The proportionality of merger remedies in differentiated product markets

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Abstract: Horizontal mergers that raise competition concerns may require divestitures that eliminate the identified concerns. At the same time, divestitures should be proportionate, not going above and beyond what is necessary to eliminate the identified concerns. In this article, we argue that in differentiated product markets out-of-market substitutes exert stronger competitive pressure on some products within the relevant product market than on others. As a result, a divestiture of products that are subject to strong competitive pressure from out-of-market substitutes may not be needed if other products that are subject to weaker competitive pressure are divested. A simplistic solution that requires divestitures in all areas of horizontal overlap could result in overly broad remedies that violate the proportionality principle.

Keywords: horizontal mergers, market definition, structural remedies, out-of-market competitive constraints

1. Introduction

Horizontal mergers can give rise to a significant impediment to effective competition (SIEC), including through non-coordinated effects emanating from the loss of competition between the merging parties.1 To allay the competition concerns identified, the parties may offer remedies such as the sale of a business unit, product lines or other assets to a suitable buyer.2 The European Union’s Merger Regulation3 states that the remedies offered by the undertakings concerned should entirely eliminate the competition problem and should be proportionate to it.4 According to the proportionality principle, divestitures should not exceed what is necessary to remove the competition concern.

In this article we take issue with a simplistic notion of remedies that equates the elimination of the SIEC with the elimination of the overlap between the merging firms. In particular, we argue that, in differentiated product markets, divestitures can become disproportionately broad if out-of-market constraints are not adequately taken into account. In such a situation, the competition authority may require divestitures that cover all areas of horizontal overlap within the boundaries of the relevant product market (that is, including products that may face strong competition from out-of-market substitutes), thereby running the risk of violating the proportionality principle. And while such a broad-strokes approach may be understandable during the first phase of a merger investigation, where remedies must clearly rule out ‘serious doubts’,5 the approach is harder to justify during the investigation’s second phase.6

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1 SIEC is the language used by the European Commission. See European Commission (2004), ‘Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings’, OJ C31/5. Other competition authorities use analogous language, such as substantial lessening of competition (SLC), which is used by authorities in the US and the UK. See US Department of Justice and Federal Trade Commission (2010), ‘Horizontal merger guidelines’, and UK Competition & Markets Authority (2021), ‘Merger assessment guidelines’. The discussion in this article applies equally to competition concerns in the form of a SIEC or a SLC.


6 We are assuming that the divestiture business does not need to cover all areas of horizontal overlap to constitute a viable and competitive business, as required by recital 23 ff. of European Commission (2008) (fn 2). In some cases, a divestiture that does not eliminate the entire overlap created...
Divestitures that eliminate the entire, or almost the entire, overlap in the markets where concerns were raised were offered in various merger investigations by the Commission in differentiated product markets over the last years. For example, in _M.5644 Kraft Foods/Cadbury_, the parties divested (after Phase I) Cadbury’s Polish Wedel brand and Cadbury’s Romanian chocolate confectionary business to address competition concerns in the chocolate tablets and pralines markets in Poland, and in the chocolate tablets markets in Romania. The divestiture in Romania eliminated the entire overlap created by the transaction in the chocolate tablets market and the divestiture in Poland nearly eliminated the entire overlap in the chocolate tablets and pralines markets. In _M.7292 DEMB/Mondelez_, the parties inter alia divested the Carte Noire brand to address competition concerns in the French market for coffee filter pads, which removed almost all of the overlap created by the transaction. An earlier divestiture proposal that encompassed the L’Or and Grand’Mère brands, which did not remove the entire overlap created by the transaction, was deemed insufficient to address the Commission’s competition concerns. In _M.7555 Staples/Office Depot_, the parties proposed to divest Office Depot’s contract distribution business in the EEA and Switzerland, national contract sales in Sweden and the Netherlands, as well as the entire business operations in Sweden. These divestitures would have removed the entire overlap between the merging companies in all markets where concerns were raised. More recently, in _M.9820 Danfoss/Eaton Hydraulics_, the parties inter alia divested parts of Danfoss’ orbital motor business and Eaton’s medium-power orbital motor business to address the Commission’s competition concerns in the orbital motor market. An earlier divestiture proposal, which did not include Eaton’s medium-power orbital motor business, was deemed insufficient to address the Commission’s competition concerns.⁷

To show why divestitures that fully remove the overlap may be overly broad we use a simple model of a horizontal merger in a differentiated product industry. We assume that both merging parties offer some products that are closer to the boundaries of the relevant market and others that are more distant. For example, the relevant product market may have been defined to comprise motors with a power of up to 100 HP and both merging parties offer motors of low power (up to 50 HP) and motors of medium power (between 50 and 100 HP). In this setup, a divestiture of one of the merging parties’ products that are more distant from the market boundary might eliminate not only the incentive to increase the prices of products that are distant from the market boundary, but also of products that are close to it.

The reason is that, in differentiated product markets, any divestiture of one of the merging parties’ products attenuates the upward pricing pressure on all other substitutable products in the merging parties’ portfolio. If the upward pricing pressure on the merging parties’ products that are close to the market boundary is weak in the first place, an attenuating effect caused by the divestiture of another product within the market boundary may well suffice to eliminate the incentive to increase the price of those products as well. Out-of-market constraints play an important role in this analysis, because the greater the competitive pressure exerted by out-of-market constraints on a product in the merging parties’ control, the weaker the incentive to increase the price of that product and, hence, the greater the likelihood that the divestiture of another product will eliminate it. Because in differentiated product markets out-of-market constraints exert stronger competitive pressure on products that are close to the market boundary than on products that are more distant from the market boundary, a divestiture of products close to the market boundary may not be necessary. A formalistic remedy design that instead requires the merging parties to address all horizontal overlaps within the relevant product market could violate the proportionality principle.

In practice, this means that, when it comes to defining the proportionate scope of divestitures in a differentiated product industry, two factors need to be carefully evaluated: (i) the strength of the competitive constraints exerted by substitutes outside the relevant product market; and (ii) the closeness-of-competition between the horizontally differentiated products in the merging parties’ control within the relevant product market. The stronger these two effects are, the less likely it is that a divestiture of products close to the market boundary is necessary to prevent a SIEC post-transaction.

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⁷ In _M.9820 Danfoss/Eaton Hydraulics_, the authors provided economic advice to the merging parties throughout the merger investigation conducted by the Commission, including in the submission of commitments. A lot of the analysis that NERA Economic Consulting performed in this case is discussed extensively in the decision document published by the Commission, available at: https://ec.europa.eu/competition/mergers/cases/202148/M_9820_8034733_3778_3.pdf (accessed 12 February 2022).
2. Theoretical model

We consider the following stylized example of an industry. There are three firms – 1, 2 and 3 – that produce products of different sizes and compete in prices (Bertrand competition). Firms 1 and 2 both produce products of small and medium size. Small products are denoted by $A_1$ and $A_2$, and medium-sized products are denoted by $B_1$ and $B_2$, with the subscript indicating the firm producing the product. Firm 3 produces products of large size only, denoted by $C_1$. In addition, products of medium size are closer in size to large products than to small products. We assume that substitutability between products is proportional to the distance in their size. This means that medium-sized products are assumed to be closer substitutes to large products than to small products.

Let’s assume that the competition authority has concluded that the relevant product market comprises small and medium-sized products. In this case, large products are not considered part of the relevant market but may nonetheless exert an out-of-market competitive constraint. The overall industry, the relevant product market and the degree of product differentiation can be graphically represented as shown in Figure 1.

We study the implications of different remedies after a horizontal merger between firms 1 and 2, which constitutes a merger to monopoly in the relevant product market. Competition authorities would likely be concerned about the non-coordinated horizontal effects of this merger and require structural remedies to eliminate the competition concerns. We are interested in the scope of a proportionate divestiture that prevents a SIEC and, at the same time, does not go above and beyond this objective.

A SIEC is unlikely if the prices of small and medium-sized products are not expected to increase post-transaction. Absent any efficiency gains, however, it is well-known that standard economic theory predicts that a merger between competing firms creates the incentive to raise the prices of the overlapping products. These predictions are purely theoretical and abstract from several relevant factors that may influence price setting. A small increase in price predicted by economic theory is therefore unlikely to be regarded by a competition authority as evidence in favour of a SIEC because some presumption of an efficiency gain can usually be credited to a typical merger. We are agnostic about the threshold that renders a predicted price increase problematic. Instead, our goal is to demonstrate how different divestitures result in different reductions in the size of the price increase and how this in turn affects the likelihood that the divestiture will eliminate the SIEC.

To assess the effect of a divestiture on post-merger prices, it is necessary to study the profit-maximizing price-setting behaviour of the merged entity before and after the divestiture. In our setup, without any divestiture, the merged entity has control over products $A_1$, $A_2$, $B_1$ and $B_2$. Its profit-maximization problem is expressed as follows:

$$\max_{p_1,p_2} \pi = (p_{A1} - c_{A1}) \cdot D_{A1}(P) + (p_{A2} - c_{A2}) \cdot D_{A2}(P) + (p_{B1} - c_{B1}) \cdot D_{B1}(P) + (p_{B2} - c_{B2}) \cdot D_{B2}(P)$$

with $p_i$ denoting the price of product $i$, $c_i$ the marginal cost of producing $i$, and $D_i(P)$ the demand for product $i$ at price $p_i$, given the prices of other substitutes (i.e., $P = \{p_1, p_2, \ldots, p_i\}$).

Without loss of generality, we consider the maximization problem for product $B_1$. In this case, it can be shown that it is profitable for the merged entity to increase the price of product $B_1$ by $x$ percent if the following inequality is satisfied:

$$p_{B1} > p_{B2} - \frac{c_{B1}}{\pi_{B1}} \cdot \frac{1}{x}$$

Figure 1 Hypothetical industry with products differentiated by size

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respectively. As these products were not under the control of firm 1 pre-merger, the ability to recapture some of the margin earned on the lost sales of firm 1 was already set at the profit-maximizing price of product $B_i$ pre-merger. What does affect the incentive to raise the price of $B_i$ post-transaction because the profit-maximization problem for firm 1 after a price increase of X% above pre-merger prices, $\eta_i(P)$ the own-price elasticity of demand for product $i$, and $DR_{B_i \rightarrow j}$, the diversion ratio from $B_i$ to another product $j$ in the merged entity’s control ($j \in \{A_1, A_2, B_2\}$).

The expression in (1) can be decomposed to study the incentive to increase the price of $B_i$ post-transaction. The first two summands of the right-hand side represent the (inverse of) the own-price elasticity of demand for $B_i$ and the margin earned on the lost sales of $B_i$ that are diverted to $A_1$. These components do not affect the merged entity's incentive to raise the price of $B_i$ post-transaction because they were already considered by firm 1 when setting the optimal price for $B_i$ pre-merger. What does affect the incentive to raise the price of $B_i$ post-transaction is represented by the third and fourth summands on the right-hand side. These terms describe the margin that is earned on the lost sales of $B_i$ that are diverted to products $A_2$ and $B_2$, respectively. As these products were not under the control of firm 1 pre-merger, the ability to recapture some of the lost sales of $B_i$ after a price increase creates an incentive to increase the price of $B_i$. It is the ability to recapture those lost sales that is eliminated by a divestiture. The effect of a divestiture on the price of $B_i$ therefore depends on magnitude of the third and fourth summands.

3. Full divestiture

We first consider the merged entity’s incentive to increase the price of $B_i$ after a full divestiture, that is, a divestiture that eliminates all horizontal overlaps created by the transaction. In our setup, a full divestiture corresponds to a divestiture of products $A_2$ and $B_2$ (or, alternatively, of any other combination of small and medium products). Under a full divestiture, the merged entity has of course no incentive to increase the price of $B_i$ post-transaction because the profit-maximization problem for $B_i$ is identical to that of firm 1 pre-transaction. Because the price of $B_i$ was already set at the profit-maximizing level pre-transaction, the merged entity will also not have an incentive to increase the price post-transaction. Formally, the profit-maximizing price for $B_i$ is set such that the following expression is satisfied:

$\frac{p_{B_i} - c_{B_i}}{p_{B_i}} = \frac{1}{|\eta_{B_i}(P)|} + \frac{p_{A_2} - c_{A_2}}{p_{A_2}} DR_{B_i \rightarrow A_1}$

which is identical to the expression faced by firm 1 pre-transaction.

4. Partial divestiture

Next, we consider the merged entity’s incentive to increase the price of $B_i$ after a partial divestiture, that is, a divestiture that eliminates only part of the horizontal overlap arising from the transaction. In our setup, this could be a divestiture of small product $A_2$ (but no divestiture of the medium-sized product $B_2$). Under a partial divestiture, the profit-maximizing problem for $B_i$ differs from the pre-transaction situation because the merged entity could now earn a margin on the lost sales of $B_i$ that are diverted to $B_2$. It can be shown that it is profitable for the merged entity to increase the price of product $B_i$ by X percent if the following inequality is satisfied:

$\frac{(1 + X\%) p_{B_i} - c_{B_i}}{(1 + X\%) p_{B_i}} \leq \frac{1}{|\eta_{B_i}(P)|} + \frac{p_{A_1} - c_{A_1}}{p_{A_1}} DR_{B_i \rightarrow A_1}$

Two points with respect to expression (3) bear emphasis. First, the term on the left-hand side and all summands on the right-hand side are non-negative. The left-hand side captures the percentage margin on $B_i$ after a price increase by X percent. This term is increasing in X. In contrast, the second and third summands on the right-hand side capture the margins on the lost sales of $B_i$ that are diverted to $A_1$ or $B_2$, respectively. These terms are

12 When we say “price increase” in this article, we mean the upward pricing pressure on $B_i$ created by the transaction. It is important to note that the upward pricing pressure predicted by expression (1) does not necessarily indicate the full increase in the price of $B_i$ post-transaction. Instead, the upward pricing pressure can be thought of as the optimal price reaction in response to a tax on the merging products. In other words, we measure the first-round price effects that are created by the reduction of competitive constraints caused by the merger. To predict the full price increase of the transaction two additional effects need to be taken into account: (i) feedback effects, as the price reactions of firms in the market are iteratively passed through into higher post-merger prices; and (ii) the rate of pass-through of price pressure into final prices, which can be below or above one depending on the convexity of the demand function. N.H. Miller, M. Remer, C. Ryan and G. Sheu, Upward pricing pressure as a predictor of merger price effects (2017) 52 International Journal of Industrial Organization, show that the upward pricing pressure tends to be an accurate predictor of price effects for demand functions with moderate convexity (e.g., linear or logit demand) and a conservative predictor for more convex demand forms (e.g., isoelastic and almost ideal demand). For a detailed discussion on the difference between upward pricing pressure and price effects, see T. Valtelli and H. Zenger, ‘Mergers with differentiated products: where do we stand?’ (2021) 58(1) Review of Industrial Organization.

13 In this stylized example it could be argued that the divestiture eliminates the commercial viability of the merger. In reality, the merging parties might well accept such a remedy if the merger also comprises other areas of business that do not give rise to horizontal overlaps.
increasing in \( X \). This implies that for some price increase above a critical threshold, the expression on the left-hand side outgrows the expression on the right-hand side and the merged entity will not have an incentive to increase the price by that percentage. We denote this critical threshold as \( X \).

Secondly, the inequality in (3) is never satisfied if the third summand on the right-hand side is zero, that is, if no margin could be earned on the lost sales of \( B_1 \) that are diverted to \( B_2 \). This scenario would be equivalent to a divestiture of product \( B_2 \), in which case we are back to the full divestiture scenario and in which the merged entity doesn’t have an incentive to increase the price of \( B_1 \).

Against this background, the expression in (3) can be compared to the expression in (1) to demonstrate that the strength of the incentive to increase the price of \( B_1 \) under a partial divestiture of \( A_2 \) depends on two components: (i) the competitive constraints exerted by out-of-market substitutes; and (ii) the closeness of competition between the to-be-divested and retained products in the merging party’s portfolio. Each of these two components is graphically represented in Figure 2 and discussed below.

### 4.1. Competitive constraints exerted by out-of-market substitutes

It is the ability of the merged entity to earn a margin on the lost sales of \( B_1 \) that are diverted to \( B_2 \) that creates an incentive to increase the price for \( B_1 \). For sufficiently small price increases, that is, for price increases below threshold \( X \), increasing the price of \( B_1 \) will be profitable. For example, if the threshold \( X \) is 2%, the merged entity has an incentive to increase the price of \( B_1 \) as long as it is not increased by more than 2%.

The threshold \( X \) increases with the margin of \( B_2 \) as well as with the diversion ratio between products \( B_1 \) and \( B_2 \). If either of these elements is zero, the threshold \( X \) is zero and the merged entity has no incentive to increase the price of \( B_1 \). It is at this stage that it becomes important to reconsider the strength of out-of-market constraints – in this case large product \( C_3 \) – and its influence on the diversion between products \( B_1 \) and \( B_2 \). The stronger the competitive pressure exerted by out-of-market constraints, the lower the fraction of lost sales that could be retained by the merged entity after a price increase of \( B_1 \). In our setup, product \( C_3 \) is a close substitute to products \( B_1 \) and \( B_2 \), which means that it could be expected that after a price increase of \( B_1 \) some customers will switch to \( C_3 \) rather than to \( B_2 \). This effect is depicted in Figure 2 by the dashed arrow, illustrating the diversion of demand to \( C_3 \) after a price increase of \( B_1 \). The stronger the diversion from \( B_1 \) to \( C_3 \), the weaker must be the diversion from \( B_1 \) to \( B_2 \) and, hence, the weaker the incentive to increase the price of \( B_1 \).

To ensure that divestitures are proportionate, it is therefore necessary to consider to what extent out-of-market constraints affect the diversion between \( B_1 \) and \( B_2 \). If out-of-market constraints are strong, the diversion is likely to be low, in which case it is unlikely that the transaction will result in an SIEC after the partial divestiture of \( A_2 \).

This discussion also demonstrates how the choice of the divested products under a partial divestiture affects the likelihood of finding an SIEC. Consider alternatively that instead of \( A_2 \) it is \( B_2 \) that is divested, and that the expression in (3) is analogously derived for product \( A_1 \). In this case, the strength of the incentive to increase the price of \( A_1 \) depends on the diversion between small products \( A_1 \) and \( A_2 \). Out-of-market constraints exerted by product \( C_3 \) would be of less relevance in this case because \( C_3 \) is only a distant substitute to small products \( A_1 \) and \( A_2 \). In other words, because the competitive pressure exerted by out-of-market constraints on horizontally differentiated product is asymmetric, a partial divestiture of small product \( A_2 \) is more effective to reduce the merged entity’s incentive to increase the price of medium product \( B_1 \) than is a partial divestiture of medium product \( B_2 \) to reduce the incentive to increase the price of small product \( A_1 \).

### 4.2. Closeness of competition between to-be-divested and retained products

Because products are differentiated, a divestiture of small product \( A_2 \) attenuates the incentive to increase the price of medium product \( B_1 \) when customers consider \( A_2 \) and \( B_1 \) to be substitutes. After a price increase of \( B_1 \) some lost sales are diverted to \( A_2 \) and the divestiture of \( A_2 \) prevents the merged entity to earn a margin on those lost sales. This effect is illustrated in Figure 2 by the elimination of the

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14 The derivative of \( \eta_b(P) \) with respect to \( p_b \) depends on the functional form of demand: it is positive under linear demand (implying that \( \frac{\partial \eta_b}{\partial p_b} \) is decreasing in \( p_b \)) and constant under log-linear demand.

15 The diversion to product \( A_1 \), after a price increase of \( B_1 \), is not shown in the figure. As set out above, the diversion to \( A_1 \) does not affect the incentive to change the price of \( B_1 \) post-transaction because it was already considered by firm 1 when setting the optimal price for \( B_1 \) pre-transaction.

16 This consideration is also reflected in recital 28 of European Commission (2004) (fn 1), which says ‘[…] It is therefore less likely that a merger will significantly impede effective competition, in particular through the creation or strengthening of a dominant position, when there is a high degree of substitutability between the products of the merging firms and those supplied by rival producers.’
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A divestiture of small products A2 is therefore not only effective in reducing the merging party’s incentive to increase the price of medium product B1 in combination with a strong competitive pressure exerted by out-of-market constraints, a divestiture of A2 can sufficiently attenuate the incentive to increase the price of product B1 to render the finding of a SIEC unlikely. Specifically, if out-of-market constraints are strong, the incentive to increase the price of product B1 is weak in the first place. A divestiture of product A2 can then further reduce the critical threshold X to a level that a finding of a SIEC is harder to support. For example, if the critical threshold for B1 is 6% before the divestiture of A2, a divestiture of A2 could reduce this threshold to 3%, which means that the merged entity only has an incentive to increase the price of B1 as long as it is not increased by more than 3%.

5. Conclusion

When a competition authority requires divestitures to address competition concerns about the non-coordinated effects of a horizontal merger in differentiated product markets, not all horizontal overlaps in the merging parties’ portfolio may need to be eliminated to prevent a SIEC. While competition authorities may be inclined to equate the elimination of a SIEC with the elimination of the overlap between the merging firms, we illustrate in this article why such a simplistic approach may violate the proportionality principle and therefore take an excessive toll on the business activities of the merging parties.

Appendix

Derivation of expression (1)

The expression in (1) is derived as follows. The first-order condition for profit maximization when setting the price of B1 states that it is profitable to increase \( p_{B1} \) when:

\[
\frac{\partial \pi_A}{\partial p_{B1}} \geq 0
\]

\[
\Leftrightarrow D_{B1} + (p_{B1} - c_{B1}) \frac{\partial D_{B1}(P)}{\partial p_{B1}} + (p_{A1} - c_{A1}) \frac{\partial D_{A1}(P)}{\partial p_{B1}} \frac{\partial p_{B1}}{\partial p_{B1}} \geq 0
\]

\[
+ (p_{A2} - c_{A2}) \frac{\partial D_{A2}(P)}{\partial p_{B1}} \frac{\partial p_{B1}}{\partial p_{B1}} + (p_{B2} - c_{B2}) \frac{\partial D_{B2}(P)}{\partial p_{B1}} \geq 0
\]

Dividing by \( \frac{\partial D_{A1}(P)}{\partial p_{B1}} \) yields:

\[
(p_{B1} - c_{B1}) + D_{B1} \frac{\partial p_{B1}}{\partial p_{B1}} + (p_{A1} - c_{A1}) \frac{\partial D_{A1}(P)}{\partial p_{B1}} \frac{\partial p_{B1}}{\partial p_{B1}} \geq 0
\]

\[
+ (p_{A2} - c_{A2}) \frac{\partial D_{A2}(P)}{\partial p_{B1}} \frac{\partial p_{B1}}{\partial p_{B1}} + (p_{B2} - c_{B2}) \frac{\partial D_{B2}(P)}{\partial p_{B1}} \frac{\partial p_{B1}}{\partial p_{B1}} \leq 0
\]

where the inequality changes direction because \( \frac{\partial D_{A1}(P)}{\partial p_{B1}} < 0 \).

Dividing by \( p_{B1} \) and using the definitions of the diversion ratio \( DR_{i\rightarrow j} = \frac{\partial D_i}{\partial p_i} / \frac{\partial D_j}{\partial p_j} \) and own-price elasticity of demand \( \eta_i = \frac{\partial \ln p_i}{\partial \ln P_i} \) yields:

\[
\frac{(p_{B1} - c_{B1})}{p_{B1}} \leq \frac{1}{|\eta_i|} + \frac{(p_{A1} - c_{A1})}{p_{A1}} \frac{p_{B1}}{p_{B1}} DR_{B1\rightarrow A1} + \frac{(p_{A2} - c_{A2})}{p_{A2}} \frac{p_{B1}}{p_{B1}} DR_{B1\rightarrow A2} + \frac{(p_{B2} - c_{B2})}{p_{B2}} \frac{p_{B1}}{p_{B1}} DR_{B1\rightarrow B2}
\]

Evaluating this formula for a price increase of X percent (i.e., using \( p_{B1} = (1 + X\%)p_{B1} \)) yields the expression in (1).