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Structural remedies as a signalling device

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Structural Remedies as a Signalling Device*

Markus Dertwinkel-Kalt[†] Christian Wey[‡]

January 2016

Abstract

We analyze the effects of structural remedies on merger activity in a Cournot oligopoly when the Antitrust Agency (AA) cannot observe a proposed merger's efficiency type. Provided the AA follows a consumer surplus standard, an efficient merger type is doomed to over-fix with its divestiture proposal in a pooling equilibrium, which is also possible under separation.

JEL-Classification: L13, L41, K21

Keywords: Remedies, Divestiture, Merger Control, Signalling.

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1 Introduction

While mergers in oligopolistic markets are typically anticompetitive, merger synergies can make a merger desirable from a social or a consumer perspective. If synergies are rather weak, remedies may be offered by the merging parties to effectively protect competition and to remove any competition concern the Antitrust Agencies (AA) may have. We consider remedies in the most usual form of physical asset sales (“structural remedies”, “divestitures”) which are designed and proposed to the AA by the merging firms and can be either rejected or accepted. In practice, the AA follows a consumer surplus (CS) standard according to which such proposals are approved which do not increase the expected post-merger price level (Whinston, 2007). Divestitures enlarge the scope for approvable mergers in the presence of merger synergies (Medvedev, 2007; Dertwinkel-Kalt and Wey, 2016). If the merger synergy, however, is very weak or absent, only under very restrictive conditions a re-allocation of productive assets through structural remedies may satisfy the consumer surplus standard (Vergé, 2010).

We assume asymmetric information between the merging firms and the AA: while firms have precise knowledge about the synergies a merger creates, the AA is uncertain about a merger’s synergy level. In line with merger practice, we suppose that the merging firms must make a remedial offer which is either accepted (in which case the merger goes through) or rejected (in which case the merger is blocked) by the AA.¹ Our main research question is how the merging firms’ remedy choice is affected by asymmetric information and whether the remedy can be used to signal the merger’s synergy type.²

Within the narrow context of merger control, it is natural to assume that the size of the proposed divestiture is the only potential signalling device available. The divestiture level can be used as a signalling device as more efficient mergers stay profitable even if a relatively large stock of capital has to be divested. We find that only a pooling equilibrium exists in which both efficient

¹This is particularly true for fix-it-first remedies in the US and phase 1 merger proposals in the EU (see, for instance, Wood, 2003).

²While we discuss how merging parties can signal their efficiency to the AA, Banal-Estanol et al. (2010) analyze how target firms can screen prospective acquirers according to their ability to generate merger-specific synergies via setting a reserve price.

and inefficient mergers are cleared whenever the difference in their efficiency levels is relatively small or if inefficient mergers are unlikely. As firms cannot separate through signalling, also rather inefficient mergers are cleared which would have been blocked by the AA under complete information. As the expected post-merger price level must not exceed the pre-merger price level, the efficient type is doomed to over-fix by proposing to divest more than under complete information.

A separating equilibrium exists only if the pooling divestiture is not profitable for the inefficient type. Such a separating equilibrium is backed by the more efficient type by proposing a “large” divestiture (possibly above the equilibrium divestiture under complete information) to deter the inefficient type from mimicking its behavior.³ Both the pooling and the separating equilibrium outcomes provides a new rationale for the often mentioned phenomenon of “over-fixing” associated with remedies. In contrast to Vasconcelos’ (2010) critique of over-fixing, consumers benefit in our setting from the efficient firm’s “over-fixed” divestiture level.⁴

³Also Cosnita and Tropeano (2009) analyze merger control under incomplete information. They propose a revelation mechanism which combines divestitures with two additional tools, the regulation of the divestitures sales price and a merger fee. Our analysis is confined to the asset sale as the only instrument the authority has at hand to “finetune” its decision. In contrast to Cosnita and Tropeano (2009), *first*, we highlight the existence of a pooling equilibrium and *second*, show that separation is also feasible with one instrument (the divestiture’s size).

⁴Vasconcelos (2010) analyzes remedies for the case of a four firm oligopoly when merger synergies are possible. Each firm owns one unit of capital and capital is indivisible. He assumes that the AA maximizes consumer surplus which is crucial when at least three firms are involved in a merger. In those instances he shows the possibility of the over-fixing problem associated with remedial divestitures (see also Farrell, 2003). The AA uses its power to restructure the industry optimally. Over-fixing may have adverse effects because a firm may abstain from proposing a (socially desirable) merger with two other firms. Instead, the acquirer expects (correctly) that the AA will use its power to sell one of the acquired firms to the remaining competitor. Consequently, the acquirer may strategically propose a one-firm takeover which can be worse from a consumer point of view than allowing a takeover of two other firms. Hence, remedies may not serve consumer interest as the antitrust authority is over-fixing in terms of consumer protection.

2 The Model

Suppose a Cournot market with $N \geq 3$ firms and a downward sloping inverse demand function $p(X)$, with $p'(X) < 0$, where p is the market price and X stands for the industry's total output of a homogenous product. We assume

$$p'(X) + x_i p''(X) < 0 \text{ holds for all } 1 \leq i \leq N, \quad (1)$$

which guarantees that each firm's reaction function slopes downward with slope between -1 and 0 . Each firm i has a capital stock k_i and produces quantity x_i at costs $c_i(x_i, k_i)$. Prior to a merger, let p^* denote the equilibrium market price and π_i^* firm i 's equilibrium profit. We examine a bilateral merger with firm 1 being the acquirer and firm 2 the target firm. Firms 1 and 2 propose to merge if the merged entity's profit π_M strictly exceeds the sum of their pre-merger profits $\pi_1^* + \pi_2^*$. A merger between firms 1 and 2 creates a synergy, which is measured by the parameter $s \in [0, 1]$. Precisely, the merged firm M (which combines the assets of firms 1 and 2) produces with the cost function $c_M(x, k, s)$, where $k = k_1 + k_2$ denotes the merged firm's capital, possibly reduced by divested assets. Without loss of generality, we assume that if a divestiture takes place, then firm 2's capital is divested.

The Antitrust Agency (AA) follows a consumer surplus (CS) standard according to which only such mergers are approved which do not lower consumer surplus, i.e., where the post-merger market price p^{pm} is not above the pre-merger market price p^* . We assume that there exists a certain synergy threshold value $\bar{s} \in (0, 1)$, such that a merger is approvable if and only if its synergy level s satisfies $\bar{s} \leq s$.⁵ A larger value of s stands for larger synergies. Thus, all merger types $s \geq \bar{s}$ would be approved under perfect information even in the absence of a divestiture. For synergy levels $s < \bar{s}$, a divestiture $\Delta \in [0, k_2]$ may exist which counter-balances the merger's anticompetitive effects such that the CS-standard is satisfied.⁶ Let firm 3 be the candidate buyer firm for the potential divestiture.⁷ We denote by $\pi_M(\Delta, s)$ the profit of a merged firm which

⁵That such a threshold value typically exists has been shown in Dertwinkel-Kalt and Wey (2016).

⁶Hereby, we assume that the merged firm divests a share of the target firm's capital k_2 . Analogously, we could assume that the merged firm divests a share of the acquirer's capital.

⁷While the buyer firm is exogenous in this paper, we analyze in our related paper (Dertwinkel-Kalt and Wey, 2016) under which circumstances which firm is the preferred buyer firm.

generates synergy s and sells a divestiture of size Δ . We assume that the merged firm's profit is strictly decreasing in the size of the divestiture and strictly increasing in the synergy level, i.e.,

$$\frac{\partial \pi_M(\Delta, s)}{\partial \Delta} < 0 \text{ for all divestitures } \Delta \in [0, k_2], \quad (2)$$

$$\frac{\partial \pi_M(\Delta, s)}{\partial s} > 0 \text{ for all synergy levels } s \in [0, 1]. \quad (3)$$

The assumption that the merged firm's profit decreases in the size of the divestiture is our main assumption, but not too restrictive. Dertwinkel-Kalt and Wey (2016) provide sufficient conditions under which this assumption is fulfilled in Cournot oligopoly. First, if the divestiture is sold at a fixed price (independent of the divestiture's size) then the assumption holds regardless of the specific model. Also if the merging parties sell the divestiture via take-it or leave-it offers the assumption is likely to hold, for instance, if the merged entity can run the capital more efficiently than the buyer firm. In addition, if the divestiture impacts negatively on the synergy level s , profits are likely to decrease in the divestiture level.

We assume that full mergers which create no synergies ($s = 0$) are unprofitable, i.e., $\pi_M(0, 0) < \pi_1^* + \pi_2^*$, while full mergers with perfect synergies ($s = 1$) are strictly profitable, i.e., $\pi_M(0, 1) > \pi_1^* + \pi_2^*$. There is a unique threshold value \tilde{s} such that a full merger satisfies profitability if and only if $s \geq \tilde{s}$, i.e., $\pi_M(0, \tilde{s}) = \pi_1^* + \pi_2^*$. Furthermore, we assume that the post-merger market price is continuous in s and strictly decreasing both in the divestiture's size Δ and in the synergy level:

$$\frac{\partial p^{pm}(\Delta, s)}{\partial \Delta} < 0 \text{ for all } s \in [0, 1], \quad (4)$$

$$\frac{\partial p^{pm}(\Delta, s)}{\partial s} < 0 \text{ for all divestitures } \Delta \in [0, k_2]. \quad (5)$$

That means that larger divestitures and higher synergies are always desirable from a consumer point of view.⁸

Then, there exists a threshold value $s' \in [0, \bar{s}]$ such that $p^{pm}(\Delta, s) \leq p^*$ for all $s \in [s', \bar{s}]$ if Δ is sufficiently large, while $p^{pm}(\Delta, s) > p^*$ for all $s \in [0, s')$ and all admissible Δ . We

⁸We impose assumption (4) for illustrative reasons. It holds, for instance, in the case of constant marginal costs if $k_1 \geq k_2 + k_3$ (for a proof, see Farrell and Shapiro, 1990, Proposition 2, or Dertwinkel-Kalt and Wey, 2016, Lemma 1). However, we could also conduct our analysis without this assumption. We discuss this case at the end of the next section.

assume that $s' \in (0, \bar{s})$, i.e., divestitures increase the scope for mergers, but cannot countervail the anticompetitive effects of the least efficient mergers. For each synergy level $s \geq s'$ denote $\Delta^{\min}(s)$ the smallest divestiture such that the consumer surplus standard is satisfied; for $s \geq \bar{s}$ we have that $\Delta^{\min}(s) = 0$. Synergies and divestitures are substitutes with respect to their effect on consumer surplus: the higher the realized synergy, the smaller the smallest divestiture level $\Delta^{\min}(s)$ such that the merger satisfies the CS-standard. In addition, there is a threshold value $s'' \in [\tilde{s}, 1)$ such that proposing a merger with divestiture $\Delta^{\min}(s)$ is strictly profitable if and only if $s > s''$.⁹ We assume that $s'' < \bar{s}$, i.e., remedies strictly improve the scope for profitable and acceptable mergers.¹⁰

Let there be two types of feasible synergy levels, $\theta \in \{h, l\}$: the “high-synergy” type s_h and the “low-synergy” type s_l , with $s_l < s_h$. Suppose that $\tilde{s} < s_l < \bar{s}$ and $s_h > s''$, such that at least for the high-synergy firm an approvable and profitable merger opportunity exists. Note that we leave it open whether or not the high type needs to propose a divestiture to induce the AA to approve its merger proposal. For the low-synergy type, a full merger is profitable, but violates the CS-standard; an approvable merger, possibly including divestitures, however, may not be profitable. A priori, the inefficient type s_l occurs with probability ρ and the efficient type s_h with counter probability $1 - \rho$. There exists a maximal divestiture $\Delta^{\max}(s_\theta) \in [0, k_2]$ for which merger-type s_θ is still profitable, while larger divestitures violate profitability; i.e., $\Delta^{\max}(s_\theta)$ satisfies $\pi_M(\Delta^{\max}(s_\theta), s_\theta) = \pi_1^* + \pi_2^*$. From the assumed Inequality (3), it follows that $\Delta^{\max}(s_h) > \Delta^{\max}(s_l)$. Hence, a merger of type s_θ will never agree to divest more than $\Delta^{\max}(s_h)$. See Table 1 and Figure 1 for an overview of all synergy and divestiture thresholds.

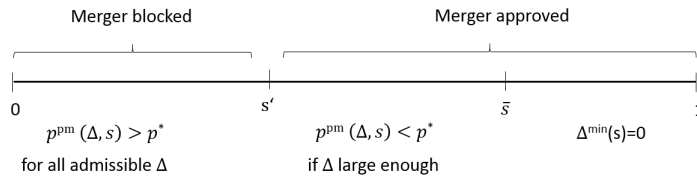


Figure 1: Merger decisions under complete information.

⁹From (2) it follows that in equilibrium firms will not divest more than the minimum divestiture which makes a merger approvable.

¹⁰This holds, for instance, in the models provided by Medvedev (2007) and Dertwinkel-Kalt and Wey (2016).

Synergy	Description
\bar{s}	threshold for approvability w/o div.
\tilde{s}	threshold for profitability w/o div.
s'	threshold for approvability w/ div.
s''	threshold for profitability w/ div.
$\Delta^{\min}(s_\theta)$	min. div. s.t. a merger w/ synergy s_θ is approvable
$\Delta^{\max}(s_\theta)$	max. div. s.t. a merger w/ synergy s_θ is profitable

Table 1: *An overview of all synergy and divestiture threshold values.*

We impose the following qualifications: *First*, a divestiture proposal is binding and cannot be reversed after the AA's decision. *Second*, only strictly profitable mergers are proposed.¹¹ *Third*, the AA approves the merger only if the expected post-merger price, $E(p^{pm})$, is not higher than the pre-merger price p^* .¹² When a merger is proposed, the AA does not know the synergy the merger will generate. Instead, the AA knows only (1) the synergies' prior distribution and (2) that only strictly profitable mergers are proposed. The merging candidates, however, are fully informed about their synergy level s_θ .¹³ We solve the following game for a subgame perfect Bayesian Nash equilibrium.

In the first stage, nature draws $s \in \{s_l, s_h\}$. In the second stage, firms 1 and 2 propose a strictly profitable merger (possibly including divestiture Δ) which generates synergy s . In the third stage, the AA either approves or blocks the merger proposal. At the fourth stage, firms compete à la Cournot.

¹¹That assumption simplifies the analysis of the separating equilibrium below. Precisely, the low-synergy type will not mimic the high-synergy type in case of indifference which allows us to easily calculate the size of the divestiture in the separating equilibrium.

¹²The AA is assumed to be risk-neutral.

¹³In addition, all competitors know the true synergy level after the merger is successfully completed.

3 Analysis

Let $p^{pm}(s_\theta)$ denote the post-merger price following a merger of synergy type s_θ with divestiture Δ . Such a merger-proposal will be approved if and only if

$$p^* - E(p^{pm}) \geq 0 \text{ or} \quad (6)$$

$$b_h p^{pm}(\Delta, s_h) + b_l p^{pm}(\Delta, s_l) \leq p^*, \quad (7)$$

where the left-hand side of (7) denotes the expected post-merger price, given the AA's beliefs b_θ on the probabilities of facing a merger proposal of type $\theta = h, l$.

Ex-ante, the AA's beliefs are $b_l = \rho$ and $b_h = 1 - \rho$. There is only one instance in which the AA can update its belief such that it can infer the merger's type from a divestiture proposal. This can only be the case when the divestiture is so large that only the high-synergy type can profitably merge which may be the case due to $\Delta^{\max}(s_h) > \Delta^{\max}(s_l)$. If the divestiture is small enough so that both types find it profitable to merge, then the AA must stick to the a priori distribution of merger types.

As the AA can, therefore, infer that a proposed merger is a high-synergy merger if the profitability condition would be violated for the low-synergy type, we can specify the following belief system of the AA. If the proposed divestiture Δ is smaller than $\Delta^{\max}(s_l)$, then the AA has beliefs $b_l = \Pr(s_\theta = s_l | \Delta < \Delta^{\max}(s_l)) = \rho$ and $b_h = \Pr(s_\theta = s_h | \Delta < \Delta^{\max}(s_l)) = 1 - \rho$, whereas beliefs are updated to $b_h = \Pr(s_\theta = s_h | \Delta \geq \Delta^{\max}(s_l)) = 1$ and $b_l = \Pr(s_\theta = s_l | \Delta \geq \Delta^{\max}(s_l)) = 0$ if the proposal Δ is weakly larger than $\Delta^{\max}(s_l)$. Consequently, the proposed divestiture may serve as a signalling device for the proposed merger's synergy level. We summarize our results on pooling and separating equilibria in the incomplete information scenario in the following proposition.

Proposition 1. *There exists at most one solution Δ^{po} so that (7) holds with equality. Then, all equilibria which involve successful merger proposals are the following.*

- i) If $\Delta^{po} \leq \Delta^{\max}(s_l)$, then Δ^{po} constitutes the unique equilibrium; that is, there is only "pooling" and any merger type proposes a merger with divestiture Δ^{po} .*
- ii) If (A) $\Delta^{po} > \Delta^{\max}(s_l)$ or Δ^{po} does not exist and (B) $\Delta^{\min}(s_h) < \Delta^{\max}(s_h)$ holds, only a separating equilibrium exists in which the efficient type proposes a successful merger; then, the*

divestiture is of size $\max\{\Delta^{\max}(s_l), \Delta^{\min}(s_h)\}$.

Proposition 1 states that a successful merger is either the result of a pooling or of a separating equilibrium, depending on whether or not the solution to condition (7) (holding with equality) leaves the low-synergy type's merger proposal profitable or not (see Figure 2). If that profitability condition is fulfilled, then only a pooling equilibrium exists. The high-synergy type could only induce separation by proposing a larger divestiture than under the pooling equilibrium which can never be profitable as the merger would also be cleared with the smaller pooling divestiture Δ^{po} . Proposing a lower divestiture is also not a feasible strategy as this can never induce separation. If solution Δ^{po} does not exist, then only a separating equilibrium exists in which only the high-synergy merger is approved. As $s_h > s''$ holds by assumption, in this equilibrium the profitability condition holds for the high-synergy type.

Inspection of (7) shows that the divestiture Δ^{po} in a pooling equilibrium increases in s_h , while it decreases in s_l and ρ . It is then immediate that a pooling equilibrium is more likely to exist if s_l is not too low. Conversely, if s_l becomes so low that a merger is no longer profitable at Δ^{po} , then a merger can only be the outcome of a separating equilibrium. In that instance, the high-synergy type proposes a divestiture $\max\{\Delta^{\max}(s_l), \Delta^{\min}(s_h)\}$, which ensures that the low-synergy type has no (strict) incentive to mimic the efficient type's proposal. We then obtain two possible scenarios in a separating equilibrium. Either, the low-synergy firm is sufficiently inefficient such that it suffices to propose the full information, price-fixing divestiture, $\Delta^{\min}(s_h)$, or the low-cost firm is efficient enough such that a merger proposal with divestiture $\Delta^{\min}(s_h)$ remains profitable. In the latter instance, the high-synergy firm can propose the "separating" divestiture level $\Delta^{\max}(s_l) < \Delta^{po}$, which deters the low-synergy type from proposing a merger at that level.

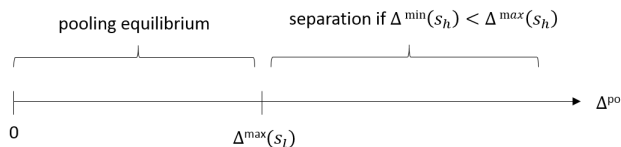


Figure 2: Equilibria depending on Δ^{po} .

From Proposition 1 it follows that a merger with synergy level $s = s_l < s'$ can be an equi-

librium outcome under pooling even though an approvable divestiture $\Delta^{\min}(s_l)$ does not exist. Also a merger with $s = s_l < s''$ can be approved under incomplete information. Such a merger is, given a divestiture which makes it approvable, not profitable under complete information, but can become profitable if the AA is unsure about the merger's type. In general, in a pooling equilibrium the required divestiture is, compared to the complete information scenario, smaller for the low-synergy type and larger for the high-synergy type; i.e., $\Delta^{\min}(s_l) > \Delta^{po} > \Delta^{\min}(s_h)$ holds. Hence, there may be instances where low-synergy merger types become profitable under incomplete information as the requested divestiture level is reduced. It then also follows that the high-synergy type must propose a larger divestiture in any pooling equilibrium when compared with the divestiture level under complete information. As the AA requires a too large divestiture from a high-synergy type, it "over-fixes" in those instances in terms of consumer protection. After a high-synergy merger has been cleared in a pooling equilibrium, the market price is strictly below the pre-merger price.

The over-fixing phenomenon can also occur in a separating equilibrium whenever the high-synergy type proposes a divestiture of $\Delta^{\max}(s_l)$ that is larger than its full information divestiture level $\Delta^{\min}(s_h)$. The following example describes such a situation. Assume a market with four firms, with linear demand $p = 1 - X$ and cost function $c(x, k) = x^2/k$. The merged firm produces with the cost function $c^M(x, k, s) = (1 - s) \cdot c(x, k)$. The buyer candidate for the acquisition of the divestiture is an entrant firm into the market. The merger types are $s_h = 1/2$ and $s_l = 3/10$, with a priori probabilities $\rho = 1/10$ and $1 - \rho = 9/10$. The high-synergy merger satisfies the CS-standard (even without divesting assets) while for the low-synergy type no divestiture exists which makes the merger approvable under full information. We then obtain profitability thresholds $\Delta^{\max}(s_l) \approx 0.20$ and $\Delta^{\max}(s_h) \approx 0.43$ for the low- and the high-synergy types. In addition, in a pooling equilibrium condition (7) must hold with equality which yields $\Delta^{po} \approx 0.22$. The high-synergy firm will propose no divestiture under complete information; i.e., $\Delta^{\min}(s_h) = 0$. According to Proposition 1 there exists a separating equilibrium, in which the efficient type divests $\max\{\Delta^{\max}(s_l), \Delta^{\min}(s_h)\} = \Delta_l^{\max} \approx 0.20$. Therefore, the AA over-fixes in favor of consumer protection when compared with the complete information benchmark.

While we imposed various assumptions for illustrative purposes, our analysis is robust with

respect to relaxing many of these. *First*, suppose that a divestiture is not to be sold to a single buyer firm. Instead, it is divided among a certain number of buyers. Analogous to Proposition 1, either a pooling equilibrium exists or the efficient merger type signals its efficiency by offering a particularly large divestiture. *Second*, drop Assumption (4). Denote the smallest divestiture level such that (6) holds (if this exists) as Δ^{po} . While part *i*) of Proposition 1 holds true, i.e., a pooling equilibrium exists as long as $\Delta^{po} \leq \Delta^{\max}(s_l)$, it is not always the case that a separating equilibrium exists otherwise. In fact, a separating equilibrium, in which the efficient firm overshoots to signal its efficiency, does not exist if for divestiture levels of at least $\max\{\Delta^{\max}(s_l), \Delta^{\min}(s_h)\}$ the consumer surplus standard is violated. This could happen, for instance, if the divestiture renders the buyer firm larger than the merged firm (see also Dertwinkel-Kalt and Wey, 2016, Lemma 1).

4 Conclusion

We analyzed the effects of structural remedies as a signalling device in a standard Cournot oligopoly with homogeneous products under a consumer welfare standard, where merging parties and the AA hold asymmetric information. Typically, firms cannot signal their efficiency level such that anticompetitive mergers may be implemented which would have been blocked in a complete-information scenario. Only under certain conditions, efficient firms can separate via proposing a particularly large divestiture which would render inefficient mergers unprofitable. Here, typically, consumers benefit from a strictly lower post-merger market price as the merged firm may be forced to “over-shoot” in order to signal its efficiency.

While it is assumed that the divestiture proposal is binding and cannot be reversed, merging firms could decide to go to court in case of excessive divestitures or if the AA disapproved the merger. However, there are several reasons why this may not be a viable option in practice. First, divestitures are proposed voluntarily by the merging firms, such that there is not much scope to appeal to the court if the proposed divestiture was accepted, but excessive. Second, if the proposed divestiture was appropriate, but denied by the AA, the merging parties may appeal to the court. This procedure, however, may be very lengthy, costly and risky, especially because the court holds ex ante less information on the merger proposal than the antitrust authority. In

particular, the revelation and verification of the merged firm's private information may induce delays and costs such that the merging firms may rather be willing to over-shoot with their divestiture proposal than to go to court.

Appendix

Proof of Proposition 1. Due to our assumptions on continuity and strict monotonicity of the post-merger market price in the divestiture level and the synergy level, i.e., assumptions (4) and (5), it follows that there exists at most one solution such that (7) holds with equality for all admissible values of b_l , b_h , s_l , and s_h . Suppose that such a solution exists.

First, we derive conditions for the existence of a pooling equilibrium. If strict profitability holds for both merger types at Δ^{po} (i.e., $\Delta^{po} < \min\{\Delta^{\max}(s_l), \Delta^{\max}(s_h)\} = \Delta^{\max}(s_l)$), then proposing a merger with divestiture Δ^{po} constitutes a pooling equilibrium. Proposing a lower divestiture cannot be an equilibrium strategy as all merger types prefer divesting a lower share, so that the AA cannot update its beliefs and rejects such an offer according to its decision rule (6). Proposing a larger divestiture is never profitable as this reduces the merger's profitability, while the merger remains approvable with Δ^{po} . If, however, $\Delta^{po} \geq \Delta^{\max}(s_h)$, then it is not profitable for both types to propose a merger with Δ^{po} . In that case, the low-synergy merger would not have been proposed under full information, while a high-synergy merger may have been profitable under full information. Finally, if $\Delta^{\max}(s_l) \leq \Delta^{po} < \Delta^{\max}(s_h)$, then only the high-synergy type proposes an approvable merger which rules out a pooling equilibrium.

Second, we investigate the existence of a separating equilibrium (Δ_h, Δ_l) . Recall, if a divestiture proposal of the low-synergy type is approved, then the same proposal by a high-synergy type would also be approved as the required divestiture is higher for lower synergy levels. If Δ_h is a profitable proposal only for the high-synergy type (i.e., $\Delta_h \geq \Delta^{\max}(s_l)$ holds), then the AA updates its beliefs to $b_l = \Pr(s_\theta = s_l | \Delta_h \geq \Delta^{\max}(s_l)) = 0$ and $b_h = 1$. Thus, (6) reduces to the decision rule of the AA under full information. Suppose that (Δ_h, Δ_l) with $\Delta_l \neq \Delta_h$ constitutes a separating equilibrium in which both types propose a strictly profitable merger. If in a separating equilibrium (Δ_l, Δ_h) the efficient type's proposal is denied, then the inefficient type's proposal is denied, too. Suppose the opposite: since proposing Δ_l fulfills the profitability

condition of the low-synergy type and therefore also of the high-synergy type, the latter has an incentive to deviate to Δ_l . It cannot occur in a separating equilibrium that both proposals Δ_l and Δ_h are approved since each merger would profitably deviate by proposing $\min\{\Delta_l, \Delta_h\}$, which may give a pooling, but not a separating equilibrium. Thus, in a separating equilibrium necessarily either both type's proposals are denied or only the high-synergy type's proposal is approved. In the latter case, as the low-synergy type must not have an incentive to deviate, we require that the high-synergy type's proposal Δ_h fulfills $\Delta_h \geq \Delta^{\max}(s_l)$. If $\Delta^{\min}(s_h) < \Delta^{\min}(s'')$, the high-synergy type necessarily proposes $\max\{\Delta^{\min}(s_h), \Delta^{\max}(s_l)\}$ in a separating equilibrium, which includes the minimal divestiture Δ so that the proposal is approved and strict profitability holds only for the high-synergy type. The low-synergy type proposes some strictly profitable, but blocked Δ_l , or no merger at all. This gives a separating equilibrium in case no pooling equilibrium exists. If, however, a pooling equilibrium in which both types propose Δ^{po} exists, then a separating equilibrium cannot exist due to $\Delta^{po} < \Delta^{\max}(s_l) \leq \max\{\Delta^{\min}(s_h), \Delta^{\max}(s_l)\}$.

If there is no solution such that (7) holds with equality, then the anticompetitive effects of the low-synergy merger cannot be countervailed by the high-type merger on average. In this case, only a separating equilibrium could exist in which the high-synergy firm (1) signals its efficiency by divesting at least $\Delta^{\max}(s_l)$ and (2) satisfies the CS-standard by divesting at least $\Delta^{\min}(s_h)$. By assumption, $s_h > s''$ such that $\Delta^{\min}(s_h)$ exists and it is, indeed, strictly profitable to merge for the high-synergy type. \square .

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