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Passive Partial Ownership, Sneaky Takeovers, and Merger Control*

Dragan Jovanovic† Christian Wey‡

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Abstract

We analyze horizontal mergers when the acquirer holds a passive partial ownership stake (PPO) in the target firm prior to the merger. We show that a PPO reduces the minimal synergy level necessary to make a merger beneficial for consumers. It follows that an antitrust authority ignoring existing PPOs when evaluating merger proposals (which reflects the current EU merger control regime) invites *sneaky takeovers*: Acquiring firms strategically use PPOs prior to a full merger proposal to get mergers approved which are, in fact, detrimental to consumers.

JEL-Classification: D43, K21, L13, L41

Keywords: Horizontal Mergers, (Passive) Partial Ownership, Antitrust, Synergies, Sneaky Takeovers

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1 Introduction

In many merger cases the acquiring firm owns a passive partial ownership stake (PPO) in the target firm prior to the merger proposal. A PPO entitles the acquiring firm to benefit from the target firm's profits, while it does not involve any (or very limited) corporate control.[1] For example, the merger cases of Volkswagen/MAN, Volkswagen/Scania, and REWE/Wasgau all involved PPOs.[2] As PPO acquisitions usually do not give any sort of corporate control, they are typically ignored by merger regulations.[3] In the EU, it is currently discussed whether or not to extend the scope of the Merger Regulation to explicitly consider transactions involving PPOs (see EC, 2013).[4] The reason is that PPO creates a financial interest of the acquiring firm in the target firm, which leads to an internalization of the negative effects from expanding output and decreasing prices, respectively.[5] Quite obviously, a more restrictive approach towards PPOs and other forms of financial interests among competitors seems to be warranted.

Our concern is a direct consequence of the current neglect of PPO acquisitions by merger regulations; namely, the adequate competitive assessment of *existing* PPOs in full merger proposals. That is, we address the following question: Given that a PPO exists, what is the optimal merger decision of an antitrust authority (AA) which is assumed to follow a consumer surplus

[1] See O'Brien and Salop (2000) and Foros, Kind, and Shaffer (2011) for the distinction between non-controlling minority shares (or, equivalently, PPOs) and ownership agreements involving corporate control.

[2] All cases we are aware of do not reveal whether or not (and if yes, how) PPOs have been considered in the antitrust authorities' merger decisions. With regard to the first two cases, the European Commission did not explicitly account for the pre-merger PPOs in its competitive assessments. The latter case is still under scrutiny, but recent press releases also suggest that the German Federal Cartel Office remains silent about the PPO issue (see Handelsblatt, 2013).

[3] This is true for the European merger guidelines which do not account for non-controlling minority shares and PPOs, respectively (see EC, 2013). In contrast, the US horizontal merger guidelines, as amended in 2010, cover both partial acquisitions leading to corporate control and those not involving corporate control, i.e., PPOs (DOJ, 2010).

[4] Recent competition reports on the PPO issue have criticized that merger regulations typically ignore PPOs (see OECD, 2008; OFT, 2010). The debate in the EU, therefore, appears to head towards a similar treatment of PPOs as in the US.

[5] This was first shown by Reynolds and Snapp (1986) as well as Bresnahan and Salop (1986) and recently reiterated in EC (2013).

standard?

We show that a PPO relaxes the minimal synergy level needed for a merger to benefit consumers. The PPO reduces the competitive intensity prior to a full merger. It then follows that a full merger which gives rise to a certain level of synergies is more likely to reduce consumer prices if one of the merging firms holds a PPO in the other firm.[6] This effect becomes more pronounced the larger the PPO becomes prior to the full merger proposal. However, the minimal synergy level necessary for a merger to be profitable may be either raised or reduced depending on the best responses of the non-merging firms.

Most importantly, merger regulations, that do not account for PPO acquisitions, create incentives among firms to abstain from full merger proposals and instead to engage in *sneaky takeovers* which proceed in two steps. In a first step, the acquiring firm abstains from proposing a full acquisition in the first stage as such a merger would harm consumers. It, therefore, strategically acquires a PPO which goes unnoticed by the AA. In a second step, the acquiring firm proposes a full takeover, which will be accepted by the AA as the complete merger increases consumer surplus. Our analysis of the effects of PPOs on subsequent mergers, therefore, highlights an additional argument in favor of a PPO control regime in analogy to current merger regulation.

Our work is related to the literature analyzing the effects of horizontal mergers in Cournot oligopoly (Salant, Switzer, and Reynolds, 1983; Perry and Porter, 1985; Farrell and Shapiro, 1990, and Besanko and Spulber, 1993).[7] Among other things, those works identify critical synergy levels which have to be met for a merger to be beneficial for consumers. In addition, our paper contributes to the literature which analyzes the effects of PPOs in oligopolistic markets. This literature goes back to Reynolds and Snapp (1986) and Bresnahan and Salop (1986). The former focus on the competitive effects of passive partial ownership agreements, while the latter propose a modified concentration index to account for the change in firms' incentives when PPOs

[6] In our model, a merger can only be desirable from a consumer perspective when the merger is not price increasing. For that to occur, we consider merger synergies. Under current merger regulations, a merger can be approved (even in a somehow concentrated market), whenever synergies are large enough ("efficiency defense"). Efficiencies were introduced into the US Merger Guidelines in 1997 (Section 4) and into the European Merger Guidelines in 2004 (Articles 76-88).

[7] More recent works are offered by Nocke and Whinston (2010, 2013).

are present.[8] All those works agree that PPOs tend to reduce the competitive intensity,[9] but none of them asks how a PPO affects future merger outcomes.[10]

Our paper is organized as follows. In Section 2, we present the model and our main results. Section 3 offers a linear Cournot example to illustrate the incentives for a sneaky takeover. Section 4 concludes.

2 The Model and Main Results

Consider a homogeneous Cournot oligopoly where $n \geq 3$ firms indexed by $i \in I = \{1, ..., n\}$ compete in quantities q_i. Firms face an inverse demand function $p(Q)$, with $Q := \sum_i q_i$. Firm i's marginal cost is constant and represented by $c_i \geq 0$. We invoke the following standard assumptions that guarantee existence and stability of a unique Cournot-Nash equilibrium (see, e.g., Shapiro, 1989).[11]

Assumption A1. *The inverse demand function fulfills the following properties:*
i) $p'(Q) < 0$*, i.e., the inverse demand is strictly decreasing in* Q*,*
ii) $Qp''(Q) + p'(Q) < 0$*, i.e., quantities are strategic substitutes implying that each firm i's profit function is strictly concave in* q_i*, and*
iii) $lim_{Q\to\infty} p(Q) = 0$*, i.e., aggregate output is bounded in equilibrium.*

Suppose that one firm $B \in I$ (the "buyer" or "acquirer") holds a PPO in one of the other firms, labeled $T \in I \backslash \{B\}$ (the "target"). A PPO does not give B corporate control over T which implies that it cannot decide on T's output directly. Rather, it partially benefits from T's profit. Let $\sigma \in [0, \widehat{\sigma})$ denote the PPO held by B in T, where $\widehat{\sigma} \in [0, 1]$ is some minimal ownership share which would allow firm B to control firm T.[12] It then follows that B's profit

[8] See also Flath (1991), Reitman (1994), and O'Brien and Salop (2000).

[9] Similar results are obtained in the context of collusion, where PPOs have a stabilizing effect (see, e.g., Malueg, 1992, and Gilo, Moshe, and Spiegel, 2006).

[10] Another approach is to assume that a partial ownership involves corporate control as in Foros, Kind, and Shaffer (2011). Interestingly, such a constellation can be even more harmful to consumers than a full merger.

[11] Notice that $p'(Q) = dp(Q)/dQ$ and $p''(Q) = d^2p(Q)/dQ^2$.

[12] In general, one may assume that $\widehat{\sigma} = 1/2$. There are, however, instances in which either a smaller ownership share guarantees corporate control, i.e., $\widehat{\sigma} < 1/2$, or a larger minimum ownership is needed to obtain corporate

function is given by

$$\pi_B = p(Q)q_B - c_B q_B + \sigma \left[p(Q)q_T - c_T q_T \right], \tag{1}$$

while T's profit function is

$$\pi_T = (1-\sigma) \left[p(Q)q_T - c_T q_T \right].$$

The remaining $n-2$ firms in the market (the "outsiders") neither hold an ownership share in one of their rivals nor are partially owned by one of them, i.e., they are entirely independent. An outsider firm, $r \in I \backslash \{B,T\}$, has a profit function $\pi_r = p(Q)q_r - c_r q_r$, with $Q_r := \sum_{r \in I \backslash \{B,T\}} q_r = Q - q_B - q_T$.

Given (1), B's equilibrium output is (implicitly) given by (asterisks indicate equilibrium values)

$$q_B^* = -\frac{p(Q^*) - c_B}{p'(Q^*)} - \sigma q_T^*, \tag{2}$$

while T's and the outsiders' equilibrium outputs can be written as

$$q_T^* = -\frac{p(Q^*) - c_T}{p'(Q^*)} \text{ and } q_r^* = -\frac{p(Q^*) - c_r}{p'(Q^*)}, \text{ for all } r \in I \backslash \{B,T\},$$

respectively. Before we proceed to the post-merger case, we present how B's equilibrium output, q_B^*, and total equilibrium output, Q^*, are affected by a change in the PPO, σ.[13]

Lemma 1. *An increase in σ reduces both B's output, q_B^*, and total output, Q^*, so that the equilibrium price increases.*

Proof. See the Appendix.

Lemma 1 is a direct result of Assumption A1 which implies that firms' best response functions are well-behaved; i.e., they are downward sloping with slope element of $(-1, 0)$. Given that $\sigma > 0$ holds, it is immediate from (1) that B's response to a change in T's output is more sensitive than towards changes in outsiders' output. Formally, let $q_B(q_T, Q_r, \sigma) = \arg\max_{q_B \geq 0} \pi_B$ denote B's best response function. It then follows that $\partial q_B(q_T, Q_r, \sigma)/\partial q_T < \partial q_B(q_T, Q_r, \sigma)/\partial q_r$, for all $r \in I \backslash \{B,T\}$.[14]

control, i.e., $\widehat{\sigma} > 1/2$. The latter can hold if a listed firm has not only issued common stocks, but also preference shares.

[13]See Reynolds and Snapp (1986) for similar results.

[14]Since T does not hold a PPO in B, its output is equally sensitive towards changes in q_B and Q_r. The same is true for the outsiders.

As the PPO induces firm B to partially internalize the negative effects of expanding its output on T's profit, firm B reduces its equilibrium output when σ increases. In response, the rival firms, both T and the outsiders, expand their equilibrium outputs, but by less than q_B is reduced, so that total output must decrease; i.e., $dQ^*/d\sigma < 0$ holds.

Figure 1 illustrates our result for an industry with two firms, B and T, and a linear inverse demand schedule. It shows that B's reaction function becomes more sensitive towards changes in T's output the higher σ. Hence, an increase in σ induces B to reduce its output, while, in response, T increases its output, but by less, so that total output (given by $q_B^* + q_T^*$) falls.

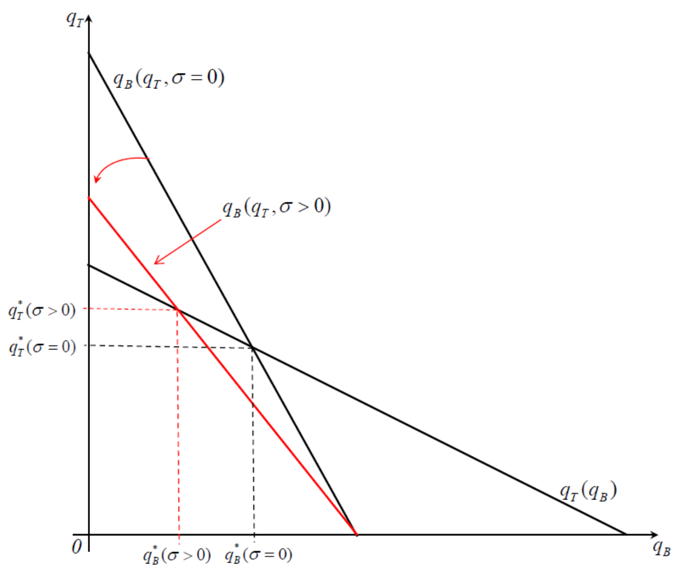

Figure 1: The Impact of a PPO on Firms' Output Choices

Suppose now that B acquires all assets of T. That is, we presume that the merging firms jointly use their assets for production which may result either from a merger of equals or an acquisition of 100% of T's shares by B.[15] The merged firm's profit function becomes $\pi_M = p(Q)q_M - c_M q_M$, where the index M stands for the merged firm and c_M is M's post-merger marginal cost. We assume that B and T have identical pre-merger marginal costs, $c_B = c_T = c$,

[15]It follows that a merger involves the elimination of a competitor as it is usually presumed in the literature on horizontal mergers; see, e.g., Salant, Switzer, and Reynolds (1983), Perry and Porter (1985), Farrell and Shapiro (1990), and, more recently, Nocke and Whinston (2010).

while the M's marginal cost can be lower than the pre-merger level because of synergies s.[16] Hence, $c_M = c - s$, where $s \in [0, c]$.[17]

Let $\overline{Q}^*$ be the total equilibrium output in the post-merger case (upper bars indicate the post-merger case). To measure a merger's effect on consumer surplus we define $\Delta CS := CS\left(\overline{Q}^*\right) - CS\left(Q^*\right)$ as the change in consumer surplus due to a full merger between B and T. Consumer surplus is given by

$$CS\left(Q\right) = \int_0^Q \left[p(x) - p(Q)\right] dx.$$

Clearly, consumer surplus is increasing in total output; i.e., $dCS\left(Q\right)/dQ = -P'(Q)Q > 0$. In the following, we analyze how the critical synergy level needed for a merger to be beneficial for consumers is related to the PPO, σ. For this purpose, let $\widetilde{s}_{CS}$ denote the critical synergy level for which $\Delta CS > 0$ (< 0) if $s > \widetilde{s}_{CS}$ ($< \widetilde{s}_{CS}$) (with equality holding at $s = \widetilde{s}_{CS}$). In the absence of a pre-merger PPO, Farrell and Shapiro (1990) have shown that consumer surplus increases if and only if

$$p(Q^*) - c_M > 2\left[p(Q^*) - c\right] \tag{3}$$

holds (see Proposition 1 in Farrell and Shapiro, 1990).[18] Inserting $c_M = c - s$ into (3) and rearranging, we get the following condition with respect to the critical synergy level, s^0_{CS}:

$$s > p(Q^*) - c =: s^0_{CS}. \tag{4}$$

Condition (4) says that the synergy level must be larger than the pre-merger mark-up, so that consumers are better off after the merger. If we assume that B owns a PPO in T prior to the

[16] We, therefore, suppose that synergies can only be realized if two firms fully merge, while a PPO does not lead to any synergies. This view is also expressed in, e.g., Gilo (2000, p. 42) and EC (2013).

[17] Note that synergies are by definition merger specific; i.e., they cannot be realized through other means than a merger. For a discussion of efficiencies gains through mergers which are not synergies, see Farrell and Shapiro (2001) and Jovanovic and Wey (2012).

[18] Condition (3) mirrors the merged firm's incentive to increase its output level, q_M, above the joint pre-merger output levels, $q^*_B + q^*_T$. This condition is a sufficient requirement for a consumer surplus increasing merger.

merger (i.e., $\sigma > 0$ holds), then condition (3) becomes[19]

$$p(Q^*) - c_M > 2\left[p(Q^*) - c\right] + \sigma p'(Q^*) q_T^*. \tag{5}$$

Solving (5) for the critical synergy level yields

$$s > p(Q^*) - c + \sigma p'(Q^*) q_T^* =: \widetilde{s}_{CS}. \tag{6}$$

Comparing (4) and (6) it is immediate that a PPO reduces the minimal synergy level which is necessary to increase consumer surplus after the merger. The reason is that a PPO induces B to become less aggressive, i.e., to decrease its output, because it will (partially) internalize the negative effects of an output expansion on T's profit (Lemma 1). All other things held constant, this makes the pre-merger equilibrium less competitive when compared with the post-merger equilibrium. Formally, this fact is mirrored in condition (6) by the third term, $\sigma p'(Q^*) q_T^* < 0$, which makes condition (6) less restrictive than condition (4). Moreover, a larger PPO further relaxes the consumer surplus constraint of a full merger; i.e., $d\left|\sigma p'(Q^*) q_T^*\right| / d\sigma > 0$.

Proposition 1 examines the effect of a PPO, σ, on the minimal synergy level, $\widetilde{s}_{CS}$, by taking full account of the pre-merger output level, Q^*, which is a function of σ.

Proposition 1. *The critical synergy level, $\widetilde{s}_{CS}$, which has to be exceeded for a merger to increase consumer surplus, is decreasing in the PPO, i.e., $d\widetilde{s}_{CS}/d\sigma < 0$ holds.*

Proof. To sign $d\widetilde{s}_{CS}/d\sigma$, it is useful to examine how ΔCS is affected by σ. Consider

$$\frac{d\Delta CS}{d\sigma} = p'(Q^*) \frac{dQ^*}{d\sigma},$$

which is clearly positive according to Lemma 1; i.e., an increase in σ decreases Q^* and thus $CS(Q^*)$, while $CS(\overline{Q}^*)$ is not affected, since $\overline{Q}^*$ is independent of σ. It then immediately follows that $\partial \widetilde{s}_{CS}/\partial\sigma < 0$ must hold. ■

The proof of Proposition 1 reveals that the main reason why a PPO reduces the minimal synergy level for a consumer surplus increasing merger is its negative impact on the consumer

[19] M's incentive to increase output is $p'(Q^*) q_M^* + p(Q^*) - c_M$ given that it offers just as much as B and T altogether in the pre-merger case, i.e., $q_M^* = q_B^* + q_T^*$, and total output is Q^*. Since B's and T's pre-merger outputs are given by $p(Q^*) - c_B + \sigma p'(Q^*) q_T^* = -p'(Q^*) q_B^*$ and $p(Q^*) - c_T = -p'(Q^*) q_T^*$, respectively, we obtain $-p'(Q^*) q_M = 2\left[p(Q^*) - c\right] + \sigma p'(Q^*) q_T^*$, where $c_B = c_T = c$ and $-p'(Q^*) q_M = -p'(Q^*) q_T^* + \left[-p'(Q^*) q_B^*\right]$.

surplus prior to the merger. The PPO negatively affects the consumer surplus in the pre-merger case, $CS(Q^*)$, but does not affect the after merger consumer surplus, $CS(\overline{Q}^*)$, so that the critical synergy level, $\widetilde{s}_{CS}$, must decrease with a larger value of the PPO.

We now examine how the PPO affects B's and T's incentives to merge in equilibrium, which we measure by the difference between post-merger profits and the sum of B's and T's pre-merger profits; i.e., $\theta_M := \pi_M - (\pi_B + \pi_T)$. Again, note that M's profit is independent of the PPO, σ. It follows that the impact of σ on the merger incentive, θ_M, is solely determined by its influence on the sum of B's and T's pre-merger profits, $\pi_B + \pi_T$, and is thus obtained by calculating $d(\pi_B + \pi_T)/d\sigma$. Applying the envelope theorem and substituting the first-order condition which defines B's equilibrium output choice, we obtain

$$\frac{d(\pi_B + \pi_T)}{d\sigma} = \underbrace{\frac{\partial \pi_T}{\partial q_B^*}\frac{dq_B^*}{d\sigma}(1-\sigma)}_{(+)} + \underbrace{\frac{\partial \widehat{\pi}_B}{\partial q_T^*}\frac{dq_T^*}{d\sigma}}_{(-)} + \underbrace{\frac{dQ_r^*}{d\sigma}\left[\frac{\partial \widehat{\pi}_B}{\partial Q_r^*} + \frac{\partial \pi_T}{\partial Q_r^*}\right]}_{(-)}, \tag{7}$$

where $\widehat{\pi}_B = p(Q)q_B - cq_B$ represents B's operating profit; i.e., $\pi_B - \sigma\left[p(Q)q_T - c_T q_T\right]$.[20] The right-hand side of (7) shows that an increase in σ has the following effects on firm B's and firm T's pre-merger profit levels: *First*, it increases T's profit, π_T, which exerts a positive effect on $\pi_B + \pi_T$.[21] *Second*, it decreases B's operating profit, $\widehat{\pi}_B$, resulting from an expansion of q_T^* as a (equilibrium) response to the reduction of q_B^*. This effect is clearly negative. *Third*, the outsiders increase their output which negatively affects B's and T's profits. The total effect is summarized in the following lemma, in which we present a condition on the outsiders' output expansion following an increase in σ for $\pi_B + \pi_T$ to fall, and hence, θ_M to rise.

Lemma 2. *If the outsiders' output expansion is larger than half of B's and T's net output reduction, then $d(\pi_B + \pi_T)/d\sigma < 0$ holds at $\sigma = 0$.*

Proof. Let $\sigma = 0$ which implies $q_B^* = q_T^*$ as well as $\partial\widehat{\pi}_B/\partial q_T^* = \partial \pi_B/\partial q_T^*$ and $\partial\widehat{\pi}_B/\partial Q_r^* = \partial \pi_B/\partial Q_r^*$. It follows that $\partial \pi_B/\partial q_T^* = \partial \pi_B/\partial Q_r^* = \partial \pi_T/\partial q_B^* = \partial \pi_T/\partial Q_r^* := \gamma < 0$. Then, (7)

[20] Notice that the envelope theorem implies that $\frac{\partial \pi_T}{\partial q_T^*}\frac{\partial q_T^*}{\partial \sigma} = 0$, since $\frac{\partial \pi_T}{\partial q_T^*} = 0$. The first-order condition defining B's equilibrium output choice, which is used in (7), is given by $\frac{\partial \pi_B}{\partial q_T^*} = \frac{\partial \widehat{\pi}_B}{\partial q_B^*} - \sigma\frac{\partial \pi_T}{\partial q_B^*} = 0$, and can be rewritten as $\frac{\partial \widehat{\pi}_B}{\partial q_B^*} = \sigma\frac{\partial \pi_T}{\partial q_B^*}$.

[21] Note that this positive effect does not fully enter $\pi_B + \pi_T$, i.e., it is weighted by $(1-\sigma)$, since B internalizes the negative externality on T's profit via σ.

reduces to

$$\left.\frac{d\left(\pi_B+\pi_T\right)}{d\sigma}\right|_{\sigma=0}=\gamma\left[\frac{dq_B^*}{d\sigma}+\frac{dq_T^*}{d\sigma}+2\frac{dQ_r^*}{d\sigma}\right]. \tag{8}$$

From (8), we obtain the condition $dQ_r^*/d\sigma > -\left[dq_B^*/d\sigma + dq_T^*/d\sigma\right]/2$ for which (8) is negative. Note that by Lemma 1 $\left[dq_B^*/d\sigma + dq_T^*/d\sigma\right]$ is negative, since T expands its output by less than q_B^* is reduced. Multiplying both sides of the inequality with $d\sigma$, yields $dQ_r^* > -\left[dq_B^* + dq_T^*\right]/2$. ■

As θ_M does not only depend on σ, but also on the synergies created by the merger, s, we can finally examine how the critical synergy level needed for a merger to be profitable is affected by σ. Let $\widetilde{s}_M$ denote the critical synergy level, for which $\theta_M > 0$ (< 0) if $s > \widetilde{s}_M$ $(< \widetilde{s}_M)$ (with equality holding at $s = \widetilde{s}_M$). Our result is stated in the next proposition which emphasizes the role of the outsiders' response to an increase in the passive ownership, σ.

Proposition 2. *A higher PPO, σ, increases (decreases) the critical synergy level needed for a merger to be profitable whenever $dQ_r^* < -(dq_B^* + dq_T^*)/2$ ($dQ_r^* > -(dq_B^* + dq_T^*)/2$) holds at $\sigma = 0$.*

Proposition 2 demonstrates that whether or not the requirements for the critical synergy level, $\widetilde{s}_M$, are relaxed as the PPO increases, crucially depends on the outsiders' best-response behavior. If the outsiders' output expansion, dQ_r^*, is lower than half of B's and T's joint output reduction, $\left[dq_B^* + dq_T^*\right]/2$, then $d\widetilde{s}_M/d\sigma > 0$. If, however, $dQ_r^* > -\left[dq_B^* + dq_T^*\right]/2$ holds, then the opposite holds. This result directly follows from the fact that an increasing PPO may either decrease or increase B's and T's joint profits (Lemma 2), $\pi_B + \pi_T$, while it leaves M's profit, π_M, unaffected.

We use Figure 2 to illustrate our results from Propositions 1 and 2. Notice that s_M^0 and s_{CS}^0 denote the corresponding critical synergy levels at $\sigma = 0$. Further, $\widetilde{s}_M^+$ and $\widetilde{s}_M^-$ indicate $dQ_r^* < -(dq_B^* + dq_T^*)/2$ and $\partial Q_r^* > -(dq_B^* + dq_T^*)/2$, respectively, and $\underline{\sigma}$ denotes the threshold PPO for which $\widetilde{s}_M^+ > \widetilde{s}_{CS}$ $(< \widetilde{s}_{CS})$ holds, whenever $\sigma > \underline{\sigma}$ $(< \underline{\sigma})$.

In addition, Figure 2 shows that profitable mergers and mergers accompanied by an increase in consumer surplus converge the higher the PPO in the pre-merger case. The difference between $\widetilde{s}_M$ and $\widetilde{s}_{CS}$ is either reduced if the outsiders' output expansion is sufficiently high, or entirely eliminated if the outsiders' output expansion is sufficiently low. In the latter case, profitable mergers are always accompanied by an increase in consumer surplus whenever the PPO is sufficiently high; i.e., $\sigma > \underline{\sigma}$ holds. In Figure 2, the grey area between lines s^0_{CS} and $\widetilde{s}_{CS}$ illustrates how a PPO prior to a full merger increases the scope for price-decreasing mergers. Given a consumer surplus standard and $\sigma = 0$, an AA would refer to s^0_{CS} to decide whether or not to allow the merger. If, however, a PPO is acquired before the full merger proposal, then the grey area in Figure 2 shows how the range of admissible mergers increases in σ.[22]

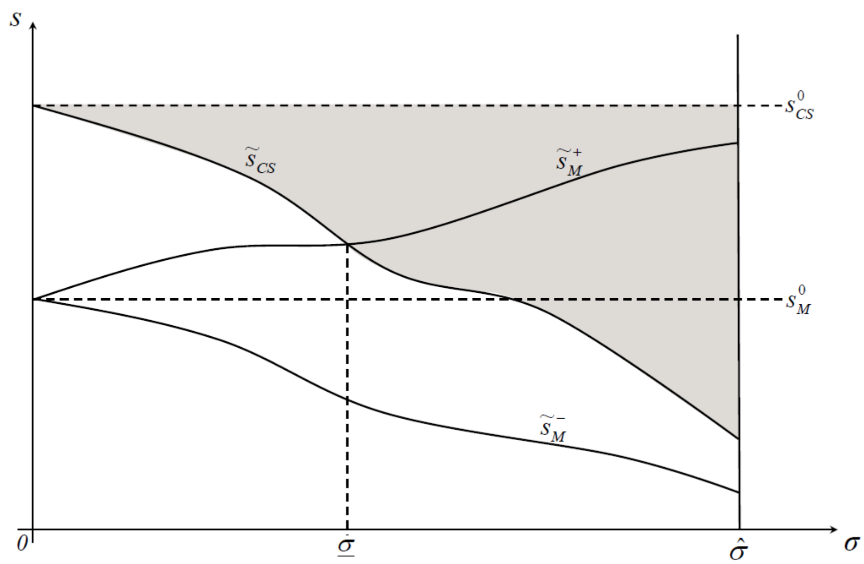

Figure 2: The Impact of a PPO on the Critical Synergy Levels

A Linear Example. We apply a linear Cournot oligopoly model to our general setup to illustrate our results. We consider an inverse demand schedule which is given by $p(Q_i) = A - Q$. We assume that firms have initially identical (constant) marginal costs, so that $c_i = c$ holds for all $i \in I$. In Table 1, we present output levels, profits, and consumer surplus both in the pre-merger equilibrium and in the post-merger equilibrium depending on the PPO, σ, and the merger synergy, s, respectively.

[22] Of course, σ must not exceed $\widehat{\sigma}$ as this would transform the PPO into a partial ownership share involving corporate control which falls under merger control.

Table 1: Equilibrium Values of the Linear Cournot Model

	Equilibrium Values	
	Pre-merger	After-merger
Quantity per Firm	$q_B^*(\sigma) = \frac{(A-c)(1-\sigma)}{n+1-\sigma}$ $q_T^*(\sigma) = q_r^*(\sigma) = \frac{A-c}{n+1-\sigma}$	$\overline{q}_M^*(s) = \frac{A-c+s(n-1)}{n}$ $\overline{q}_r^*(s) = \frac{A-c-s}{n}$
Profit per Firm	$\pi_B^*(\sigma) = \pi_r^*(\sigma) = \left(\frac{A-c}{n+1-\sigma}\right)^2$ $\pi_T^*(\sigma) = (1-\sigma)\left(\frac{A-c}{n+1-\sigma}\right)^2$	$\overline{\pi}_M^*(s) = \left[\frac{A-c+s(n-1)}{n}\right]^2$ $\overline{\pi}_r^*(s) = \left[\frac{A-c-s}{n}\right]^2$
Consumer Surplus	$CS^*(\sigma) = \frac{1}{2}\left[\frac{(A-c)(n-\sigma)}{n+1-\sigma}\right]^2$	$\overline{CS}^*(s) = \frac{1}{2}\left[\frac{(n-1)(A-c)+s}{n}\right]^2$

Using Table 1, we can easily show that the merger incentive, θ_M, is increasing in σ, i.e.,

$$\frac{d\theta_M}{d\sigma} = \frac{(A-c)^2(n-3+\sigma)}{(n+1-\sigma)^3} > 0$$

holds. That is, B's and T's pre-merger profits, $\pi_B^*(\sigma) + \pi_T^*(\sigma)$, strictly decrease in σ, while $\overline{\pi}_M^*(s)$ is not affected by σ implying $dQ_r^* > -[dq_B^* + dq_T^*]/2$.

Moreover, it can be checked that the merger's effect on consumer surplus, $\Delta CS(\sigma, s) := \overline{CS}^*(s) - CS^*(\sigma)$, is increasing in σ:

$$\frac{d\Delta CS(\sigma,s)}{d\sigma} = \frac{(A-c)^2(n-\sigma)}{(n+1-\sigma)^3} > 0$$

holds. Again, this result follows from noticing that pre-merger total output strictly decreases in σ. Setting $\theta_M(\sigma, s) = 0$ and $\Delta CS(\sigma, s) = 0$, we can calculate the following critical synergy levels

$$\widetilde{s}_M = \frac{(A-c)\left[\sqrt{n^2(2-\sigma)} - (n+1-\sigma)\right]}{(n+1-\sigma)(n-1)}$$

and

$$\widetilde{s}_{CS} = \frac{(A-c)(1-\sigma)}{n+1-\sigma},$$

with $\widetilde{s}_{CS} > \widetilde{s}_M$ for all feasible σ. It is immediately verified that $d\widetilde{s}_M/d\sigma < 0$ and $d\widetilde{s}_{CS}/d\sigma < 0$ hold. Hence, a PPO increases both the merger incentive and the chance for a full merger to be approved (by decreasing the minimal synergy level necessary to make the merger consumer increasing).

3 Sneaky Takeovers

In this section, we show how a PPO can be used to get a merger approved which would otherwise have been blocked by an antitrust authority (AA) applying a consumer surplus standard. For this purpose, we refer to our linear example.

Suppose first that firm B does not hold a PPO in T prior to the merger; i.e., $\sigma = 0$. Then, all firms realize equilibrium profits given by $\pi_i^* = [(A-c)/(n+1)]^2$. Further, assume that a merger between firms B and T leads to synergies, $\widehat{s}$, which satisfy $\widehat{s} \in \left[s_M^0, s_{CS}^0\right)$, i.e., $\theta_M \geq 0$ and $\Delta CS < 0$ hold simultaneously given $\sigma = 0$. In that case, an AA which uses a consumer surplus standard to assess proposed mergers and does not face any informational constraints would clearly block the merger between B and T. However, B could acquire a PPO in T before the merger in order to get the merger accepted by the AA whenever the AA explicitly accounts for the PPO when evaluating the proposed merger. We call this strategy a sneaky takeover as it aims at outplaying the AA by reducing the minimal synergy requirement which follows from the consumer surplus standard.

In the following proposition, we present the relevant condition for the PPO, σ, which has to be met to get a full merger between B and T approved by the AA.

Proposition 3. *If B acquires a PPO in T in the pre-merger phase which satisfies $\sigma \geq \widetilde{\sigma} \in \{\sigma \in \mathbb{R}_+ : \widehat{s} = \widetilde{s}_{CS}(\sigma)\}$, then a merger with synergies $\widehat{s}$ will be cleared whenever the AA accounts for the PPO when evaluating the proposed merger.*

Our finding in Proposition 3 crucially relies on the fact that the minimal synergy level necessary to leave consumers unaffected by a merger is decreasing in the PPO; i.e. $d\widetilde{s}_{CS}/d\sigma < 0$ holds (see Lemma 1). In addition, it critically depends on the assumption that the AA cannot control PPO acquisitions. Hence, B needs only to acquire a sufficiently large PPO, $\sigma \geq \widetilde{\sigma}$, in the pre-merger phase in order to get the merger accepted at a later point in time. This result is illustrated in Figure 3 in which we highlight the set of all feasible σ which lead to an approval of the merger between B and T involving a synergy level of $\widehat{s}$. Notice that if the AA cannot block the PPO acquisition, it induce firms to use PPOs strategically in order to get a full merger accepted which would have been blocked otherwise.

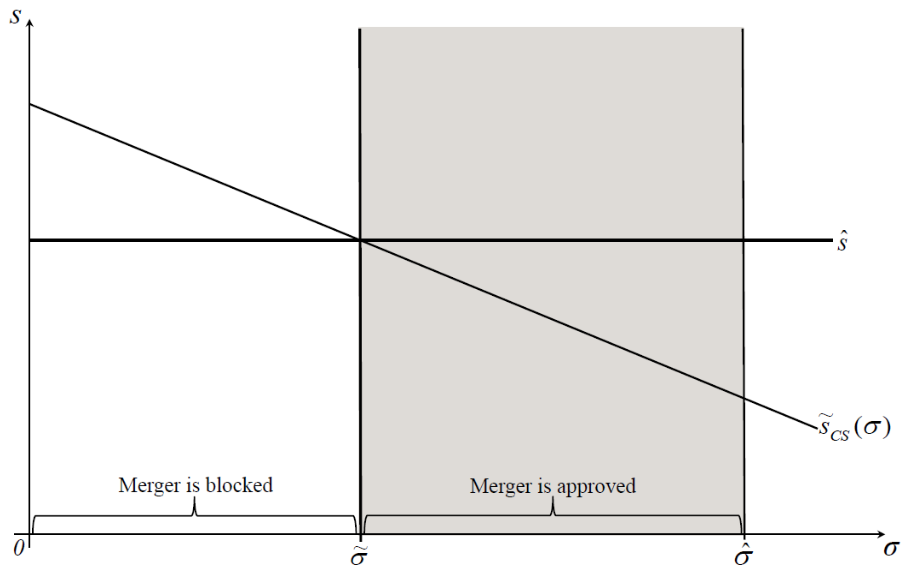

Figure 3: Sneaky Takeovers

Numerical Example. In this numerical example we show that *i)* $\widetilde{\sigma}$ exists and *ii)* that it is jointly profitable for B and T to strategically acquire a PPO prior to the merger. Set $n = 5$, $A = 40$, $c = 10$ and $\widehat{s} = 4.2$. It is easily checked that a merger between B and T will be blocked in the absence of a PPO ($\sigma = 0$). This follows from noticing that a merger would increase the price level, and hence, decrease consumer surplus; i.e., $\widehat{s} < s^0_{CS} = 5$.

If, however, B acquires a PPO of $\sigma \geq \widetilde{\sigma} \approx 0.185$ in T prior to the merger, then $\widetilde{s}_{CS} \approx 4.2$ and the merger will thus leave consumer surplus unaffected. Furthermore, note that $\pi^*_B(\sigma = 0) + \pi^*_T(\sigma = 0) \approx 50$, $\pi^*_B(\widetilde{\sigma}) + \pi^*_T(\widetilde{\sigma}) \approx 48.3$ and $\theta_M(\widehat{s}, \widetilde{\sigma}) \approx 39.3$, so that the gains from a merger exceed the (temporary) loss in profits resulting from a passive partial ownership agreement between B and T in the pre-merger phase.

4 Conclusion

We have shown that considerations of PPOs among merger candidates are critical for the assessment of a merger's effects on consumer surplus. Overall, a PPO reduces the minimal synergy level necessary to leave consumer surplus unaffected by a merger. Interestingly, merger incentives may increase or decrease depending on the magnitude of the non-merging firms' response.

More specifically, whenever the outsiders' output expansion is lower than half of the merging candidates' output reduction due to the PPO, merger incentives increase. Otherwise, i.e., if the outsiders are more aggressive and expand their output by more than half the merging candidates' reduce their output, merger incentives decrease.

We conclude that PPOs should fully fall under the supervision of AAs in analogy to merger control. PPOs do not only reduce the competitive intensity in a given market directly, but their ignorance must invite sneaky takeovers which are detrimental to consumer welfare. After the (uncontrolled) acquisition of a PPO, it becomes much harder to block a merger (under a consumer surplus standard) because of the anticompetitive effects the PPO unfolds prior to the full merger proposal. Our analysis, therefore, adds to the policy recommendation that AAs should control PPOs (OECD, 2008; OFT, 2010; EC 2013).

In the realm of our model, any PPO should be blocked as it only serves to reduce the minimal synergy level necessary to make the merger consumer surplus increasing at a later stage. One may think of a richer model with incomplete information in which, e.g., the PPO also increases the quality of a signal about the realizable synergy level. If a PPO increases the precision of such a signal, it is no longer obvious that the AA should block any acquisition of a PPO. Under incomplete information about the possible merger synergies a PPO creates an option value which is exerted whenever the signal is sufficiently attractive. Large synergies may increase consumer welfare, so that it is no longer obvious whether any PPO acquisition should be blocked by the antitrust agency.

Appendix

In this Appendix we provide the omitted proof of Lemma 1.

Proof of Lemma 1. Differentiating (1) with respect to q_B, we obtain the first-order condition

$$\frac{\partial \pi_B}{\partial q_B} = p'(Q)q_B + p(Q) - c_B + \sigma p'(Q)q_T, \tag{9}$$

which implicitly defines B's best response function, $q_B(q_T, Q_r, \sigma)$. Differentiating (9) with respect to σ yields

$$\frac{\partial^2 \pi_B}{\partial q_B \partial \sigma} = p'(Q)q_T,$$

which is negative as $p'(Q) < 0$ holds by Assumption 1. Moreover, as

$$\frac{\partial^2 \pi_B}{\partial q_B^2} = p''(Q)q_B + 2p'(Q) + \sigma p''(Q)q_T < 0$$

holds by Assumption A1 (given that $p(Q)$ is not too convex), it follows that the effect of a marginal increase in σ on $q_B(q_T, Q_r, \sigma)$, which is given by

$$\frac{\partial q_B(q_T, Q_r, \sigma)}{\partial \sigma} = -\frac{\frac{\partial^2 \pi_B}{\partial q_B \partial \sigma}}{\frac{\partial^2 \pi_B}{\partial q_B^2}},$$

must be negative.

We next sign the effect of a marginal increase in σ on total output in equilibrium, Q^*; i.e., $dQ^*/d\sigma$. Note that $dQ/d\sigma$ can be decomposed into $(dQ/dq_B)(dq_B/d\sigma)$. Since $dq_B/d\sigma < 0$, we must show that $dQ/dq_B > 0$. Note that this part of the proof corresponds to Farrell and Shapiro's (1990) proof of their Lemma on p. 123. Consider firm B's response to a marginal change in its rivals' quantities which is given by

$$\frac{dq_B(Q_{-B}, \sigma)}{dQ_{-B}} = -\frac{\frac{\partial^2 \pi_B}{\partial q_B \partial Q_{-B}}}{\frac{\partial^2 \pi_B}{\partial q_B^2}} =: \beta_B, \tag{10}$$

where $Q_{-B} = q_T + Q_r$ represents all firms other than B and $\partial^2 \pi_B / (\partial q_B \partial Q_{-B}) = p''(Q)q_B + p'(Q) + \sigma [p''(Q)q_T + p'(Q)]$. It is easily checked that $\beta_B \in (-1, 0)$, as both the numerator and the denominator are negative and $\partial^2 \pi_B / \partial q_B^2 < \partial^2 \pi_B / (\partial q_B \partial Q_{-B})$ holds. The latter immediately follows from $\sigma < 1$. Rearranging (10) gives $dq_B = \beta_B dQ_{-B}$. Adding $\beta_B dq_B$ to both sides of the equation gives (after some manipulations) $dq_B = [\beta_B / (1 + \beta_B)] \, dQ = -\lambda_B dQ$, with $\lambda_B > 0$, which holds for any firm i in the market; i.e., $dq_i = -\lambda_i dQ$. Summing up over $i \in I \backslash \{B\}$, we obtain $dQ_{-B} = -\sum_{i \neq B} \lambda_i dQ$ and adding dq_B to both sides yields $dQ = -\sum_{i \neq B} \lambda_i dQ + dq_B$ or $dQ \left(1 + \sum_{i \neq B} \lambda_i\right) = dq_B$ or

$$\frac{dQ}{dq_B} = \frac{1}{1 + \sum_{i \neq B} \lambda_i}.$$

As $\lambda_i > 0$, it follows that $dQ/dq_B \in (0, 1)$. ■

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