Governance and Financing in Oligopoly: The Stakeholder Society as a Collusive Device

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Abstract

This paper examines the linkages between corporate governance, financial structure and product market competition. In an oligopoly in which governance, financing and output decisions follow in sequence, we show that the stakeholder society can emerge as an equilibrium governance mode. When that occurs, the stakeholder society causes a switch in the strategic nature of product market competition, which enables firms to credibly commit to a less aggressive performance in the output market.

Keywords: Corporate governance, stakeholder society, financing, oligopoly.

JEL Classification: D23, G32.

1 Introduction

Economists use to be suspicious of the motives behind the stakeholder society. In particular, the stakeholder society sometimes is viewed as synonymous with the absence of effective control over management (Tirole, 2001), and it may rely on specific interests by managers (Hellwig, 2000). Our analysis complements this view and shows that the stakeholder society can become a useful collusive device in the output market. To that end, we explore the strategic relationships between corporate governance, financial structure and product market competition. In an oligopoly where governance, financing and output decisions follow sequentially, our results suggest that the stakeholder society can emerge as an equilibrium governance mode. When that occurs, the stakeholder society leads to a change in the strategic nature of the interaction by firms in the output market. This enables firms to credibly commit to a less aggressive output stance, which contrasts to the shareholder society where the limited liability effect commits a leveraged firm to a more aggressive performance in the marketplace.

The term stakeholders defines a group much broader than a firm's shareholders. In general, it refers to the constituencies affected, either favorably or adversely, by the operation of the firm; that is, the parties that have a stake in the firm: something to gain or lose as a result of corporate activity. Examples of stakeholders include employees, suppliers, financiers, customers, and communities who suffer from the eventual closure of a plant. Although some stakeholders are linked to the firm by means of explicit contracts, many others rely on implicit contractual relationships. Due to this heterogeneity, the stakeholder society may refer to a broad mission of management and the sharing of control by stakeholders. In this paper, we adopt the view that the stakeholder society means both a broad managerial mission and divided control. In particular, we follow Tirole (2001) in considering that the stakeholder

society is likely to be best promoted through flat managerial compensation.

As opposed to the stakeholder society, shareholder value is likely to be best promoted through profit-based compensation, as then managers are likely to engage in shareholder-value maximizing strategies. When managers maximize shareholder value, Brander and Lewis (1986) show that product market competition can be altered by previously taken financing decisions (see Glazer, 1994, for an analysis under long term debt, and Showalter, 1995, for an analysis under price competition). In particular, under normal conditions with output competition, Brander and Lewis (1986) find that debt levels can commit firms to an aggressive performance in the output market. This provides each firm with an incentive to gain strategic advantage in the marketplace. But given that this incentive applies to any firm, firms are trapped in a version of the Prisoners' Dilemma and the industry ends up with a higher output level, which in turn reduces each firm's total value. This contrasts to the situation that may arise under the stakeholder society. In specific, our results reveal that when the stakeholder society is able to cause a switch in the strategic nature of product market competition, which means that output reaction functions become upward sloping, then the stakeholder society is the equilibrium governance form. In that case, firms can credibly commit to a more collusive situation where the industry ends up producing a lower output level.

Our results are complement to the findings obtained by Hirshleifer and Thakor (1992), who show that a manager can be more conservative in selecting projects due to career concerns, and that may alleviate the conflict of interest between shareholders and stakeholders over investment portfolio selection (see also Myers, 1977). As argued by Hellwig (2000), and Tirole (2001), managerial incentives in the stakeholder society are generally governed by career concerns because with flat compensation schemes managers are only motivated through items such as reputation and the threat of bankruptcy. In these circumstances, our analysis suggests that the linkages

between corporate governance, financial structure and product market competition may lead to the stakeholder society as an equilibrium governance mode from where a collusive device arises.

The rest of the paper is organized as follows. Section 2 presents the model, Section 3 examines the output market equilibrium, Section 4 deals with debt levels, Section 5 determines the stakeholder society as an equilibrium governance structure, and Section 6 gathers our main conclusions.

2 The Model

Consider that firms 1 and 2 are competitors in a market where they submit their output levels x_1 and x_2, respectively. Each firm i's operating profit (that is, the difference between revenue and variable cost) is denoted by $\pi^i(x_i, x_j, z_i)$, where z_i is a random variable distributed over the interval $[\underline{z}, \overline{z}]$ according to a distribution function $F(z_i)$ with density $f(z_i)$. For simplicity, z_i and z_j are assumed to be independent and identically distributed. Each firm i's profit function, π^i, satisfies the usual properties in Cournot-type models: $\pi^i_{ii} < 0$, $\pi^i_j < 0$, and $\pi^i_{ij} < 0$, where subscripts denote partial derivatives. In addition, we adopt the convention that operating profits are increasing in z_i, so that $\pi^i_z > 0$. As in Brander and Lewis (1986), the effect of z_i on marginal profit is an important aspect in the analysis below. When $\pi^i_{iz} > 0$, marginal profits are higher in better states of the world, as in the cases of downward shifts in marginal production cost or upward shifts in marginal revenue. When $\pi^i_{iz} < 0$, marginal profits are lower in better states of the world, which accounts for possible, less likely situations. We follow Brander and Lewis (1986) in considering $\pi^i_{iz} > 0$ as the normal case. For further reference define $\alpha_i \equiv \pi^i_{ij} - \pi^i_{iz}\pi^i_j/\pi^i_z$.

The timing in the model is as follows. First, shareholders decide on the gover-

nance structure of the firm. There are two possible types of governance structure: first, shareholders can retain the control of the firm and instruct the firm's manager to maximize shareholder value; second, a firm can be of the stakeholder society type characterized by a broad mission of management and the sharing of control by stakeholders. Our specification of the former organizational mode follows Brander and Lewis (1986), which captures situations where the manager performs on behalf of shareholders and receives a profit-based compensation. In dealing with the latter form, we follow Tirole (2001), who argues that the stakeholder society is likely to be best promoted through flat managerial compensation. Once the governance structure of each firm has been determined, financing decisions take place. As in Brander and Lewis (1986), firms can be equity or debt financed. The variable D_i stands for firm i's debt obligation and summarizes its financial structure. Then, on the grounds of the chosen financial structure, output decisions take place before uncertainty resolves. After output levels are chosen and the uncertainty regarding firms' profits is settled, each firm i must satisfy its debt obligation by paying D_i out of its current profits. Shareholders are protected by limited liability. We denote by z_i^* the value of z_i such that firm i can just meet its debt obligation with nothing left over, that is, $\pi^i(x_i,\ x_j,\ z_i^*) - D_i = 0$. At any of these stages, firms take their decisions simultaneously. We adopt Subgame Perfect Nash Equilibrium (SPNE) as the solution concept in our analysis.

3 Output Market

In this section, we examine how corporate governance aspects interact with the limited liability aspects of financial leverage in affecting the strategic output decisions by firms.

3.1 Shareholder Value Maximization

At the stage of the game when output levels are determined, debtholders are captive and debt levels are taken as given. In consequence, the managers have no incentive to act in the debtholders' interests when shareholder value maximization is the corporate goal. Assuming $\underline{z} < z_i^* < \overline{z}$, firm i's value to is shareholders, V^i, can be written as

$$V^i = \int_{z_i^*}^{\overline{z}} [\pi^i(x_i, x_j\ z_i) - D_i]\ dF(z_i). \tag{1}$$

Under shareholder value maximization, the first-order condition for a maximum at the output stage is given by

$$V_i^i = \int_{z_i^*}^{\overline{z}} \pi_i^i(x_i, x_j, z_i)\ dF(z_i) - \frac{dz_i^*}{dx_i}[\pi^i(x_i, x_j, z_i^*) - D_i]f(z_i^*) = 0. \tag{2}$$

From the definition of z_i^*, this reduces to

$$V_i^i = \int_{z_i^*}^{\overline{z}} \pi_i^i(x_i, x_j, z_i)\ dF(z_i) = 0, \tag{3}$$

which shows that expected marginal profit over all non-default states must be zero if the equity value, V_i, is to be maximized with respect to x_i.

The second-order condition for a maximum can be written as

$$V_{ii}^i = \int_{z_i^*}^{\overline{z}} \pi_{ii}^i(x_i, x_j, z_i)\ dF(z_i) - \frac{dz_i^*}{dx_i}\pi_i^i(x_i, x_j, z_i^*)f(z_i^*) < 0, \tag{4}$$

where $dz_i^*/dx_i = -\pi_i^i(x_i, x_j, z_i^*)/\pi_z^i(x_i, x_j, z_i^*)$. Under the concavity of π^i for any z_i, equation (4) holds when $f(z_i^*)$ is below a given threshold value. We assume that this is the case. Additionally, we assume that $V_{ij}^i < 0$ and $V_{ii}^i V_{jj}^j - V_{ij}^i V_{ji}^j > 0$ in order to obtain a conventional benchmark in which reaction functions are downward sloping and stability is fulfilled when the mode of interaction is the typical Cournot competition.

The Nash equilibrium follows from equation (3) for $i, j = 1, 2$, $i \neq j$, and if $D_1 = D_2 = D$ then that equilibrium is symmetric and unique. In these circumstances, Brander and Lewis (1986) show the following results:

Proposition 1. *Under shareholder value maximization the symmetric Nash equilibrium output level $x = x_i = x_j$ is increasing in the debt level $D = D_i = D_j$ when $\pi_{iz}^i > 0$ and decreasing when $\pi_{iz}^i < 0$.*

Proof. See Proposition 1 in Brander and Lewis (1986). ■

Proposition 2. *Under shareholder value maximization, the following properties hold:*

(i) Given $\pi_{iz}^i > 0$, a unilateral increase in firm i's debt, D_i, causes an increase in x_i and a decrease in x_j.

(ii) Given $\pi_{iz}^i < 0$, a unilateral increase in firm i's debt, D_i, causes a decrease in x_i and an increase in x_j.

Proof. See Proposition 2 in Brander and Lewis (1986). ■

According to Proposition 1, a necessary and sufficient condition for financial structure to have no effect on the output market is $\pi_{iz}^i = 0$ for $i = 1, 2$. In contrast to this, when z_i affects marginal profits, financial structure influences on the output

market. In particular, for the normal case where $\pi^i_{iz} > 0$, the marginal returns from extra production are positively correlated with the total profit of the firm because increasing output increases the variance in the firm's profit stream. Hence, as firms take on more debt, they have an incentive to pursue output strategies that raise returns in good states and lower returns in bad states. Due to their limited liability, shareholders ignore decreases in returns in default states, as then debtholders become residual claimants. Since this argument takes place for the two firms, it follows that a completely equity-financed industry will produce a lower output than the corresponding leveraged industry when $\pi^i_{iz} > 0$.

Proposition 2 is a key insight in the analysis by Brander and Lewis (1986). This result shows that firm i's debt level affects the position of this firm's output reaction function. In the normal case where $\pi^i_{iz} > 0$, a higher debt level, D_i, makes it optimal for firm i to produce more in response to any output level from its competitor. Under such circumstances, debt financing leads to a commitment device which enables the firm to commit to an aggressive performance in the output market.

3.2 The Stakeholder Society

We follow Tirole (2001) in considering that the stakeholder society is likely to be best promoted through flat managerial compensation. In the presence of a constant, private payoff differential m_i between default and non-default states, this means that the manager is only motivated through the threat of bankruptcy, so that this agent decides on output to maximize

$$\Omega^i = [1 - F(z^*_i)]m_i. \tag{5}$$

In those circumstances, the first-order condition for a maximum at the output stage is given by

$$\Omega_i^i = -m_i f(z_i^*)\frac{dz_i^*}{dx_i} = 0, \tag{6}$$

and the second-order condition is

$$\Omega_{ii}^i = -m_i f(z_i^*)\frac{d^2 z_i^*}{dx_i^2} - m_i f'(z_i^*)\left(\frac{dz_i^*}{dx_i}\right)^2 < 0. \tag{7}$$

From equation (6), this second-order condition can be written as

$$\Omega_{ii}^i = m_i f(z_i^*)\frac{\pi_{ii}^i(x_i, x_j, z_i^*)}{\pi_z^i(x_i, x_j, z_i^*)} < 0. \tag{8}$$

Given that $\pi_{ii}^i < 0$ and $\pi_z^i > 0$, it follows that equation (8) holds when the first-order condition in (6) holds. In that case, the stability requirement can be expressed as $\Omega_{ii}^i\Omega_{jj}^j - \Omega_{ij}^i\Omega_{ji}^j > 0$, which we assume to hold. In this context, our first result is as follows.

Proposition 3. *Under the stakeholder society, firm i's best-response function at the output stage is decreasing in x_j if $\alpha_i < 0$, and it is increasing in x_j if $\alpha_i > 0$.*

Proof. Denote firm i's best-response function from equation (6) by $R^i(x_j, \cdot)$. From the differentiation of equation (6) it follows that $R_j^i = -\Omega_{ij}^i/\Omega_{ii}^i$. From the second-order condition in equation (8), the sign of R_j^i must be equal to that of Ω_{ij}^i. In turn, Ω_{ij}^i is given by

$$\Omega_{ij}^i = \frac{m_i}{(\pi_z^i)^2}\left\{f(z_i^*)\left[\pi_z^i\pi_{ij}^i + \pi_z^i\pi_{iz}^i\frac{dz_i^*}{dx_j} - \pi_i^i\left(\pi_{jz}^i + \pi_{zz}^i\frac{dz_i^*}{dx_j}\right)\right] - f'(z_i^*)\pi_i^i\pi_j^i\right\},$$

which from equation (6), the fact that $dz_i^*/dx_j = -\pi_j^i/\pi_z^i$, and the definition of α_i reduces to $\Omega_{ij}^i = m_i\alpha_i f(z_i^*)/\pi_z^i$. Hence, the result is shown. ■

This proposition shows that the mode of corporate governance can affect the strategic nature of the interaction among firms in the output market. Specifically, the stakeholder society can lead to situations where each firm's output reaction function is upward sloping in the normal case with $\pi_{iz}^i > 0$. When $\pi_{iz}^i > 0$, an increase in the output level of firm i's rival, x_j, followed by an increase in firm i's output, x_i, leads to a fall in $\pi_{ij}^i(z_i^*)$ and a raise in $\pi_{iz}^i(z_i^*)$. As a consequence, firm i's best response to an increase in x_j will consist of an increase in x_i whenever, in absolute terms, the magnitude of the raise in $\pi_{iz}^i(z_i^*)$ is greater than the magnitude of the fall in $\pi_{ij}^i(z_i^*)$, in the sense that $\alpha_i > 0$. In that case, output reaction functions are upward sloping. In contrast, if the magnitude of the fall in $\pi_{ij}^i(z_i^*)$ is greater than the magnitude of the raise in $\pi_{iz}^i(z_i^*)$, in the sense that $\alpha_i < 0$, output reaction functions are downward sloping. Finally, in the less likely case where $\pi_{iz}^i < 0$, $\alpha_i < 0$ and then output reaction functions are downward sloping. The arising of upward sloping reaction functions is a key aspect in our analysis on the stakeholder society as an equilibrium mode of corporate governance.

The Nash equilibrium follows from equation (6) for $i, j = 1, 2$, $i \neq j$, and if $D_1 = D_2 = D$ then that equilibrium is symmetric and unique. In these circumstances, we obtain the following result:

Proposition 4. *Under the stakeholder society, the symmetric Nash equilibrium output level $x = x_i = x_j$ is increasing in the debt level $D = D_i = D_j$ when both $\pi_{iz}^i > 0$ and $\pi_{ii}^i + \alpha_i < 0$, and it is decreasing when both $\pi_{iz}^i > 0$ and $\pi_{ii}^i + \alpha_i > 0$, or $\pi_{iz}^i < 0$.*

Proof. Under the stakeholder society, firm i's first-order condition at the output stage is $\Omega_i^i = m_i f(z_i^*)\pi_i^i/\pi_z^i = 0$. When the firms are symmetric, totally differentiating this leads to $\Omega_{ii}^i dx + \Omega_{ij}^i dx + \Omega_{iD}^i dD = 0$, where $\Omega_{ii}^i = m_i f(z_i^*)\pi_{ii}^i/\pi_z^i$, $\Omega_{ij}^i =$

$m_i f(z_i^*)\alpha_i/\pi_z^i$, and $\Omega_{iD}^i = m_i f(z_i^*)\pi_{iz}^i/(\pi_z^i)^2$. Hence, $dx/dD = -\pi_{iz}^i/[\pi_z^i(\pi_{ii}^i + \alpha_i)]$. Since $\pi_{iz}^i < 0$ implies that $\pi_{ii}^i + \alpha_i < 0$, this completes the proof. ■

As in Proposition 1, a necessary and sufficient condition for financial structure to have no effect on the output market is $\pi_{iz}^i = 0$ for $i = 1, 2$. In contrast to this, if z_i influences on marginal profits, financial structure affects the output market. When $\pi_{iz}^i > 0$ and $\pi_{ii}^i + \alpha_i < 0$, increasing output increases the variance in the firm's profit stream, and as firms take on more debt, they have an incentive to pursue output strategies that raise returns in good states and lower returns in bad states, while if $\pi_{iz}^i > 0$ and $\pi_{ii}^i + \alpha_i > 0$, or $\pi_{iz}^i < 0$, the argument is reversed.

Proposition 5. *In the stakeholder society, the following properties hold:*

(i) Given $\pi_{iz}^i > 0$, a unilateral increase in firm i's debt, D_i, causes an increase in x_i, while it causes a decrease in x_j when $\alpha_j < 0$, and an increase in x_j when $\alpha_j > 0$.

(ii) Given $\pi_{iz}^i < 0$, a unilateral increase in firm i's debt, D_i, causes a decrease in x_i, while it causes an increase in x_j when $\alpha_j < 0$, and a decrease in x_j when $\alpha_j > 0$.

Proof. Totally differentiating the firms' first-order conditions at the output stage yields

$$\begin{aligned} \Omega_{ii}^i dx_i + \Omega_{ij}^i dx_j + \Omega_{iD_i}^i dD_i &= 0, \\ \Omega_{ji}^j dx_i + \Omega_{jj}^j dx_j &= 0. \end{aligned}$$

where it has been taken into account that $\Omega_{jD_i}^j = 0$. Then, Cramer's rule allows us to write

$$\begin{aligned} dx_i/dD_i &= -\Omega_{iD_i}^i \Omega_{jj}^j/(\Omega_{ii}^i \Omega_{jj}^j - \Omega_{ij}^i \Omega_{ji}^j), \\ dx_j/dD_i &= \Omega_{iD_i}^i \Omega_{ji}^j/(\Omega_{ii}^i \Omega_{jj}^j - \Omega_{ij}^i \Omega_{ji}^j). \end{aligned}$$

From the firms' first-order conditions at the output stage, $\Omega^i_{ii} = m_i f(z^*_i)\pi^i_{ii}/\pi^i_z$, $\Omega^j_{jj} = m_j f(z^*_j)\pi^j_{jj}/\pi^j_z$, $\Omega^i_{ij} = m_i f(z^*_i)\alpha_i/\pi^i_z$, $\Omega^j_{ji} = m_j f(z^*_j)\alpha_j/\pi^j_z$, and $\Omega^i_{iD_i} = m_i f(z^*_i)\pi^i_{iz}/(\pi^i_z)^2$, where $\pi^i_z = \pi^i_{z_i}$, $\pi^i_{iz} = \pi^i_{iz_i}$, and $\pi^j_z = \pi^j_{z_j}$. Hence, the result follows. ■

As in Proposition 2, this result shows that firm i's debt level affects the position of this firm's output reaction function. If $\pi^i_{iz} > 0$, a higher debt level, D_i, makes it optimal for firm i to produce more in response to any output level from its competitor. Under such circumstances, debt financing leads to a commitment device which enables the firm to commit to an aggressive performance in the output market. The novelty of this proposition is that a higher debt level by firm i can also lead firm j to produce more when firm j's reaction function is upward sloping. From Proposition 4, that can be the case when $\pi^j_{jz} > 0$ under the stakeholder society.

For debt levels taken as given, the following proposition states that in the normal case where $\pi^i_{iz} > 0$, each firm's output level will be lower under the stakeholder society than under shareholder value maximization for any output of the rival firm. This suggests that the stakeholder society may relax to some extent the aggressive performance induced by limited liability with shareholder value maximization.

Proposition 6. *For given debt levels, D_i and D_j, and given firm j's output, x_j, if $\pi^i_{iz} > 0$ then firm i's output level under the stakeholder society is smaller than the output level chosen under shareholder value maximization.*

Proof. Under shareholder value maximization, firm i's first-order condition at the output stage is given by equation (3). Under the stakeholder society, firm i's first-order condition leads to $\pi^i_i(x_i, x_j, \underline{z}^*_i) = 0$, where $\underline{z}^*_i = z^*_i(R^i(x_j, D_i), x_j, D_i)$ with

$R^i(x_j, D_i)$ as the firm i's best-response function that arises from equation (6). Since $\underline{z}_i^* \leq z_i^*$, the result follows. ■

4 Debt Levels

When the manager selects the debt level of the firm, shareholders and bondholders anticipate the resolution of the Nash equilibrium in the output market. As a consequence, when the firms' managers decide on debt levels, their objective of is to maximize the total value of the firm. That value is denoted by Y^i, and it can be written as

$$Y^i = V^i + W^i = \int_{\underline{z}}^{\overline{z}} \pi^i(x_i(D_i, D_j), x_j(D_j, D_i), z_i)\ dF(z_i), \tag{9}$$

where W^i denotes firm i's debt value. This expression shows that the value of the firm follows from the expected value of operating profits over all states of the world. In the absence of bankruptcy costs and tax advantages of debt, this implies that issuing debt is a type of break-even decision for the firm in which output rates depend on debt levels. As a consequence, given the mode of corporate governance, a particular debt structure in the industry consists of a commitment to a particular output configuration.

If the output decision rests on shareholder value maximization, equation (3) allows us to write the marginal effect of an increase in D_i on firm i's value as

$$Y_{D_i}^i = \left[\int_{\underline{z}}^{z_i^*} \pi_i^i(z_i)\ dF(z_i)\right] \frac{dx_i}{dD_i} + \left[\int_{\underline{z}}^{\overline{z}} \pi_j^i(z_i)\ dF(z_i)\right] \frac{dx_j}{dD_i}. \tag{10}$$

Since π_j^i is negative, Proposition 2 implies that the second term in the right hand side of equation (10) is positive when π_{iz}^i is positive, and it is negative when π_{iz}^i is negative. In addition, the first term is zero when $D_i = D_j = 0$ (then the firms produce the conventional Cournot output level). If $\pi_{iz}^i > 0$, this means that each firm has an individual incentive to increase its debt level in order to gain strategic advantage in the output market. Since this incentive applies to the two firms, in a symmetric equilibrium $D_i = D_j > 0$ and then the resulting output level is greater than the Cournot output level. Hence, given the non-cooperative nature of the equilibrium, the availability of debt creates an effect that, in equilibrium, ends up promoting the degree of competition in the output market. Consequently, the owners of the firms are worse off than if they could not issue debt. The following result by Brander and Lewis (1986) summarizes these aspects.

Proposition 7. *When managers maximize shareholder value in deciding on output levels, the following properties hold:*

(i) Industry debt levels are positive if $\pi_{iz}^i > 0$*, while the firms are entirely equity financed if* $\pi_{iz}^i < 0$*.*

(ii) Under symmetry, the value of the industry, $Y^1 + Y^2 = 2Y$*, is not maximized in equilibrium. In particular,* $dY/dD < 0$ *if* $\pi_{iz}^i > 0$*, and* $dY/dD > 0$ *if* $\pi_{iz}^i < 0$*.*

Proof. See propositions 5 and 6 in Brander and Lewis (1986). ■

Under the stakeholder society, the marginal effect of an increase in D_i on firm i's value is given by

$$Y_{D_i}^i = \left[\int_{\underline{z}}^{\overline{z}} \pi_i^i(z_i)\ dF(z_i)\right] \frac{dx_i}{dD_i} + \left[\int_{\underline{z}}^{\overline{z}} \pi_j^i(z_i)\ dF(z_i)\right] \frac{dx_j}{dD_i}. \tag{11}$$

At the Cournot configuration ($D_i = D_j = 0$) the first term in the right hand side of this expression is zero and, since π_j^i is negative, $Y_{D_i}^i > 0$ if $dx_j/dD_i < 0$. Hence, when dx_j/dD_i is negative it turns out that firm i has an individual incentive to increase its debt level and, given that this incentive applies to the two firms, in a symmetric equilibrium $D_i = D_j > 0$. In these circumstances, it follows that the output level is greater than the Cournot output level, and the owners of the firms are worse off than if they could not issue debt. The following result summarizes this argument.

Proposition 8. *In the stakeholder society, the following properties hold:*

(i) Given $\pi_{iz}^i > 0$, industry debt levels are positive if $\alpha_i < 0$, while the firms are entirely equity financed if $\alpha_i > 0$; given $\pi_{iz}^i < 0$, industry debt levels are positive if $\alpha_i > 0$, while the firms are entirely equity financed if $\alpha_i < 0$.

(ii) Under symmetry, the value of the industry, $Y^1 + Y^2 = 2Y$, is not maximized in equilibrium. In particular, given $\pi_{iz}^i > 0$, $dY/dD < 0$ if $\alpha_i < 0$, and $dY/dD > 0$ if $\alpha_i > 0$; and given $\pi_{iz}^i < 0$, $dY/dD < 0$ if $\alpha_i > 0$, and $dY/dD > 0$ if $\alpha_i < 0$.

Proof. We first show part (i). Consider that $\pi_{iz}^i > 0$. Since $\pi_j^i < 0$, Proposition 5 implies that the second term in the right hand side of equation (11) is positive when $\alpha_j < 0$, and it is negative when $\alpha_j > 0$. Given that the first term in the right hand side of equation (11) is zero when $D_i = D_j = 0$, at this point it follows that $Y_{D_i}^i > 0$ if $\alpha_j < 0$, while $Y_{D_i}^i < 0$ if $\alpha_j > 0$. This shows part (i) when $\pi_{iz}^i > 0$. Next, consider that $\pi_{iz}^i < 0$. Given that $\pi_j^i < 0$, here Proposition 5 implies that the second term in the right hand side of equation (11) is positive when $\alpha_j > 0$, and it is negative when $\alpha_j < 0$. Since the first term in the right hand side of equation (11) is zero

when $D_i = D_j = 0$, $Y^i_{D_i} > 0$ if $\alpha_j > 0$, and $Y^i_{D_i} < 0$ if $\alpha_j < 0$, from where part (i) in the result follows.

Let us now check part (ii). Under symmetry, $x = x_i = x_j$. If $V^i_{ii} < 0$ and $V^i_{ii}V^j_{jj} - V^i_{ij}V^j_{ji} > 0$ hold globally, it follows that Y^i is strictly concave in x when $D_i = D_j = 0$ and $z^*_i = z^*_j = \overline{z}$. Consequently, if the firms are entirely equity financed, they fail to maximize joint profits because the output level is greater than the output level that maximizes joint profits. Given $\pi^i_{iz} > 0$, consider that $D_i = D_j = 0$, so that the first term in the right hand side of equation (11) is zero. Since $\pi^i_j < 0$, $Y^i_{D_i} > 0$ if $\alpha_j < 0$, and $Y^i_{D_i} < 0$ if $\alpha_j > 0$ from Proposition 5. In turn, the joint profit maximizing configuration requires the tangency of the isoprofit functions of the firms, so that $Y^i_i/Y^i_j = Y^j_j/Y^j_i$. However, this is contradicted by the fact that $\Omega^i_{ii}/\Omega^i_{ij} < \Omega^j_{ji}/\Omega^j_{jj}$ when $\alpha_i > 0$, and $\Omega^i_{ii}/\Omega^i_{ij} > \Omega^j_{ji}/\Omega^j_{jj}$ when $\alpha_i < 0$. Therefore, the equilibrium output produced by each firm in the stakeholder society is greater than the output level of completely equity-financed firms when $\alpha_i < 0$ for $i = 1, 2$, it is less than the output level of completely equity-financed firms when $\alpha_j > 0$ for $i = 1, 2$, and it is greater than the joint profit maximizing output in both of these cases. Since an analogous reasoning applies when $\pi^i_{iz} < 0$, this completes the proof. ■

This proposition implies that, given $\pi^i_{iz} > 0$ for $i = 1, 2$, the equilibrium output produced by each firm in the stakeholder society is greater than the Cournot output level when $\alpha_i < 0$, and it is less than the Cournot output level when $\alpha_i > 0$. Analogously, given $\pi^i_{iz} < 0$ for $i = 1, 2$, the equilibrium output produced by each firm in the stakeholder society is greater than the Cournot output level when $\alpha_i > 0$, and it is less than the Cournot output level when $\alpha_i < 0$. Hence, in the normal case where $\pi^i_{iz} > 0$, the equilibrium output level in the stakeholder society will be lower than the Cournot output level whenever the stakeholder society changes the strategic nature of the output market competition. Given $\pi^i_{iz} > 0$, this occurs if $\alpha_i > 0$; that

is, when the change in the strategic nature of the output market interaction implied by the stakeholder society leads to a replacement of the downward sloping Cournot reaction functions by upward sloping reaction functions. Due to this change in the strategic nature of output competition, the stakeholder society allows firms to reach a more collusive outcome. In particular, firms are enabled to achieve an outcome which is more collusive than both the Cournot outcome and the shareholder-value maximizing outcome.

5 The Stakeholder Society as an Equilibrium Form of Corporate Governance

This section deals with the first stage of the game, where each firm's mode of governance structure is determined. From that analysis, the following proposition summarizes the situation in which the stakeholder society becomes an equilibrium mode of governance structure in the normal case where $\pi^i_{iz} > 0$.

Proposition 9. *Given $\pi^i_{iz} > 0$, the stakeholder society is the unique symmetric Nash equilibrium when $\alpha_i > 0$.*

Proof. Consider that each firm i's manager decides on output in order to maximize Ω^i. If $\alpha_i > 0$, Proposition 6 implies that each firm's total value is greater than the value associated with each manager deciding on output to maximize shareholder value. In addition, when the firms are completely equity-financed, $Y^i_{D_i} > 0$ if $\alpha_j < 0$, and $Y^i_{D_i} < 0$ if $\alpha_j > 0$ from Proposition 5. Since $\Omega^i_{ii}/\Omega^i_{ij} < \Omega^j_{ji}/\Omega^j_{jj}$ when $\alpha_i > 0$, this implies that the equilibrium output produced by each firm in the stakeholder society is less than the output level of completely equity-financed firms when $\alpha_i, \alpha_j > 0$, and these circumstances each firm's total value is greater than the value associated with completely equity-financed firms.

Next, consider that firm i's manager decides on output to maximize Ω^i, while firm j's manager decides on output to maximize V^j. This situation gives rise to reaction functions $R^i(x_j, D_i)$ and $r^j(x_i, D_j)$ at the output stage. In order to check that $R^i(x_j, D_i)$ cannot be the Cournot reaction function, consider the firms' first-order conditions at the output stage, from where

$$\begin{aligned} \Omega^i_{ii}dx_i + \Omega^i_{ij}dx_j + \Omega^i_{iD_i}dD_i &= 0, \\ V^j_{ji}dx_i + V^j_{jj}dx_j &= 0, \end{aligned}$$

since $V^j_{jD_i} = 0$. Then, Cramer's rule allows us to write

$$\begin{aligned} dx_i/dD_i &= -\Omega^i_{iD_i}V^j_{jj}/(\Omega^i_{ii}V^j_{jj} - \Omega^i_{ij}V^j_{ji}), \\ dx_j/dD_i &= \Omega^i_{iD_i}V^j_{ji}/(\Omega^i_{ii}V^j_{jj} - \Omega^i_{ij}V^j_{ji}). \end{aligned}$$

Since $V^j_{ji} < 0$, $dx_i/dD_i > 0$ and $dx_j/dD_i < 0$ when both π^i_{iz} and α_i are positive. Given the reaction functions $R^i(x_j, D_i)$ and $r^j(x_i, D_j)$, this implies that $Y^i_{D_i} > 0$ if $D_j = 0$ and $R^i(x_j, D_i)$ were to go through the Cournot output levels, x^C_i and x^C_j. Consequently, firm i's reaction function will differ from the Cournot reaction function, so that $D_i > 0$. Next, let us check that $D_j = 0$ is firm j's best response to this. From the firms' first-order conditions at the output stage, we can write

$$\begin{aligned} \Omega^i_{ii}dx_i + \Omega^i_{ij}dx_j &= 0, \\ V^j_{ji}dx_i + V^j_{jj}dx_j + V^j_{jD_j}dD_j &= 0, \end{aligned}$$

where it has been taken into account that $\Omega^i_{iD_j} = 0$. Using Cramer's rule yields

$$
\begin{aligned}
dx_i/dD_j &= -\Omega^i_{ii}V^j_{jD_j}/(\Omega^i_{ii}V^j_{jj} - \Omega^i_{ij}V^j_{ji}), \\
dx_j/dD_j &= \Omega^i_{ij}V^j_{jD_j}/(\Omega^i_{ii}V^j_{jj} - \Omega^i_{ij}V^j_{ji}).
\end{aligned}
$$

Since $\Omega^i_{ij} > 0$ if $\alpha_i > 0$, $dx_i/dD_j > 0$ and $dx_j/dD_j > 0$ when both π^i_{iz} and α_i are positive. Given $R^i(x_j, D_i)$ and $r^j(x_i, D_j)$, this means that $Y^j_{Dj} < 0$ if $r^j(x_j, D_i)$ is to go through the Cournot output levels, x^C_i and x^C_j, so that Proposition 3 implies that $D_j = 0$ is firm j's best response to its competitor firm's action. Since this implies in turn that $x_i > x^C_i$ and $x_j < x^C_j$, then $Y^i > Y^{iC}$ and $Y^j < Y^{jC}$, where Y^{iC} and Y^{jC} denote the firms' total values for the Cournot configuration. By symmetry, this shows the result. ■

Proposition 9 shows that in the normal case under output competition, the stakeholder society is an equilibrium mode of corporate governance when it leads to output reaction functions that are upward sloping. In that situation, the stakeholder society leads to a switch in the strategic nature of product market competition, which credibly commits the firms to a less aggressive output stance. Then, not only is the aggressive output stance associated with shareholder value maximization avoided by the firms, but, in fact, the equilibrium outcome becomes more collusive than the conventional Cournot outcome.

6 Concluding Remarks

In the context of an oligopoly in which governance, financing and output decisions follow in sequence, our analysis reveals that the stakeholder society can arise as an equilibrium governance mode. When that occurs, the stakeholder society causes a switch in the strategic nature of product market competition, which enables the firms to credibly commit to a less aggressive output stance.

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