

Toward a More Complete Treatment of Efficiencies in Merger Analysis: Lessons from Recent Challenges

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Consider an example of a merger of two hypothetical widget companies: In a properly defined relevant market (Market A), the merger is projected to generate harmful competitive effects of \$15. But, the merger is expected to generate efficiencies in a second relevant market (Market B), \$20 of which would be passed through to customers, and the vast majority of customers buy the products in both Market A and Market B together so customers in Market A would benefit directly from efficiencies in Market B. Should this merger be approved? If the antitrust authority were to block the merger because of the projected harm in Market A, customers in Market A would be worse off (because they would lose the lower prices that would be achieved in Market B if the merger were to be approved). But the Horizontal Merger Guidelines do not explicitly contemplate the effects of such demand-side complementarities in its treatment of efficiencies.¹

Consider a second example of a merger between two other widget companies. Again, the merger would generate harmful competitive effects of \$15 in Market A. But, the proposed merger also would generate merger-specific, verifiable efficiencies with a 40 percent probability, \$50 of which would be passed through to customers. Should this merger be approved? In terms of expected value, the merger would yield a net benefit to customers of \$5 and should therefore be cleared.² But one could also interpret the probability of realizing the efficiencies as less than 50 percent as meaning that they are “unlikely” to be achieved and thus should not be counted at all.³ Under this interpretation of the Guidelines, the antitrust authority would seek to block the merger because consumers would be subject to a harm of \$15 in the absence of efficiencies.

From an economic perspective, one could argue that both of these mergers should be approved by the antitrust agencies because consumers, on an expected value basis, are better off with the mergers. However, a plain reading of the Guidelines would suggest that both of these hypothetical mergers should be blocked.

The issues raised in these two examples are not purely hypothetical—they were part of the economic analysis undertaken by the defendants in two recent merger challenges brought by the agencies: the *GE/Electrolux* merger⁴ and the *Staples/Office Depot* merger.⁵ Moreover, the substantive issues raised by these examples have not been fully examined by the literature. Indeed, although there is an extensive literature on determining and measuring the competitive effects of a merger—including studies pertaining to market definition, merger simulation, unilateral and coordinated

¹ U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines § 10 (2010) [hereinafter Guidelines].

² The expected value of the efficiencies is 40 percent multiplied by \$50 or \$20. Thus, the net *beneficial* effect of the merger is \$5—the \$20 of expected merger-specific efficiencies minus the \$15 of projected harm.

³ Guidelines, *supra* note 1, § 10 (“The Agencies credit only those efficiencies likely to be accomplished with the proposed merger . . .”).

⁴ United States v. Electrolux, No. 15-cv-01039-EGS.

⁵ FTC v. Staples, Inc., No. 15-cv-02115-EGS.

effects, maverick firms, power buyers, and many other issues related directly to analyzing competitive effects—the literature with regard to merger-induced efficiencies is not as well developed.

Such a lack of focus on efficiencies is surprising because the vast majority of mergers are deemed procompetitive by the investigating agencies. For example, the agencies rarely challenge mergers and in 2014 the FTC and DOJ requested additional information only on roughly three percent of all reported mergers.⁶ Moreover, retrospective studies of horizontal mergers by agency and academic economists indicate the presence of merger efficiencies.⁷

At least since the work of Oliver Williamson,⁸ economists have considered the trade-off between anticompetitive harm from a reduction in competition on the one hand and merger efficiencies on the other. However, as summarized William Kolasky and Andrew Dick, movement toward a robust balancing of efficiencies against likely merger harms has been slow.⁹ The biggest shift in the consideration given to efficiencies occurred in 1984, when the Guidelines moved from an efficiencies defense of a merger only in “extraordinary cases”¹⁰ to an acknowledgment that “the primary benefit of mergers to the economy is their efficiency-enhancing potential” and outlined evaluation criteria that signaled that the DOJ would be more open to the possibility that efficiencies could offset merger harms.¹¹

Although subsequent changes to the Guidelines have provided more clarity surrounding the treatment of efficiencies by the agencies and arguably have conveyed even more openness to efficiency arguments,¹² merger efficiencies still receive far less attention in merger reviews and litigations than do potential merger harms.

This article takes a step toward a more complete perspective on efficiencies, which will hopefully focus more attention on an often short-changed element of merger analysis. Specifically, we provide more depth and clarification with regard to the definition of “inextricably linked” efficiencies in the Guidelines and then discuss whether the standard that efficiencies must be “likely” is appropriate from an economic perspective.

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⁶ U.S. Dep’t of Justice & Fed. Trade Comm’n, *HSR Annual Report* (FY 2014) (noting that in fiscal year 2014, 1,663 transactions were reported under the HSR Act, 51 transactions received Second Requests, and the agencies brought 33 enforcement actions.)

⁷ For example, in a retrospective study of mergers and merger enforcement, John Kwoka, *Does Merger Control Work? A Retrospective on U.S. Enforcement Actions and Merger Outcomes*, 78 ANTITRUST L.J. 619 (2013), Kwoka finds that 13 of 56 transactions studied (12 of 44 where there was no known remedy imposed by antitrust authorities) resulted in price decreases. In recent merger retrospective studies in healthcare, see, e.g., Aileen Thompson, *The Effect of Hospital Mergers on Inpatient Prices: A Case Study of the New Hanover-Cape Fear Transaction*, 18 INT’L J. ECON. BUS. 1, (2011); and Deborah Haas-Wilson & Christopher Garmon, *Hospital Mergers and Competitive Effects: Two Retrospective Studies*, 18 INT’L J. ECON. BUS. 1, (2011), and retail, see, e.g., Daniel Hosken, Luke M. Olsen & Loren K. Smith, *Do Retail Mergers Affect Competition? Evidence from Grocery Retailing* (Fed. Trade Comm’n Bureau of Economics Working Paper No. 313 (2012)), also find a mix of price increases and price decreases following horizontal mergers, indicating that horizontal mergers can create merger efficiencies.

⁸ Oliver E. Williamson, *Economies as an Antitrust Defense: The Welfare Tradeoffs*, 58 AM. ECON. REV. 1 (1968).

⁹ William J. Kolasky & Andrew R. Dick, *The Merger Guidelines and the Integration of Efficiencies into Antitrust Review of Horizontal Mergers*, 71 ANTITRUST L.J. (2003).

¹⁰ U.S. Dep’t of Justice Merger Guidelines § V.A (1982). The 1968 Guidelines contained similar language to the 1982 Guidelines, limiting consideration of efficiencies to “exceptional circumstances” U.S. Dep’t of Justice Merger Guidelines § 10 (1968).

¹¹ U.S. Dep’t of Justice Merger Guidelines § 3.5 (1984).

¹² See, e.g., Kolasky & Dick, *supra* note 9, (reviewing the changes to the treatment of efficiencies in the 1992 and 1997 revisions of the Guidelines); Gregory J. Werden, *An Economic Perspective on the Analysis of Merger Efficiencies*, ANTITRUST, Summer 1997, at 12 (discussing the economic implications of the 1997 revision to the Guidelines); Roger D. Blair & Jessica S. Haynes, *The Efficiencies Defense in the 2010 Horizontal Merger Guidelines*, 39 REV. INDUS. ORG. 57 (2011) (summarizing the implications of the 2010 revision to the Guidelines).

Toward A More Precise Definition of “Inextricably Linked” Efficiencies

The Guidelines focus attention on the impact of a merger on consumer welfare in a relevant market—i.e., one evaluates the opposing effects of upward pricing pressure from the loss of an independent competitor and the downward pricing pressure from merger efficiencies *in the relevant market (or relevant markets)*.¹³

In many cases, market-by-market evaluation of likely merger harm is practical and appropriate because markets operate independently enough that harm in a particular relevant market can be resolved through a partial divestiture or other remedy that is limited to that relevant market. However, in some cases the realization of merger efficiencies in one market is dependent on a merger being allowed to proceed in another market. The Guidelines provide a cursory footnote about such instances, noting that in some cases, merger efficiencies in other markets should be counted because they are “so inextricably linked with [the relevant market] that a partial divestiture or other remedy could not feasibly eliminate the anticompetitive effect in the relevant market without sacrificing the efficiencies in the other market(s).”¹⁴ In such cases, the appropriate evaluation of merger effects must consider both the anticompetitive effects in the relevant market *and* the net effects of merger efficiencies in all markets that are inextricably linked.

The limited consideration given to inextricably linked efficiencies in the Guidelines seems mismatched to the potential importance of such efficiencies, particularly for mergers between firms that sell multiple products that are supply-side complements (e.g., are produced using the same technologies or distributed using the same networks) or demand-side complements (e.g., are sold together) or both. That is, the increasing prevalence of multiproduct firms and mergers between them increases the probability incidence of supply-side and demand-side cross-market efficiencies. Recent challenges brought by the DOJ and the FTC against mergers between multiproduct firms, where the competitive effects analysis was limited to relevant markets defined as subsets of products offered by the merging parties, highlight the need to understand how linked merger efficiencies should be counted.¹⁵

First, if there are supply-side complementarities across products, cost efficiencies on products where there are no merger concerns may depend on links to products where there are merger concerns—and the Guidelines clearly contemplate this possibility.¹⁶ Consider the following example:

- Firms that produce the same two products—A and B—propose to merge. The merger would generate significant upward pricing pressure on product A but not on product B.
- Products A and B rely on the same production technology.
- If the merger is allowed without any divestitures, the combination of the merging parties’ production technologies would reduce production costs on products A and B by \$0.10 per unit,

¹³ See, e.g., Fed. Trade Comm’n & U.S. Dep’t of Justice, *Commentary on the Horizontal Merger Guidelines* 49 (2006) (“Efficiencies in the form of quality improvements also may be sufficient to offset anticompetitive price increases following a merger. Because a quality improvement involves a change in product attributes, a simple comparison of pre- and post-merger prices could be misleading. A careful analysis of the effects of changes in product attributes and prices on consumer welfare is likely to be necessary.”) See also Guidelines, *supra* note 1, at 2 (“Regardless of how enhanced market power likely would be manifested, the Agencies normally evaluate mergers based on their impact on customers.”).

¹⁴ Guidelines, *supra* note 1, § 10 n.14.

¹⁵ See, e.g., FTC v. Sysco Corp., No. 15-cv-00256-APM, United States v. Electrolux, No. 15-cv-01039-EGS; FTC v. Staples, Inc., No. 15-cv-02115-EGS.

¹⁶ *Commentary on the Horizontal Merger Guidelines*, *supra* note 13, at 57.

but the merged entity would realize no production efficiencies if there is a divestiture of product A from one of the merging firms.¹⁷

- In the absence of the merger or with a divestiture of product A, a total of 100 units of each product would be sold at \$1 each.
- With the merger and the cost improvement of \$0.10 per unit, the merged entity would sell 90 units of product A at \$1.05 and 120 units of product B at \$0.95.

In this example, consumers are better off with the merger because product B is more price elastic than is product A,¹⁸ and thus consumer savings on product B ($> 100 * \$0.05$) exceed consumer harm on product A ($< 100 * \$0.05$).¹⁹

Antitrust authorities have, in rare instances, considered supply-side inextricably linked efficiencies. Kolasky and Dick describe a real-world example—a merger of two natural gas gathering and processing companies that were the only two such companies operating in several counties in West Texas.²⁰ The two companies planned through a horizontal merger to combine underutilized natural gas gathering systems and processing plants—a production efficiency. Investigators determined that these merger efficiencies outweighed any possible anticompetitive harm and that the efficiencies would not be realized fully if a divestiture of assets was required. Although this is an instance where supply-side inextricably linked efficiencies were given due consideration by the agency, the cursory explanation of inextricably linked efficiencies in the Guidelines makes it unclear to antitrust practitioners and merging parties as to when such efficiencies will be considered inextricably linked to the relevant market and when they will be disregarded completely.

Moreover, the fact that demand-side complementarities—e.g., through purchases of bundled products—can impact the flow of efficiencies realized through a merger has not been given due consideration in merger analysis. Consider the following example:

- Two firms that produce the same two products—A and B—propose to merge. The merger would generate significant upward pricing pressure on product A but not on product B.
- There are 150 total customers, 50 of whom purchase only product A, 50 of whom purchase only product B, and 50 of whom consider products A and B to be perfect complements (i.e., products A and B are only valuable to these customers if purchased together).
- There is a merger efficiency that reduces the production costs of product B by \$0.20 but does not affect product A.
- In the absence of the merger a total of 100 units of each product would be sold to the 150 customers; those that purchase either product A or B à la carte pay \$1 each; those that purchase a bundle of products A and B pay \$1.90 each.
- Assume that with the cost improvement of \$0.20 on product B, the merged entity would sell 45 units of product A at \$1.05, 60 bundles of products A and B at \$1.80 each, and 75 units of product B at \$0.85 each.

Moreover, the fact that demand-side complementarities—e.g., through purchases of bundled products—can impact the flow of efficiencies realized through a merger has not been given due consideration in merger analysis.

¹⁷ For example, a situation where realization of merger efficiencies requires an investment that only makes financial sense if the merger involves both product A and product B.

¹⁸ This scenario is not unlikely—markets that experience more competition are associated with higher price elasticity of demand, all else being equal.

¹⁹ This example could be recast to represent a situation where there is only a single product, the anticompetitive harm is limited to a narrow subset of consumers, but the merger-induced efficiencies apply to all buyers. For example, a hospital merger might be evaluated for its potential impact on commercially insured patients, but any efficiencies realized through the merger could benefit patients with government insurance plans as well.

²⁰ Kolasky & Dick, *supra* note 9, at 231.

In this example, the welfare of purchasers of both products improves because the benefit to those that purchase a bundle of products A and B more than offsets the harm to à la carte purchasers of product A.

The above example is simplistic. The principle that demand-side complementarity among goods offered by multiproduct firms affects the pass-through of merger efficiencies is more general. For example, Sonia Jaffe and E. Glen Weyl show that in a merger of multiproduct firms, the net upward pricing pressure on one firm's product is a function of diversion ratios from that product to *all* of the products of its merger partner (multiplied by margins that incorporate merger efficiencies).²¹ In other words, the Jaffe-Weyl model shows that in the presence of complementarities, the upward price pressure associated with one product is inextricably linked with the merger-specific variable cost efficiencies of other products. As discussed below, the reason is simple: one product's cost efficiencies alter the post-merger relative margins of all products, which changes the pricing incentives associated with those products.

Multiproduct firms produce and market complementary goods, goods and services, and thus ignoring linked efficiencies potentially causes antitrust agencies to thwart procompetitive mergers.

The “generalized upward pricing pressure” or “GePP” model presented in Jaffe-Weyl is somewhat technical. However, complex as it is, under the common assumption that firms engage in Bertrand price competition, as with other UPP indices, GePP can be expressed in terms of diversion ratios and price-cost margins.²² Moreover, the Jaffe-Weyl model is quite general and thus can be simplified to accommodate only the salient complementarities of a particular merger. For example, consider two multiproduct firms that each sell two products—A and B. Individually, the products are substitutes for each other (i.e., each firm's product A and product B is a substitute for the corresponding product A and product B produced by the other firm.) Moreover, products A and B are complements when produced by the same firm.²³ Under these conditions, the upward pricing pressure on firm 1's products in the Jaffe-Weyl model are given by:

$$GePP_1^A = \frac{1}{1 - D_1^{AB} D_1^{BA}} [D_{12}^A (P_2^A - c_2^A) + D_1^{AB} D_{12}^B (P_2^B - c_2^B)] \quad (1)$$

$$GePP_1^B = \frac{1}{1 - D_1^{AB} D_1^{BA}} [D_{12}^B (P_2^B - c_2^B) + D_1^{BA} D_{12}^A (P_2^A - c_2^A)] \quad (2)$$

where D_{12}^A is the diversion ratio from firm 1 to firm 2 on product A, D_1^{AB} is the (negative) diversion ratio between firm 1's product A and firm 1's product B (i.e., the proportion of firm 1's lost sales on product A that is also lost on firm 1's product B because the goods are complements), and D_1^{BA} is the (negative) diversion ratio between firm 1's product B and firm 1's product A.²⁴

As would be expected, equations (1) and (2) show that merger price effects are increasing in the magnitude of diversion ratios between the merging firms' substitute products. However, the equations also imply that it often will be the case that upward pricing pressure on product A is decreasing in the complementarity of product B with product A (i.e., the magnitude of D_1^{AB} and

²¹ Sonia Jaffe & E. Glen Weyl, *The First-Order Approach to Merger Analysis*, 5 AM. ECON. J.—MICROECONOMICS 4, § II.C (2013). See Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*, 10 B.E. J. THEORETICAL ECON. 1, 31–32 (2010), for a less rigorous explanation of the same notion.

²² The diversion ratio from firm 1 to firm 2 for product A is the fraction of product A sales firm 1 would lose to firm 2 were firm 1 to increase prices.

²³ Although stylized, this example is not so difficult to imagine. For example, in the appliance industry some customers prefer to buy washers and dryers that are of the same brand.

²⁴ These equations can be derived from the multiproduct UPP formula given in Jaffe-Weyl, *supra* note 21, § II.D (under the heading “Bertrand” on p. 195). See the Appendix, *infra*, for this derivation.

D_1^{BA}).²⁵ Intuitively, firm 1 raising the price of product A decreases the sales of firm 1's complementary product B, decreasing upward pricing pressure. Importantly, when this is the case, the presence of merger efficiencies on firm 2's product B decreases $GePP_1^A$, a factor that should be considered when weighing an enforcement action involving product A.

The discussion and examples provided above demonstrate the potential importance of efficiencies that are "inextricably linked" across products through either supply-side or demand-side complementarities. In our experience, linked efficiencies are given little, if any, consideration in antitrust investigations and enforcement actions. Multiproduct firms produce and market complementary goods and services, and thus ignoring linked efficiencies potentially causes antitrust agencies to thwart procompetitive mergers. And, although complex, models like that of Jaffe-Weyl provide useful starting points from which the agencies can develop first-order approaches to better fit the particular features of horizontal mergers of multiproduct firms.

Treatment of Expected Merger Efficiencies in the Context of Merger Litigation

As noted above, the vast majority of horizontal mergers do not raise significant antitrust concerns. However, when a merger is between close substitutes in a concentrated industry, merging parties typically are required to demonstrate that merger-specific efficiencies will enhance the merged entity's incentive and ability to compete (to the benefit of consumers). Generally, it is the burden of the merging parties to provide evidence that merger efficiencies will be realized.

Placing responsibility on the merging parties for demonstrating merger efficiencies is reasonable, particularly during the investigation stage of a potential merger challenge. After all, as explained in the Guidelines: "[I]nformation relating to efficiencies is uniquely in the possession of the merging firms."²⁶

Cognizable efficiencies are defined in the Guidelines as those that are both merger-specific and verified.²⁷ Assume potential merger efficiencies are merger specific. "Verified" is an interesting word to use in the context of a prospective merger evaluation because none of the outcomes of the merger, including any potential merger efficiencies, can be "verified" until after the merger has occurred. Merger investigations typically involve assessments of inherently uncertain events, e.g., expected merger price increases. Yet the Guidelines seem to imply that merging parties are held to a higher standard of certainty with regard to merger efficiencies. For example, the Guidelines state: "Efficiency claims *will not be considered* if they are vague, speculative, or otherwise cannot be verified by reasonable means."²⁸ Such language, as well as standard practices, indicates that merger efficiencies are often evaluated as though it were possible to demonstrate both merger specificity and verifiability before the merger occurs. That is, estimated merger efficiencies are either deemed to be cognizable and credited fully or considered to be not cognizable and given zero credit.

Of course, no efficiencies are 100 percent guaranteed, especially before a merger is consummated. Put another way, each claimed merger efficiency will occur with some positive probability. Hence, a more appropriate treatment of likely merger efficiencies would be to estimate the

²⁵ Mathematically, the upward pricing pressure of, for example, firm 1's product A is decreasing in the complementarity between firm 1's products A and B if the derivative of $GePP_1^A$ with respect to the diversion ratio between firm 1's products A and B (D_1^{AB}) is positive. In the case of the $GePP_1^A$ in equation (1), $\frac{\partial GePP_1^A}{\partial D_1^{AB}} = \frac{D_{12}^B(P_2^B - c_2^B) + D_1^{BA}D_{12}^A(P_2^A - c_2^A)}{(1 - D_1^{AB}D_1^{BA})^2} > 0$.

²⁶ Guidelines, *supra* note 1, § 10.

²⁷ *Id.*

²⁸ *Id.* (emphasis added).

expected value of each claimed merger efficiency, much the same way that investigators currently evaluate the likely price effects of a merger. That is, assume the investigator has been convinced by the merging parties that a \$100 efficiency will be realized if a merger is consummated but thinks that another claimed \$70 efficiency is somewhat unlikely. Rather than crediting the merging parties with just the \$100 efficiency, it would be more appropriate to estimate the expected value of the sum of the two efficiencies—which could be greater than or less than \$100.²⁹

The deterministic treatment of merger efficiencies as counting or not counting as opposed to using a probabilistic approach could lead to undesirable outcomes. For example, consider two proposed mergers. For simplicity, assume that each merger is between firms that produce products with identical prices (equal to 1) and percentage margins (equal to 0.5), with symmetric diversion ratios (equal to 0.2). Hence, each merger has a GUPPI of 0.1 for each firm's product.³⁰ Merger 1 would realize marginal cost efficiencies of 0.3 on each firm's product with probability 0.7, while Merger 2 would realize marginal cost efficiencies of 0.6 on each firm's product with probability 0.5. Under a coarse count/do not count standard for efficiencies, the agencies would allow Merger 1 but block Merger 2—which is precisely the wrong outcome from a consumer welfare standpoint.³¹

Refining merger efficiencies to probabilistic outcomes is likely an unnecessary step for most merger investigations, especially those that are not close calls. Moreover, calculations of probability-weighted merger efficiencies would place a significant burden on merging parties and the antitrust authorities during the investigation phase of a merger review. Hence, it would be pragmatic and appropriate for preliminary merger reviews to consider claimed merger efficiencies as is done currently—by either counting such efficiencies fully or not counting them at all.

As part of merger litigations, however, using probability-weighted measures of merger efficiencies, instead of the coarse count/do not count standard suggested by the Guidelines, would be a more effective approach to produce the correct outcome for consumer welfare. Indeed, all elements of a merger evaluation—market definition, competitive effects analysis, etc.—typically are reevaluated and sharpened for presentation to the court, so reevaluating efficiencies should not impose any additional burden.

Perhaps even more importantly, our recommended approach for the final stages of a merger investigation and in the litigation phase of merger challenges would harmonize the economic analysis of upward price pressure resulting from the loss of an independent competitor with the economic analysis of merger-specific efficiencies. When one analyzes the potential effects of the merger on prices, there is always some uncertainty regarding the precise point estimate of the potential merger effect. Yet, lawyers and economists usually accept the best point estimate as the

²⁹ We are not the first to suggest that merger efficiencies should be credited according to expected values. See, e.g., Daniel A. Crane, *Rethinking Merger Efficiencies*, 110 MICH. L. REV. 347–92 (2011); J.J. Simons & Daniel A. Crane, *Unified Merger Analysis: Integrating Anticompetitive Effects and Efficiencies, and Emphasizing First Principles*, HMG REVIEW PROJECT—COMMENT, Project No. P092900 (2009).

³⁰ The GUPPI for firm 1 in a merger with firm 2 can be expressed as $GUPPI_1 = D_{12} \times M_2 \times \frac{P_2}{P_1}$. The subscripts in the equation index firms, D is diversion ratio, M is percent margin, and P is price. Under the stated assumptions, the GUPPI for each firm is the same, say $GUPPI = D \times M$.

³¹ In expectation, Merger 1 would realize efficiencies of 0.21, which is less than $\frac{GUPPI}{(1-D)(1-M)} = \frac{0.1}{0.8 \times 0.5} = 0.25$, while Merger 2 would realize efficiencies of 0.30, which is greater than this expression. Hence, in expectation, Merger 1 would lead to a price increase because $\frac{GUPPI}{(1-D)(1-M)}$ exceeds expected realized efficiencies (i.e., $0.25 > 0.21$), while Merger 2 would result in a price decline because $\frac{GUPPI}{(1-D)(1-M)}$ is less than expected realized efficiencies (i.e., $0.30 > 0.25$). For a derivation and explanation of this test for weighing merger efficiencies against upward pricing pressure, see Farrell & Shapiro, *supra* note 21, at 12–13.

best available measure of the merger price effect. The approach we recommend for merger litigations puts efficiencies on the same playing field as price effects: We would use the best point estimate of efficiencies, taking into account uncertainties about the potential outcomes.

Conclusion

For too long, efficiencies—the primary motivator for the vast majority of mergers—have been short-changed in merger analysis. This article helps to provide a deeper understanding of the appropriate framework for considering merger-specific efficiencies. But the research into efficiencies, given their importance in difficult merger decisions, cannot end here. We must continue to investigate and refine how the treatment of efficiencies can be improved going forward. ●

Appendix: Derivation of 2×2 Multiproduct UPP for Bertrand Competition

The multiproduct UPP formula for Bertrand competition is given by:

$$GePP_i = - \left(\frac{\partial Q_i^{-1}}{\partial P_i} \right)^T \left(\frac{\partial Q_j}{\partial P_i} \right)^T (P_j - c_j),$$

where $GePP_i(P)$ is a vector of $GePP$ for the products sold by firm i , and j indexes firm i 's merger partner.³²

Assume merging parties, indexed by 1 and 2, each produce products A and B. Then the multiproduct UPP for firm 1 is given by:

$$GePP_1 = \begin{bmatrix} GePP_1^A \\ GePP_1^B \end{bmatrix} = - \left(\begin{bmatrix} \frac{\partial Q_1^A}{\partial P_1^A} & \frac{\partial Q_1^A}{\partial P_1^B} \\ \frac{\partial Q_1^B}{\partial P_1^A} & \frac{\partial Q_1^B}{\partial P_1^B} \end{bmatrix}^{-1} \right)^T \begin{bmatrix} \frac{\partial Q_2^A}{\partial P_1^A} & \frac{\partial Q_2^A}{\partial P_1^B} \\ \frac{\partial Q_2^B}{\partial P_1^A} & \frac{\partial Q_2^B}{\partial P_1^B} \end{bmatrix}^T \begin{bmatrix} (P_2^A - c_2^A) \\ (P_2^B - c_2^B) \end{bmatrix}.$$

Given the assumption that products A and B are complements only when produced by the same

firm, $\frac{\partial Q_2^A}{\partial P_1^B} = \frac{\partial Q_2^B}{\partial P_1^A} = 0$, and thus $GePP_1$ can be rewritten:

$$GePP_1 = \frac{1}{\frac{\partial Q_1^A}{\partial P_1^A} \frac{\partial Q_1^B}{\partial P_1^B} - \frac{\partial Q_1^A}{\partial P_1^B} \frac{\partial Q_1^B}{\partial P_1^A}} \begin{bmatrix} -\frac{\partial Q_1^B}{\partial P_1^B} \frac{\partial Q_2^A}{\partial P_1^A} (P_2^A - c_2^A) + \frac{\partial Q_1^B}{\partial P_1^A} \frac{\partial Q_2^B}{\partial P_1^B} (P_2^B - c_2^B) \\ \frac{\partial Q_1^A}{\partial P_1^B} \frac{\partial Q_2^A}{\partial P_1^A} (P_2^A - c_2^A) + -\frac{\partial Q_1^A}{\partial P_1^A} \frac{\partial Q_2^B}{\partial P_1^B} (P_2^B - c_2^B) \end{bmatrix}.$$

³² See Jaffe & Weyl, *supra* note 21, § II.D.

Finally, dividing the numerator and the denominator of $GePP_1$ by $\frac{\partial Q_1^A}{\partial P_1^A} \frac{\partial Q_1^B}{\partial P_1^B}$ and multiplying through gives:

$$GePP_1^A = \frac{1}{1 - D_1^{AB} D_1^{BA}} [D_{12}^A (P_2^A - c_2^A) + D_1^{AB} D_{12}^B (P_2^B - c_2^B)] \text{ and}$$

$$GePP_1^B = \frac{1}{1 - D_1^{AB} D_1^{BA}} [D_{12}^B (P_2^B - c_2^B) + D_1^{BA} D_{12}^A (P_2^A - c_2^A)],$$

where $D_{12}^X = -\frac{\frac{\partial Q_2^X}{\partial P_1^X}}{\frac{\partial Q_1^X}{\partial P_1^X}}$ is the diversion ratio from firm 1 to firm 2 for product $X = A, B$, and

$D_1^{AB} = -\frac{\frac{\partial Q_1^B}{\partial P_1^A}}{\frac{\partial Q_1^A}{\partial P_1^A}}$ and $D_1^{BA} = -\frac{\frac{\partial Q_1^A}{\partial P_1^B}}{\frac{\partial Q_1^B}{\partial P_1^B}}$ are the diversion ratios between firm 1's products A and B.