission permits and emission taxes in a duopoly model consisting of a CSR firm and a profit-maximizing firm, and show that an emission tax can be redundant when both excess burden of taxation and the degree of CSR are insignificant.

In this paper, we examine an oligopoly game model in which labor-managed firms compete with each other. Since the pioneering work on a theoretical model of a labor-managed firm by Ward (1958), there have been many theoretical models that incorporate labor-managed firms (see, for example, Law and Stewart, 1983; Lambertini and Rossini, 1998; Lambertini, 2001; Cuccia and Cellini, 2009; Luo, 2013).

We consider a three-stage game model in which labor-managed firms compete in quantities. In the first stage, each labor-managed firm non-cooperatively chooses the level of CSR. In the second stage, each labor-managed firm non-cooperatively chooses whether to offer lifetime employment as a strategic commitment device (For details, see Ohnishi,

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2001, 2002). In the third stage, each labor-managed firm non-cooperatively chooses an actual output level. We examine the reaction functions of labor-managed firms in the model.

Model

There is a market composed of $n(\geq 2)$ labor-managed firms. There is no possibility of entry or exit. The market price is determined by the inverse demand function $p(Q)$, where $Q = \sum_{i=1}^{n} q_i$ denotes the total output produced by all labor-managed firms. We assume the strictly concave inverse demand function: $p' < 0$ and $p'' < 0$.

In the first stage of the market game, each labor-managed firm i (i = 1,…,n) simultaneously and independently chooses $\theta_i \in [0,1]$, which denotes the percentage of the consumer surplus, $CS = \int_0^Q p(X)dX - p(Q)Q$. In the second stage, each labor-managed firm i simultaneously and independently decides whether to offer lifetime employment as a strategic commitment device. If labor-managed firm i offers lifetime employment, then it chooses an output level $q_i^* \in (0,\infty)$, employs the necessary number of employees to produce q_i^*, and enters into a lifetime employment contract with all of the employees. In the end of the game, each labor-managed firm i simultaneously and independently chooses an actual output $q_i \in [0,\infty)$.

Hence, labor-managed firm i's objective function is given by

$$\Omega_i = \begin{cases} \theta_i\left[\int_0^Q p(X)dX - p(Q)Q\right] + \dfrac{p(Q)q_i - c(q_i) - f}{l(q_i)} & \text{if } q_i > q_i^*, \\ \theta_i\left[\int_0^Q p(X)dX - p(Q)Q\right] + \dfrac{p(Q)q_i - c(q_i) - f}{l(q_i^*)} & \text{if } q_i \leq q_i^*, \end{cases} \quad (1)$$

where $c(q_i)$ denotes the capital input function, $f \in (0,\infty)$ is the fixed cost, and $l(q_i)$ is the labor input function. We assume the increasing marginal costs: $c' > 0$, $c'' > 0$, $l' > 0$ and $l'' > 0$.

In the next section, we present the reaction functions of labor-managed firms in the model.

Reaction Functions

We consider the maximization problem for labor-managed firm i. We derive labor-managed firm i's best reaction function from (1). If labor-managed firm i produces output q_i within the limit of the output level it has chosen in the first stage, then its reaction function is defined by

$$\bar{R}_i(q_{-i}) = \arg\max_{q_i \geq 0} \left\{ \theta_i \left[\int_0^Q p(X)dX - p(Q)Q \right] + \frac{p(Q)q_i - c(q_i) - f}{l(q_i^*)} \right\}, \tag{2}$$

where $q_{-i} = (q_1, q_2, \ldots, q_{i-1,} q_{i+1}, \ldots, q_n)$. On the other hand, if labor-managed firm *i* wishes to produce $q_i > q_i^*$, then its reaction function is defined by

$$R_i(q_{-i}) = \arg\max_{q_i \geq 0} \left\{ \theta_i \left[\int_0^Q p(X)dX - p(Q)Q \right] + \frac{p(Q)q_i - c(q_i) - f}{l(q_i)} \right\}. \tag{3}$$

Therefore, if labor-managed firm *i* selects q_i^* and offers lifetime employment, then its best reply is shown as follows:

$$R_i^L(q_{-i}) = \begin{cases} R_i(q_{-i}) & \text{if } q_i > q_i^*, \\ q_i^* & \text{if } q_i = q_i^*, \\ \bar{R}_i(q_{-i}) & \text{if } q_i < q_i^*. \end{cases} \tag{4}$$

Labor-managed firm *i* chooses q_i in order to maximize Ω_i, given q_{-i}. Therefore, the first-order condition for labor-managed firm *i* when $q_i > q_i^*$ is

$$(p + p'q_i - rk')l - (pq_i - rk - f)l' - \theta_i p'Q = 0. \tag{5}$$

On the other hand, the first-order condition for labor-managed firm *i* when $q_i < q_i^*$ is

$$p + p'q_i - c' - \theta_i l^* p'Q = 0. \tag{6}$$

Therefore, we obtain

$$R_i'(q_{-i}) = -\frac{p'(l - q_i l') - p'' q_i l - \theta_i p' - \theta_i p'' Q}{(2p' + p'' q_i - c'')l - (pq_i - c - f)l'' - (1+Q)\theta_i p''} \tag{7}$$

and

$$\bar{R}_i'(q_{-i}) = -\frac{p' + p'' q_i - \theta_i l^* (p' + p'' Q)}{2p' + p'' q_i - c'' - \theta_i l^* (p' + p'' Q)}. \tag{8}$$

Since $l'' > 0$, $l - q_i l' < 0$, and hence $p'(l - q_i l') - p'' q_i l$ is positive. The numerator of (7) is positive. On the other hand, the numerator of (8) may be negative.

The main result of this study can be stated in the following proposition.

Proposition 1: (i) $R_i(q_{-i})$ is always upward-sloping. (ii) $\bar{R}_i(q_{-i})$ may be not always upward-sloping.

In the next section, we provide a simple example to support this proposition.

Example

We consider the strictly concave inverse demand function: $p(q_1, q_2) = a - (q_1 + q_2)^2$, where $a \in (0, \infty)$ represents a constant and $a > q_1 + q_2$. Moreover, $c(q_j) = mq_j^2$ $(j = 1,2)$ and $l(q_j) = wq_j^2$, where $m,\ w \in (0, \infty)$ are constants. The objective functions of labor-managed firms are those specified in the previous sections. Therefore, the first-order condition for labor-managed firm *j* when $q_j > q_j^*$ is

$$2\theta_j (q_j + q_k)^2 - \frac{aq_j + 3q_j^2 - 2q_j^3 - q_j q_k^2 - 2f}{q_j^3} = 0 \quad (j, k = 1, 2;\ j \neq k). \tag{9}$$

On the other hand, the first-order condition for labor-managed firm *j* when $q_j < q_j^*$ is

$$2\theta_j (q_j + q_k)^2 - \frac{a - 3q_j^2 - 4q_j q_k - q_k^2 - 2cq_j}{wq_j^{*2}} = 0. \tag{10}$$

The former reaction function is always upward-sloping, whereas the later reaction function is upward-sloping if and only if

$$\theta_j > \frac{2q_j + q_k}{2wq_j^{*2}(q_j + q_k)}. \tag{11}$$

We now assume that $q_j = q_j^* = q_k = 2$ and $w = 1$. Then, if $\theta_j > 3/16$, labor-managed firm *j*'s reaction function is upward-sloping, whereas if $\theta_j < 3/16$, it is downward-sloping.

Conclusion

We have studied a Cournot oligopoly model with a concave demand function where labor-managed firms compete with each other and have presented the reaction functions of labor-managed firms in the game model. First, we have shown that the reaction functions of labor-managed firms have both upward and downward sloping cases. Next, we have provided an example to support our result. In this example, we have shown a case in which the reaction functions of labor-managed firms are downward-sloping.

References

Baron, D. P. (2001). Private politics, corporate social responsibility, and integrated strategy. *Journal of Economic Management and Strategy 10*, 7-45.

Besley, T., & Ghatak, M. (2007). Retailing public goods: the economics of corporate social responsibility. *Journal of Public Economics 91*, 1645-1663.

Bulow, J., Geanakoplos, J., & Klemperer, P. (1985). Multimarket oligopoly: strategic substitutes and complements. *Journal of Political Economy, 93*, 488-511.

CDP. (2013). *Use of internal carbon price by companies as incentive and strategic planning tool: a review of findings from CDP 2013 disclosure.* Retrieved from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.actuaries.org.uk/system/files/documents/pdf/cdp-carbon-pricingdec13.pdf

Cracau, D. (2015). The effect of strategic firm objectives on competition. In K. Ohnishi, *Firms' Strategic Decisions: Theoretical and Empirical Findings, Volume 1* (pp. 170-181). Sharjah, UAE: Bentham Science Publishers.

Cuccia, T., & Cellini, R. (2009). Workers' enterprises and the taste for production: the arts, sport and other cases. *Scottish Journal of Political Economy 56*, 123-137.

Delbono, F., & Scarpa, C. (1995). Upward-sloping reaction functions under quantity competition in mixed oligopolies. *Bulletin of Economic Research 47*, 341-346.

Fanti, L., & Buccella, D. (2018). Profitability of corporate social responsibility in network industries. *International Review of Economics 65*, 271-289.

Flores, D., & García, A. (2016). On the output and welfare effects of a non-profit firm in a mixed duopoly: a generalization. *Economic Systems 40*, 631-637.

García, A., Leal, M., & Lee, S.-H. (2019). Endogenous timing with a socially responsible firm. *Korean Economic Review 35*, 345-370.

Goering, G. E. (2007). The strategic use of managerial incentives in a non-profit firm mixed duopoly. *Managerial and Decision Economics 28*, 83-91.

Han, L. (2019). Partial ownership for a public firm and corporate social responsibility. *Theoretical Economics Letters 9*, 2447-2455.

Hirose, K., Lee, S.-H., & Matsumura, T. (2017). Environmental corporate responsibility: a note on the first-mover advantage under price competition. *Economics Bulletin 37*, 214-221.

Ipsos MORI. (2003). *Ethical companies.* Retrieved from https://www.ipsos.com/en-uk/ethical-companies

Kitzmueller, M., & Shimshack, J. (2012). Economic perspectives on corporate social responsibility. *Journal of EconomicLiterature 50*, 51-84.

Königstein, M., & Müller, W. (2001). Why firms should care for customers. *Economics Letters 72*, 47-52.

Kopel, M. (2015). Price and quantity contracts in a mixed duopoly with a socially concerned firm. *Managerial and Decision Economics 36*, 559-566.

Kopel, M., & Brand, B. (2012). Socially responsible firms and endogenous choice of strategic incentives. *Economic Modelling 29*, 982-989.

Kopel, M., Lamantia, F., & Szidarovszky, F. (2014). Evolutionary competition in a mixed market with socially concerned firms. *Journal of Economic Dynamic & Control 48*, 394-409.

KPMG. (2015). *Currents of change: KPMG survey of corporate responsibility reporting 2015*. Retrieved from http://www.kpmg.com/cn/en/issuesandinsights/articlespublications/pages/kpmg-survey-of-corporate-responsibility-reporting

Lambertini, L. (2001). Spatial competition with profit-maximising and labour-managed firms. *Papers in Regional Science 80*, 499-507.

Lambertini, L., & Rossini, G. (1998). Capital commitment and Cournot competition with labour-managed and profit-maximising firms. *Australian Economic Papers 37*, 14-21.

Lambertini, L., & Tampieri, A. (2012). Corporate social responsibility and firms' ability to collude. In S. Boubaker, & D. K. Nguyen, *Board Directors and Corporate Social Responsibility* (pp. 167-178). London: Palgrave Macmillan.

Law, P. J., & Stewart, G. (1983). Stackelberg duopoly with an Illyrian and profit-maximising firm. *Recherches Economiques de Louvain 49*, 207-212.

Leal, M., Garcia, A., & Lee, S.-H. (2019). Excess burden of taxation and environmental policy mix with a consumer-friendly firm. *Japanese Economic Review 70*, 517-536.

Luo, J. (2013). Absorptive capacity and R&D strategy in mixed duopoly with labor-managed and profit-maximizing firms. *Economic Modelling 31*, 433-439.

Ohnishi, K. (2001). Lifetime employment contract and strategic entry deterrence: Cournot and Bertrand. *Australian Economic Papers 40*, 30-43.

Ohnishi, K. (2002). On the effectiveness of the lifetime-employment-contract policy. *Manchester School 70*, 812-821.

Ohnishi, K. (2010). Lifetime employment contract and quantity competition with profit-maximizing and joint-stock firms. *Journal of Institutional and Theoretical Economics 166*, 462-478.

Ohnishi, K. (2021). *Lifetime employment and reaction functions of socially concerned firms under quantity competition.* MPRA paper number 110867.

Ohnishi, K. (2022). *Wage-rise contract and mixed Cournot duopoly competition with profit-maximizing and socially concerned firms.* Munich: MPRA paper number 112536.

Planer-Friedrich, L., & Sahm, M. (2018). Why firms should care for all consumers. *Economics Bulletin 38*, 1603-1612.

Ward, N. (1958). The firm in Illyria: market syndicalism. *American Economic Review 48*, 566-589.

Xu, Y. (2014). CSR impact on hospital duopoly with price and quality competition. *Journal of Applied Mathematics 2014*, 152060.

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