

ACTIVE Ownership Relations in Oligopoly

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Abstract

I discuss welfare implications concerned with using the ‘merger-equivalent’ approach to intra-industry partial share-acquisitions. Two practical implications to competition policy stem from the ‘merger-equivalent’ approach: i) passive ownership relations should not be analysed, and ii) active ownership relations should be analysed as a full merger. Previous research on passive ownership relations has demonstrated that the first policy implication leads to a too mild treatment of passive ownership-relations. This paper argues that the second policy implication leads to a too lenient policy as well, that is, analysing a substantial share acquisition as a full merger may underestimate the loss in welfare.

1 INTRODUCTION

The ‘merger equivalent’ approach is oftentimes used by antitrust authorities when analysing societal gains and losses from partial intra-industry shareholdings. Two policy implications originate from this approach. First, when no proof of intent of monopolisation is evident, (Reynolds and Snapp, 1986), page 142 argue that: “American authorities have analyzed the anticompetitive potential of partial ownership arrangements by approaching them as if the firms involved were merging.” Such a policy construction is also employed in the European Union, see (Ezrachi and Gilo, 2006). Second, this approach seems to have been used only in cases where the partial shareholdings also involve transfer of control over production resources. A small partial equity interest in a competing firm – frequently referred to as a passive (or silent) ownership share – is not challenged by antitrust authorities. As (Reynolds and Snapp, 1986) maintain: “This ‘merger equivalent’ approach has necessarily led to lenient treatment for equity interests too small to convey control”. This latter policy implication, when no transfer of control occurs, has also been challenged in several other articles, (Bresnahan and Salop, 1986), (Farrell and Shapiro, 1990), (Kwoka, 1992) and (Deneckere and Davidson, 1985). The former policy implication, where the partial ownership relation involves transfer of control, is discussed in the present paper. It is demonstrated that when control over production resources is transferred from the acquired firm to the acquiring firm, the latter has an incentive to reduce output in the partially acquired firm, in order to elevate prices.² Furthermore, the inflated price gives the acquiring firm incentives to

increase its own production. When pursuing such an asymmetric production policy, stemming from an active partial ownership relation, total output may be lower than in the full merger case. Thus, the rather counterintuitive result emerges, where a full merger may lead to a lower price and higher welfare than what a partial acquisition does. Accordingly, when antitrust authorities regard a partial acquisition, involving transfer of control, in a duopoly market as a full merger (to monopoly), they may in fact underestimate the true societal cost of the financial transaction.

As oftentimes assumed in the corporate governance literature, this paper takes the stand that an investor is able to obtain real control over a firm via a partial shareholding, see (Shleifer and Vishny, 1997) for a survey on corporate governance. Oftentimes a majority (50 %) of the shares in a firm is assumed sufficient to control the firm, while (La Porta, Lopez-De-Silanes and Shleifer, 1999) maintain that an ownership share of about 20 % in an otherwise widely held firm may well be enough to effectively control the firm. Both (Amundsen and Bergman, 2002) and (Alley, 1997) give examples of substantial ownership relations among competing firms. A sufficiently asymmetric ownership structure potentially creates a wedge between the control an investor is able to exert over the firm (real control) and the control that is warranted from share ownership (formal control), see for instance (Aghion and Tirole, 1997). This paper disregards the potential problems arising when there are several large investors, restricting the analysis to the case where one large investor is able to fully control the partially acquired firm.

From this it is illustrated that the acquiring firm has incentives to tunnel resources from the partially held firm. (Johnson et al., 2000) defines two types of tunnelling (pages 22-23). First, “a controlling shareholder can simply transfer resources from the firm for his own benefit through self-dealing transaction”. Examples of this type of tunnelling range from theft to the use of various transfer-pricing transactions. Second, when “the controlling shareholder can increase his share of the firm without transferring any assets through dilutive share issues, minority freezeouts, insider trading, creeping acquisitions, or other financial transactions that discriminate against minorities”, tunnelling is said to take place. The present paper analyses the case where the large investor is another firm competing in the same industry, and the focus is on how a firm may have incentives to alter its optimal behaviour in the product market via transactions in financial markets. As a consequence, the standard framework for analysing ownership-relations in industrial economics is applied; see for instance (Farrell and Shapiro, 1990). Accordingly, it is assumed that tunnelling of resources also can take place by pursuing an asymmetric production policy among the firms involved in the ownership relation.³ Control over a firm is in the current paper solely related to control over production resources.

From the above framework, it is established how a policy of tunnelling may cause overall welfare to fall compared to the full-merger case. This result stems from the fact that the partial ownership relation

gives incentives to transfer profits among the firms by using an asymmetric production plan. Thus, the (cost minimising) multiplant equilibrium is abandoned, causing an inefficient usage of production resources. This inefficiency may also be transmitted to the price level, causing prices to rise compared to the monopoly price level.

After outlining the theoretical model in the next section, three propositions are put forward and established. First, a proof that a partial ownership stake in a firm – combined with full control over the production resources in this firm – leads to an effect similar to the tunnelling effect as discussed within corporate governance is given. Second, it is showed that an active ownership duopolist⁴ produces a lower amount than the optimal monopoly output. Thus, it is argued that prevailing competition laws in fact may understate the effect on welfare by defining a partial acquisition – involving transfer of control – as a full merger. Third, it is demonstrated that an outside firm⁵ only partially offsets the effects delineated above.

2 MODEL

In this section a simple model of an industry with several production plants and several firms is outlined. The relationship between price and quantity produced is assumed to be represented by $p(\sum_i q_i)$, where $\sum_i q_i = Q$ and subscripts represent firms. In addition, price is assumed to fall with quantity produced, $p'(\cdot) < 0$.⁶ Let all production plants be described completely by its cost function, $c(q_i)$, and let cost of production be increasing ($c'(\cdot) > 0$) and convex ($c''(\cdot) > 0$) in output, q_i . Let also all production plants be identical, $c(q_i) = c(q_j)$, $\forall q_i = q_j$. Suppose also that firm i fully owns production plant i , and assume that firm i owns a portion of the shares in firm j , represented by δ , $0 \leq \delta \leq 1$. Any ownership share in a firm entitles the holder a portion δ of the profits as dividends. For simplicity it is assumed that the ownership share δ is sufficiently large for firm i to control firm j entirely. Furthermore, when firm i is able to exert control over firm j , firm i also controls production plant j . Assume now a duopoly industry structure and let firm 1 hold a controlling portion of the shares in firm 2. Accordingly, firm 1 maximises profits by choosing the optimal production level for both plants. The maximisation problem is:

$$\underset{q_1, q_2}{MAX} \Pi_1 = p(\cdot)q_1 - c(q_1) + \delta[p(\cdot)q_2 - c(q_2)] \quad (1)$$

(1) is identical to the maximisation problem in a passive ownership relation, however, and in contrast to models of passive ownership relations, firm 1 maximises profits also by determining production in both plants. The first order conditions are therefore:

$$\frac{\partial \Pi}{\partial q_1} = p(\cdot) + p'(\cdot)q_1 + \delta p'(\cdot)q_2 - c'(q_1) = 0 \quad (2)$$

$$\frac{\partial \Pi}{\partial q_2} = \delta [p(\cdot) + p'(\cdot)q_2] + p'(\cdot)q_1 - \delta c'(q_2) = 0 \quad (3)$$

From (2) and (3) one is able to find the optimal production plan for the active ownership duopolist. Note that the Cournot equilibrium gives a higher level of industry-wide production than the multiplant monopoly solution, $Q^C > Q^M$.⁷ Furthermore, (Flath, 1991) demonstrated that passive ownership Cournot competition leads to a lower level of production than the no-ownership Cournot outcome but higher than the monopoly level, $Q^M \leq Q^{POC} \leq Q^C$. In what follows three propositions related to the active ownership equilibrium are presented and proved. First, in the duopoly case it is established that firm 1, the active ownership duopolist, has incentives to produce a higher output in plant 1 than in plant 2. Thus, the active ownership equilibrium involves a diversion of profits from firm 2 to firm 1. Second (and still in duopoly) it is demonstrated that the active ownership equilibrium lead to a decrease in industry output compared to the monopoly output, $Q^{AOC} \leq Q^M \leq Q^{POC} \leq Q^C$, thereby causing a fall in consumer surplus. In addition, since the equilibrium production plan differs from the multiplant monopoly production plan, a fall in overall producer surplus must take place. Thus, the active ownership equilibrium generates a fall in overall welfare compared to the multiplant monopoly outcome. Third, it is established that when an outside firm (a firm not involved in any ownership arrangement) exists in the industry, this firm will only partially offset the reduction in production stemming from the active ownership relation.

Proposition 1: (Tunnelling) Firm 1's optimal production plan involves a higher level of production in plant 1 (fully owned) than in plant 2 (partially owned). As a consequence, there is a tunnelling of profits from firm 2 to firm 1.

Proof:

In the active ownership equilibrium plant 1 is fully controlled by firm 1 (100 % ownership), and plant 2 is fully controlled by firm 1 via firm 1's partial ownership in firm 2. When firm 1 owns a share less than 100% of firm 2, $\delta < 1$, but still controlling the production process in plant 2, the first order conditions (2) and (3) can be written as:

$$p(\cdot) - c'(q_1) = \delta [p(\cdot) - c'(q_2)] \quad (4)$$

Since plant 2 is only partially owned by firm 1, we must have that:

$$p(\cdot) - c'(q_1) < p(\cdot) - c'(q_2),$$

or equivalently:

$$c'(q_1) > c'(q_2)$$

In view of the fact that production plants are identical and marginal costs are increasing in quantity, the share of total output from plant 1 is larger than for plant 2.

QED

Thus, since the active ownership duopolist must share some of the profits from plant 2 with the remaining $(1 - \delta)$ shareholders, the active ownership duopolist will tunnel profits from plant 2 to plant 1. Roughly speaking, the active ownership duopolist diverts a profit of $\delta \epsilon$ into a profit of 1ϵ . This result contrasts the results from the literature on passive ownership relations where the firm holding a share in another firm acts less competitively, while the partially owned firm acts more aggressively.

This proposition also demonstrates the need for assuming that the marginal cost is increasing in quantity, $c''(\cdot) > 0$. When marginal costs are assumed constant, the corner solution emerges and plant 2 is not used in production. Only when marginal costs are increasing in the production level the

equilibrium outcome that both plants are used in production will come about. Thus, when $c''(\cdot) = 0$, the special case arises where firm 1 produces at the multiplant monopoly output level, using only plant 1. The next proposition demonstrates that the active duopoly equilibrium, assuming $c''(\cdot) > 0$ may lead to a reduction in overall welfare compared to the monopoly equilibrium.

Proposition 2: (Welfare Loss) The active ownership duopolist ($\delta < 1$) chooses to produce less than the multiplant monopolist ($\delta = 1$). Accordingly, the price is higher in the active ownership equilibrium than in the multiplant monopoly equilibrium.

Proof:

The proof of this proposition is in two stages, first it is demonstrated how a change ownership affects production plans for both production plants, and second, that the changes in individual production plans are used to infer the change in total output. It is known that a change in ownership share affects production via the expression (See (Dixit, 1986) or (Varian, 1992)):

$$\frac{dQ}{d\delta} = -\sum_i \frac{dq_i}{d\delta} = -\sum_i \frac{\partial^2 \Pi / \partial q_i \partial \delta}{\partial^2 \Pi / \partial q_i^2} \quad (5)$$

A firm holding a controlling stake in a competing firm maximises (1), and first order conditions are given by equations (2) and (3). In order to determine how a change in ownership determines production in both plants, $dq_i / d\delta$ must be determined. Differentiating the first order conditions (2) and (3) with respect to δ give the equations $\partial^2 \Pi / \partial q_2 \partial \delta = p(\cdot) + p'(\cdot)q_2 - c'(q_2)$ and $\partial^2 \Pi / \partial q_1 \partial \delta = p'(\cdot)q_2$. Differentiating (2) and (3) with respect to q_i give the desired expression, $\partial^2 \Pi / \partial q_1^2 = 2p'(\cdot) + p''(\cdot)[q_1 + \delta q_2] - c''(q_1)$ and $\partial^2 \Pi / \partial q_2^2 = 2\delta p'(\cdot) + p''(\cdot)[\delta q_2 + q_1] - \delta c''(q_2)$.⁸ Inserting the relevant derivatives into equation (5) gives the following expressions:

$$\frac{dq_1}{d\delta} = -\frac{p'(\cdot)q_2}{2p'(\cdot) + p''(\cdot)[q_1 + \delta q_2] - c''(q_1)} \quad (6)$$

$$\frac{dq_2}{d\delta} = -\frac{p(\cdot) + p'(\cdot)q_2 - c'(q_2)}{2\delta p'(\cdot) + p''(\cdot)[q_1 + \delta q_2] - \delta c''(q_2)} \quad (7)$$

Since the denominators in equations (6) and (7) are both second order conditions for production, both denominators are, by assumption, negative. Moreover, the numerator in equation (6) is negative, thus $dq_1/d\delta < 0$. However, since $p'(\cdot)q_1 < 0$ the numerator in equation (7) must be positive. This is evident by noting that the first order condition in (3) can be written as $p(\cdot) + p'(\cdot)q_2 - c'(q_2) = -p'(\cdot)q_1/\delta > 0$, consequently this expression is positive and $dq_2/d\delta > 0$. Second the sum of $dq_1/d\delta > 0$ and $dq_2/d\delta > 0$ can be shown to be positive. In proposition 1 above, it was demonstrated that $q_1 > q_2$, accordingly it must also be the case that $p(\cdot) + p'(\cdot)q_2 - c'(q_2) > |-p'(\cdot)q_1| > |p'(\cdot)q_2|$. Thus, the numerator in (7) is larger than the absolute value of the numerator in (6). Finally, the difference between the second order conditions in equations (6) and (7) can be written as $\partial^2\Pi/\partial q_1^2 - \partial^2\Pi/\partial q_2^2 = \{2p'(\cdot) - c''(q_1)\} - \{2\delta p'(\cdot) - \delta c''(q_2)\}$. Since $\delta < 1$, $c''(\cdot) > 0$ and $q_1 > q_2$, it must be the case that $\partial^2\Pi/\partial q_1^2 - \partial^2\Pi/\partial q_2^2 < 0$, or $|\partial^2\Pi/\partial q_1^2| > |\partial^2\Pi/\partial q_2^2|$. From these inequalities, it follows that the positive change in production in plant 2 from a change in the ownership share is larger than the absolute value of the negative change in production from plant 1 from a change in the ownership share, $dq_2/d\delta > |dq_1/d\delta|$.

QED

The proposition that there is a loss in welfare from an active ownership duopoly compared to the multiplant monopoly case is best understood by taking the monopoly outcome as a point of departure. From (1), the firm holding a controlling stake in a competing firm will choose the same production plan as the multiplant monopoly equilibrium when $\delta = 1$. However, as the ownership share decreases, $\delta < 1$, the active ownership duopolist produces a larger amount in plant 1 (receives all of the profits) than in plant 2 (receives the share δ of the profits), see figure 1 below. In addition, total output is less than the multiplant monopolist production level when $\delta < 1$, thereby pushing the price *above* the monopoly price level. Accordingly, consumer surplus falls as δ falls.

Figure 1 about here

In addition, since $c''(\cdot) > 0$, and that the active ownership equilibrium is different from the multiplant monopoly outcome, industry-wide profits must be lower in the active ownership duopoly case than in the multiplant monopoly equilibrium. As a consequence, overall welfare is reduced in the active ownership outcome compared to the multiplant monopoly equilibrium. Accordingly, when competition authorities consider a partial ownership relation – which involves transfer of control – as a full merger they may in fact underestimate the negative effect on welfare. Furthermore, if a firm is able to control the production resources in a partially acquired firm by holding only a small fraction of the shares, the loss in welfare can be substantial. Not only from increased price, but also from an inefficient usage of production resources.

When analysing Bertrand competition in a differentiated good market, similar results may be found. In cases where the two firms' outputs are substitutes ($dq_1/dp_2 > 0$) firm 1 has incentives to set a relatively high price on firm 2's product, thereby increasing the demand for its own product. This also enables firm 1 to set a higher price on its own product. When the products are complements ($dq_1/dp_2 < 0$) the opposite result appears, where firm 1 sets a relatively lower price on the product produced by firm 2, effectively increasing the demand for product 1. As a consequence, the equilibrium when products are differentiated in Bertrand competition resembles the case analysed above, where firm 1 is able to use a price policy enhancing the value of firm 1 on expense of firm 2. Following (Singh and Vives, 1984), dual results are true for Cournot firms competing in differentiated products. That is, when products are substitutes, firm 1 has incentives to increase output in plant 2 relatively more than in plant 1, a policy that leads to a relatively higher price on firm 1's product and a relatively lower price on firm 2's product, compared to the no-ownership equilibrium. In all cases, firm 1 is able to transfer profits from the minority shareholders of firm 2 via the production/pricing policy.

The policy of tunnelling described above brings about a waste of profits since the overall profit is lower in an active ownership duopoly than in the multiplant-monopoly case. One should expect that the shareholders have incentives to write a contract among themselves enabling them to reap additional profits. If a share of the dividends paid to minority shareholders is contracted to be forwarded to the majority shareholder, the latter has incentives to increase the production in plant 2 and reducing output in plant 1. Thus, this new equilibrium would approach the multiplant monopoly equilibrium thereby increasing overall welfare. Such a contract needs not be written between the shareholders; more likely, the contract involves some form of transactions between the firms, contracts favourable to the firm in control over the production resources. Since the majority shareholder is able to put a policy of tunnelling into being, one may also expect that the majority shareholder is able to instruct, say, transfer-pricing arrangements between the firms advantageous to the controlling firm.

What is more, these contracts may increase firm 1's incentives to use plant 2 in production, potentially increasing overall welfare. However, these types of contracts are generally seen as welfare reducing in the literature. (Johnson et al., 2000) argues that "legal protection of minority shareholders and creditors is an empirically significant determinant of financial development across countries". While (Johnson et al., 2000) see these contracts, for instance favourable transfer-pricing arrangements, as the mean of tunnelling; the current paper regards an asymmetric production plan as the mean of tunnelling, while contracts can be regarded as a way of overcoming the welfare loss originating from tunnelling. However, there is no guarantee that the minority shareholders are being better off from these contracts. What may be more important, the argument of (Johnson et al., 2000), that financial development may be hampered by tunnelling, is still valid.

Proposition 3: (Outside firm) When introducing a third firm into the analysis, this firm only partially offsets the negative effect on production, reducing the negative effect on welfare.

Proof:

Proposition 2 demonstrated that an ownership share of less than 100 %, combined with full control over the production facilities in the acquired firm, resulted in a reduction in the combined output of plants 1 and 2. The optimal response for an outside firm to a change in the combined production level by plants 1 and 2, is given by the slope of the reaction function of this firm. The slope of firm 3's reaction function (R_3) is defined as (see (Dixit, 1986)):

$$R_3 = \frac{\partial^2 \Pi_3 / \partial(q_1 + q_2) \partial q_3}{\partial^2 \Pi_3 / \partial q_3^2} = - \frac{p'(\cdot) + p''(\cdot)q_3}{2p'(\cdot) + p''(\cdot)q_3 - c''(\cdot)} \quad (8)$$

When restricting the term $p''(\cdot)q_3$ to be less than the absolute value of $p'(\cdot)$, the numerator is negative, and since $c''(\cdot) > 0$, the reaction function is negative but larger than -1, $-1 < R_3 < 0$.⁹ From this, it is established that firm 3 responds to a negative change in the joint output by plants 1 and 2, by increasing its production. What is more, the magnitude of the production increase by firm 3 is less than the magnitude of the combined fall in production by plants 1 and 2.

QED

It is therefore established that the total effect on production as a result of active ownership relations may be negative, also when an outside firm is introduced in the analysis. As a consequence, it may still be the case that the industry equilibrium is characterised by a higher price when firm 1 controls firm 2, holding only a fraction of the shares in firm 2, compared to the case where firm 1 holds 100 % of the shares in firm 2 (multiplant firm).

When firms compete in a differentiated market, the above result may still hold. This is irrespective of whether price or quantity is the strategic variable. However, the profitability of the shareholding is now also affected by the relative substitutabilities/complementarities of the products.

3 CONCLUSION

This paper discusses the societal consequences of a partial acquisition of shares among firms competing in the same industry. The literature has documented that a small passive ownership share between firms in the same industry may lead to a fall in overall welfare. However, an acquisition of a large ownership-share has been less analysed in the literature, perhaps because such transactions has been analysed as if the firms involved in the financial transactions were merging. This paper illustrates that when analysing a partial (but large) share-acquisition among competing firms as a full merger, competition authorities may in fact take too lightly on the financial transaction.

Under fairly general assumptions, it is proved that the acquiring firm may increase production in plants fully owned, on the expense of plants only partially owned. Then it is also established that this production plan leads to a reduction in total output, causing the price to rise *above* the monopoly price level. These observations lead to the claim that a partial acquisition, combined with transfer of control over production resources, should not be regarded as a full merger. This is so because the effect of an active ownership relation (acquisition) is more detrimental to overall welfare than the negative effect from a full merger. This argument comes not only from the observation that consumer surplus falls from increased price level, but also from the fact that such an ownership arrangement leads to reduced producer surplus via a suboptimal production plan.

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² As will be evident later, the present paper assumes that marginal costs are increasing in output. Constant marginal costs lead to an equilibrium where the acquiring firm shuts down the plants owned by the partially acquired firm when the ownership share is less than 100%.

³ A wide range of variables can potentially be used to illustrate how profits can be transferred between firms, for instance advertising and research and development.

⁴ An active ownership duopolist is defined as a firm holding only a fraction of the shares in the competitor, still controlling the production resources of the firm in question.

⁵ An outside firm in this context is defined as neither holding a share in, nor being held by a competing firm.

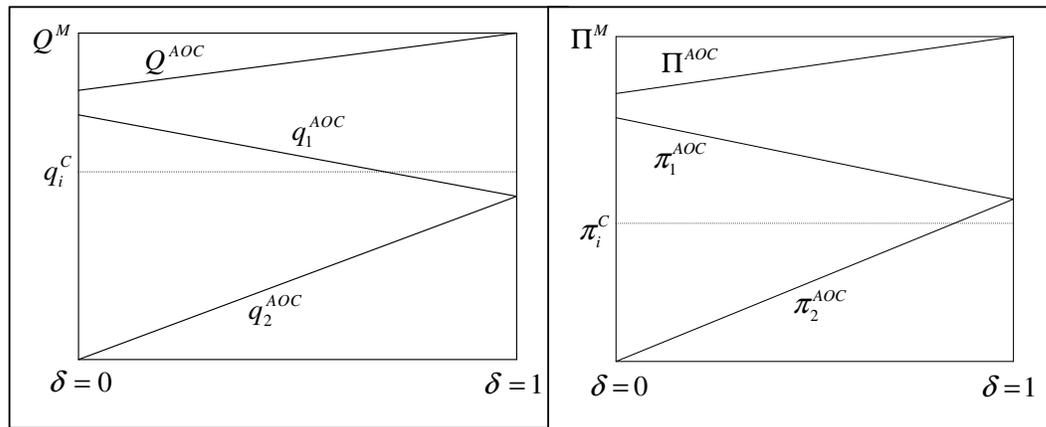
⁶ Superscript ' denotes differentiation. When two superscripts are present, the order of differentiation is given by the denominator in the left hand side of the equation, or q when no expression on the left hand side is given.

⁷ See (Mas-Colell, Whinston and Green, 1995) for a proof of $Q^C > Q^M$. Characters as superscript denotes mode of competition. M indicates the multiplant monopoly solution, C indicates the Cournot equilibrium, POC and AOC denotes passive and active ownership Cournot equilibrium respectively.

⁸ In doing this, the usual assumption related to the second order condition ($\partial^2\Pi/\partial q_2^2$) is utilised, that is, p''_0 is not too large. Accordingly, an additional restraint on the curvature of the indirect demand relation is imposed.

⁹ This implies that an additional restraint on the curvature of the inverse demand relation is imposed. That is, the inverse demand relation cannot curve too much.

Figure 1: Evolution of quantites (left) and profits (right) as a function of δ ^{a)}



a) The vertical axes denotes ownership share, while the vertical axes represent quantities (left) and profits (right). Superscript denotes mode of competition, monopoly (M), Cournot duopoly competition (C), or active ownership duopoly (AOC). Subscript denotes individual firm $i=1,2$, where 1 is acquiring firm and 2 is acquired firm.