Mergers with Differentiated Products

by Carl Shapiro

The antitrust treatment of horizontal mergers by the Justice Department and the Federal Trade Commission is one of the most well developed and closely scrutinized areas of antitrust law. The enforcement agencies have extraordinary experience reviewing mergers and the merger bar is no less sophisticated. From my perspective as an antitrust economist, this sophistication permits merger enforcement to be at the cutting edge when it comes to incorporating economic learning into competition policy.

The 1992 DOJ and FTC Merger Guidelines have placed important attention on the "unilateral effects" of a merger, i.e., the tendency of a horizontal merger to lead to higher prices simply by virtue of the fact that the merger will eliminate the direct competition between the two merging firms, even if all other firms in the market continue to compete independently. Unilateral effects are contrasted to "coordinated effects," i.e., the danger that the merger will lead to collusion between the merged entity and its remaining rivals.

This article discusses some of the methods used by the Antitrust Division to analyze unilateral effects in mergers involving differentiated products. While the methods outlined here do not replace the standard steps of defining markets and measuring market shares and concentration, they can significantly supplement those steps.

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To place the topic in context, it is instructive to compare mergers with homogeneous products to those involving differentiated products. For homogeneous products, the traditional structural approach of defining markets and measuring market shares and market concentration has deep roots, along with a rich empirical tradition linking market structure to performance. In these markets, it is both natural and appropriate to count up each firm's unit or dollar sales, or capacity, to measure market shares, and to make inferences about a merger's effects based on market structure, including the HHI of market concentration. The danger of collusion is surely related to market concentration (although quantifying this relationship is difficult), and economists' primary model of non-cooperative oligopolistic competition among manufacturers of homogeneous goods relates market structure to performance.[1] Although economists continue to debate the empirical relationship between market structure and performance, there exists a solid foundation for using market structure prominently in evaluating horizontal mergers involving homogeneous goods.[2]

This traditional structural approach towards merger policy, which dates back to the 1960s but has been refined as just described, is less attractive for differentiated products. When products are highly differentiated, concerns about coordinated effects may be secondary to concerns about unilateral effects. And, to assess unilateral effects most accurately, it is highly desirable to go beyond industry concentration measures to look directly at the extent of competition between the merging brands. This is especially true if competition is "localized," i.e., if some brands are especially close substitutes for other brands due to their product characteristics or image. To put this differently, at the Antitrust Division we must concern ourselves with the prospect that the prices for one or more brands sold by the merging parties will rise after the merger, even if prices do not uniformly rise throughout the relevant market. Such concerns are not present, or are far less pronounced, in markets for homogeneous products.

The danger that a merger of Brands A and B will cause anticompetitive price increases for one or both of these brands is greatest if the merging brands are "close," in the sense that many customers using one brand consider the other brand their second choice. Ultimately, unilateral anticompetitive effects are based on the following logic: As the price of Brand A rises, some customers will shift from Brand A to Brand B. Prior to the merger, these customers would be lost to the firm owning Brand A. After the merger, this same firm owns Brand B and thus does not lose these customers. As a result, the price increase is more profitable to the merged entity.

To explicate this logic, consider a merger between Brands A and B. The likely post-merger price increase for Brand A is driven by two variables, each of which we have a good chance of observing with a proper investigation. The first I call the Diversion Ratio from Brand A to B. This Diversion Ratio is the answer to the following question: If the price of Brand A were to rise, what fraction of the customers leaving Brand A would switch to Brand B? The second variable is the Gross Margin — the percentage gap between price and incremental cost — for Brand B.[3] Roughly speaking, a valuable index of the potential anticompetitive unilateral effects is obtained by multiplying the Diversion Ratio by the Gross Margin. Any danger of a unilateral price increase may be alleviated by product repositioning, entry, or efficiencies. Nonetheless, the Diversion Ratio and the Gross Margin are the key variables in the demand-side portion of the analysis.

Monopolistic Competition

To a greater or lesser degree, virtually all markets involve some element of product differentiation.[4] Even in a classic homogeneous-goods market — such as the market for an agricultural commodity or for a specific chemical compound — producers often attempt to differentiate themselves based on product quality, reliability, or customer service.

My emphasis here is on markets where the brands are distinct in important and long-lasting ways. It is helpful to keep two categories in mind: (1) branded consumer products, where each brand of pens, bread, facial tissue, computer software, or cereal, is distinct; and (2) physical facilities that distribute or deliver goods or services, such as supermarkets, department stores, branch banks, or hospitals, where the differentiation is based on location. These two broad categories correspond to the familiar tasks of product and geographic market definition.

Unilateral Competitive Effects

The predominant approach taken by economists studying markets with differentiated products is to model the firms as independently setting the prices of each of their brands. As usual in economics, we assume that each firm seeks to maximize its own profits. This method of analysis fits perfectly with the "unilateral effects" portion of the Merger Guidelines (§ 2.2).

It is fair to say that economic analysis of differentiated-products mergers at the Division typically focuses on unilateral effects, unless there are structural factors facilitating collusion following the merger or there is a history of collusion in the industry. This emphasis represents a significant shift in a fairly short period of time.

Economic analysis regarding unilateral effects is more amenable to quantification than is economic analysis of the dangers of collusion. Ultimately, we are trying to measure the added incentive to raise price caused by the merger. Employing a combination of game-theoretic and econometric methods, we now have the capability to estimate consumer demand using industry data and, based on these demand estimates, to derive specific predictions regarding post-merger prices.[5] This contrasts somewhat with the analysis of the dangers of collusion. While we are fairly confident in listing and analyzing factors that facilitate or hinder collusion, including market structure, there is no single accepted method of quantifying the increased likelihood of collusion attendant to a merger.

Our ability to predict unilateral effects based on demand patterns is only as good as the available data. Very often we must make do with qualitative evidence or rather rough estimates. However, even when the data are limited, the theory of monopolistic competition can provide some very helpful predictions based on premerger Gross Margins and market shares, which often can be measured using data routinely collected during the second request process. These predictions will need to be checked against the views of industry participants, company documents, and other information sources, but they do constitute a vital part of merger analysis.

A final caveat: the analysis below applies when the firms independently set uniform prices for their branded products. To the extent that firms engage in price negotiations on a customer-by-customer basis or engage in other forms of price discrimination, the analysis must be modified or replaced with another approach.

Estimating Post-Merger Prices: Four Steps

Economists in the agencies and those working for private parties largely agree on what to look for to estimate unilateral competitive effects, although they may differ in specific implementation steps. We seek to estimate the post-merger Bertrand equilibrium in prices, accounting for the new market structure in which some brands are jointly owned that had previously been independent and for the new cost structure of the merged entity.[6]

The analytical steps in this exercise can be described succinctly in a manner consistent with the methodology of the Merger Guidelines: If a significant proportion of consumers considers the merging firms' products to be their first and second choices (at premerger prices), then the merged entity will have an incentive to impose a nontrivial price increase following the merger. Unless product repositioning or entry would render such a price increase unprofitable, and unless synergies imply that the price increase will not in fact raise profits, the merger will injure consumers and be anticompetitive.

There are many valid ways to carry out this analysis. As much as anything, the method chosen depends upon the available data. Generally, however, I find it useful to structure my thinking about unilateral effects in differentiated product markets in terms of the following four steps.[7] Consider a merger between brands A and B, and focus attention on the danger that the price of Brand A will be elevated after the merger:[8]

(1) Consider a price increase for Brand A of, say, 10 percent. Try to measure what fraction of the sales lost by Brand A due to this price increase would be captured by Brand B. I call this fraction the Diversion Ratio (from Brand A to Brand B).

(2) Based on premerger Gross Margins and the estimated Diversion Ratio, calculate the post-merger price increase, assuming no synergies or rival supply responses.

(3) Try to account for any likely and timely changes in prices or product offerings by nonmerging parties, including product repositioning and entry.

(4) If there are credible and documented synergies that lower marginal costs, reduce the predicted post-merger prices accordingly. This step can lead to a predicted price decrease.

The first two steps capture the demand-side analysis; the third step is the supply-side analysis; the final step accounts for possible efficiencies. If these steps indicate that the merged entity would find it optimal to impose a significant price increase following the merger, then the merger is very likely to be anticompetitive.

The Diversion Ratio

The concept underlying the Diversion Ratio is easily comprehensible: "If you raise your price, what fraction of your lost customers will turn to your rival (now merger partner)?"

The Diversion Ratio is a close cousin of the cross-elasticity of demand between the merging brands.[9] If the unit sales of the merging brands are equal prior to the merger, the Diversion Ratio from Brand

A to Brand B is equal to the cross elasticity of demand from Brand A to Brand B, divided by the own-price elasticity of demand for Brand A.[10] Suppose, for example, that Brand A has an own-price elasticity of demand of 2.0 (i.e., a 1 percent increase in the price of Brand A causes unit sales to decline by 2 percent), and that the cross-price elasticity of demand from Brand A to Brand B is 0.5. If the two brands' premerger unit sales are equal, then the Diversion Ratio from Brand A to Brand B is (0.5)/(2.0) or 25 percent. Stated differently, one-quarter of the unit sales lost by Brand A if its price rises are captured by Brand B.

In some cases, the Diversion Ratio from Brand A to Brand B will be closely linked to Brand B's market share. In particular, if all sales lost by Brand A are captured by other brands in the market, and if all brands are "equally close" to each other, then the Diversion Ratio from Brand A to Brand B may be stated as $s_B/(1-s_A)$, where s_A and s_B are the brands' respective market shares.[11] In the more realistic situation where some customers substituting away from Brand A switch to products outside the market entirely, this Diversion Ratio will be proportionately lower. For example, if 20 percent of the customers lost by Brand A leave the market entirely, the Diversion Ratio from Brand A to Brand B will instead be $(0.8)s_B/(1-s_A)$.

Since the Diversion Ratio plays a crucial role in this analysis, in differentiated-product mergers the Antitrust Division will invariably want to know the best estimate of the Diversion Ratio based on the available evidence.

Estimating Unilateral Competitive Effects in Practice

Steps 1 and 2: Demand-Side Analysis. In practice, the demand-side analysis depends heavily on the availability of data.[12] Two recent merger cases at the Antitrust Division that led to consent decrees illustrate what can be done with detailed data.

The merger of Interstate Bakeries Corporation and Continental Baking Company involved the first and third largest bakers of fresh bread in the United States.[13] The Division concluded that the deal would substantially lessen competition in the production and sale of white pan bread in five regional markets. The proposed Final Judgment orders Interstate and Continental to divest certain white bread brands in each geographic market. Our competitive concerns, as well as the ultimate relief, were greatly informed by our economic analysis of the merger's anticompetitive unilateral effects.

The Kimberly-Clark acquisition of Scott Paper Company posed a threat to competition in the markets for baby wipes and facial tissues.[14] Again, our analysis was significantly informed by econometric analysis of the demand for the various brands in these markets, from which we were able to estimate likely price increases following the acquisition.

In both of these merger investigations, we had access to excellent data on prices and unit sales derived from checkout scanners at retail locations. These data provided information regarding competition both from other brands and from private label products. In the bakeries merger, we focused on the brands of premium white bread sold by Continental and Interstate. In the baby wipes market, we focused on competition between Kimberly-Clark's Huggies brand of baby wipes and Scott's two brands of baby wipes, Baby Fresh and Wash-a-Bye Baby; together the merging parties controlled over 50 percent of the sales in this $500 million market. In the facial tissue market, we estimated the cross-elasticity between Kimberly-Clark's Kleenex brand and Scott's Scotties brand; together, the two parties controlled nearly 60 percent of the sales in this $1.34 billion market.

In these two mergers we were able, with considerable work and making various assumptions about the structure of demand, to estimate a complete model of demand for the various brands. These methods subsume the Diversion Ratio concept I stressed above. The calibrated model of consumer demand derived from the supermarket scanner data was then used, in a high-tech version of Steps 1 and 2 above, to predict the likely post-merger price increases for the various merging brands.[15]

In this prediction exercise, we assumed that all firms in the industry set prices independently after the merger to maximize profits. The predictions of the model at this point do not account for product repositioning, entry, or synergies. In all cases, however, this demand-side analysis did take account of competition from private-label products as well as branded goods. In the bread merger, the computer model predicted price increases in the 5 to 15 percent range for Continental's and Interstate's premium white pan breads in the Los Angeles and Chicago areas. In baby wipes, we estimated that there would have been substantial price increases following the merger. Price increases were also predicted in facial tissue, especially for the smaller Scotties brand.

While econometricians dream about this type of "high-tech" analysis, in reality the data are rarely available to do this type of full-blown simulation analysis with assurance. If econometric estimation of elasticities based on transactions data is not possible, relevant consumer survey data may still be available to directly estimate the Diversion Ratio. Survey data are not as good as actual transactions data, but can still be reliable if valid sampling procedures were used and if the results are not overly sensitive to the framing of the questions. If reliable survey data are also unavailable, it still may be possible to use company documents and other qualitative information regarding consumers' brand preferences to estimate Diversion Ratios.

The firm's market shares can be very helpful in estimating Diversion Ratios if none of the brands in the market are especially "close" to or "distant" from each other. As noted above, Diversion Ratios will be proportional to market shares in this case. For example, consider such a market in which Brand A has a 25 percent share and Brand B has a 15 percent share. Suppose also that very few customers of Brand A would reduce their overall purchases in the market if Brand A were to raise its price; instead these customers would by and large pick among the other brands. In this case, the Diversion Ratio from Brand A to Brand B is 20 percent.[16] The Diversion Ratio will be lower, to the extent that some of Brand A's customers reduce their total purchases in the market when the price of Brand A rises. If half of the customers dropping Brand A leave the market altogether, or if customers switching to other

brands in the market reduce their purchases by half when switching away from their favorite Brand, the Diversion Ratio from Brand A to Brand B will only be 10 percent.

Under this analysis, if the merging brands are similar in characteristics, or if the merging brands have large shares within a broader product category, the Diversion Ratio is likely to be high. Note in particular that the Diversion Ratio is likely to be high for a brand that is merging with a dominant brand: the large market share of the dominant brand makes it likely that customers switching away from the smaller brand will divert to the dominant brand rather than elsewhere. On the other hand, if the merging brands are usually sold to different types of consumers, or through different channels, or if consumers' preferences are such that they can easily substitute to a broad range of products (e.g., gifts instead of premium pens, or breakfast foods instead of ready-to-eat cereals), the Diversion Ratio is likely to be lower, other things equal.

Merely asserting that there are numerous products to which consumers could substitute, and thus the Diversion Ratio must be low, ignores the importance of diverse consumer preferences and does not replace this step of the analysis. Nor is a merger immunized merely because the merging brands are not next-closest substitutes, as some parties claim, any more than a merger is immunized merely because the merged entity still faces some post-merger competition.

To complete the demand-side analysis, the estimated Diversion Ratio can be used, along with premerger Gross Margins and perhaps other industry measures, to give a rough prediction of the post-merger price increases for the merging brands. The principle here is that high Gross Margins and high Diversion Ratios suggest large post-merger price increases. The tricky part is that the actual calculation of the post-merger price increase depends upon the specific shape assumed for the demand curve.

A simple formula can be derived for the post-merger price increase if one is willing to assume that consumer demand functions exhibit constant elasticity over the relevant range of prices. Very often when economists estimate demand using data, they employ such constant-elasticity demand functions. With constant-elasticity demand, and assuming that the two merging brands are symmetric prior to the merger, the merged entity's profit-maximizing percentage price increase is $mD/(1–m–D)$.[17] Here m is the premerger Gross Margin and D is the Diversion Ratio between the two merging brands.

For example, suppose that the premerger price is $100, and the cost per unit is $60, so the premerger markup, m, is 40 percent, not uncommon at all for differentiated products. If we assume a Diversion Ratio of 0.2 (i.e., 20 percent of the sales lost when the price of Brand A goes up are captured by Brand B), then the optimal post-merger price increase in percentage terms is (0.4)*(0.2)/(1–0.4–0.2) = 0.2: a 20 percent price increase would maximize profits.

This formula must be used with great caution because it relies on several strong assumptions, as I have noted. To the extent that the elasticity of demand for a brand rises as the price of that brand rises,

Diversion Ratio Example

The importance of the Diversion Ratio and the Gross Margin can be seen with a few numerical examples. Consider a situation in which Brands A and B each have premerger prices of $100 and premerger unit sales of 1000. Suppose that each brand has a marginal cost of $60, so the premerger Gross Margin is ($100–$60)/$100 or 40%. Prior to the merger, Brand A makes profits (often, contribution to fixed costs) of $40 per unit times 1000 units, or $40,000. Consistent with premerger optimal pricing by Brand A, suppose that a 10% price increase by Brand A would lead to a 25% reduction in sales, to 750 units. At this higher price, Brand A could earn profits of $50 per unit times 750 units, or $37,500. Since this is less than the $40,000 figure, prior to the merger Firm A did not find it profitable to set the higher price.

How would a merger between Brands A and B change this calculation? Suppose that the Diversion Ratio from Brand A to Brand B is 30%. In other words, of the 250 units lost by Brand A due to the price increase, 30%, or 75 units, are diverted to Brand B. The merged entity would take into account the additional profits earned by Brand B from these customers when considering raising prices from $100 to $110. Assuming the price of Brand B also rises to $110, these 75 diverted sales generate profits of $50 per unit, or $3750 in total. Adding these to the $37,500 from the premerger calculation, the post-merger profits per brand at the elevated prices are $41,250. The merger has made it profitable to raise prices 10% above premerger levels. In this example, a 10% price increase will be profitable after the merger if and only if the Diversion Ratio is at least 20%.*

Compare this example to one in which the premerger Gross Margin is smaller. Specifically, suppose now that the marginal cost is $80, so the premerger Gross Margin is only ($100–$80)/$100 or 20%. The premerger profits on Brand A are now only $20 per unit or $20,000. Now, consistent with optimal premerger pricing, suppose that a 10% price increase would result in a 50% loss of sales, to 500 units. Prior to the merger, a 10% price increase would reduce profits to $30 per unit times 500 units or $15,000, some $5000 less than could be earned at a price of $100.

What about after the merger? Now a 30% Diversion Ratio would mean 30% of the 500 lost units, or 150 units, would be captured by Brand B; at a $30 profit margin per unit, this adds $4500 in profits. But this $4500 of extra profit is still not enough to make up for the loss of $5000 in profits on Brand A. With the smaller Gross Margin in this example, a larger Diversion Ratio would be necessary to make a 10% price increase profitable.

*In these examples, I ask only whether a 10% price increase would generate more profits than premerger prices. Below, I discuss how to calculate the optimal post-merger price increase. Fortunately, with linear demand, the maximal profitable price increase is exactly twice the optimal price increase. So, if a 10% price increase is profitable, it will be optimal to raise prices at least 5%. Throughout this article, I use 10% price increases purely for illustrative purposes.

the constant-elasticity-of-demand calculations will overestimate the post-merger price increases. This overestimation can be significant, especially if the formula as stated generates a large percentage price increase.[18] Certainly it is desirable to find support for the constant-elasticity assumption in documents, in the testimony of industry participants, or in the data before using this formula or variants on it.

If demand instead takes a linear form, the elasticity rises as the price rises, making the optimal post-merger price increase smaller. In this case, an alternative formula can be derived: the optimal post-merger percentage price increase with linear demand (again with premerger symmetry between the two brands) is given by $mD/2(1–D)$. This formula is quite different from the earlier one. Using the same numerical example as above, with a premerger Gross Margin of 40 percent and a Diversion Ratio of 20 percent, the post-merger price increase would be "only" 5 percent.[19]

I am keenly aware that the two formulas presented above give quite different predictions. This observation does not take away from my main point — that Diversion Ratios and Gross Margins are key variables to explore in a merger investigation involving differentiated products — but should serve as a warning. The fact is, the profit-maximizing post-merger price increase is sensitive to consumers' ability to substitute away from the merging brands as prices rise.[20] It is simply not possible, and one should not expect, to fully predict price changes on the basis of two numbers, the Diversion Ratio and the Gross Margin, alone. One way or another, however, the Diversion Ratio (or its close cousin) and the Gross Margin will be an integral part of the analysis.

Finally, even if data are limited and precise predictions of post-merger price increases are difficult to make with confidence, these formulas still are a useful starting point in gaining a sense of the likely magnitude of any post-merger price increase, if full-scale demand estimation is not possible.[21] And the numerator in both of these expressions, mD, i.e., the product of the Gross Margin and the Diversion Ratio, is a very useful quick guide to the likely anticompetitive dangers, even if we cannot predict the post-merger price increase confidently based on these two variables alone.

In some cases, we can measure Gross Margins quite well, but may be uncertain about the Diversion Ratios. In this situation we can use either of the two formulas above to ask how large the Diversion Ratio must be in order for the optimal post-merger price to be at least 10 percent (say) above premerger levels. Using the linear demand formula just given, the post-merger price increase will be at least 10 percent if and only if the Diversion Ratio is at least $0.2/(m+0.2)$. If the premerger Gross Margin is 40 percent ($m=0.4$), prices will go up at least 10 percent if the Diversion Ratio is at least one-third. Again, the larger the Gross Margins, the lower the Diversion Ratio necessary to raise anticompetitive concerns.

Steps 1 and 2 invariably will lead to the interim prediction that prices will rise after the merger, if indeed Brands A and B compete with each other. After all, a merger between rival brands does eliminate competition between those brands, which in and of itself leads to higher prices.[22] But we do not condemn all horizontal mergers, of course. To begin with, we recognize that this incentive to raise price is very slight for some mergers, even horizontal ones. Steps 1 and 2 should detect this, in the form of a very small predicted price increase. But there are two more important reasons why horizontal mergers often are not anticompetitive. First, the true price increase may be far smaller than predicted by Steps 1 and 2, or negligible, because rivals may respond to defeat any price increase. Second, the merger may reduce costs. Steps 3 and 4 are where these crucial considerations come into play.

Step 3: Product Repositioning and Entry. If the merging brands are "close" in attributes, the Diversion Ratio is likely to be high, and Step 2 will suggest a significant price increase. In precisely this situation, however, it may well pay for a rival firm to reposition its brand, or introduce a new brand, closer to the merging brands. And this threat could well deter the price increase in the first place. Alternatively, a de novo entrant could locate its brand near Brands A and B if prices of these brands were above competitive levels. Very often in differentiated-product markets, brands enter and exit with some regularity, and existing products may be repositioned either through design changes or revised marketing strategies. As a general rule, the "farther" a brand must be moved to compete more effectively with the merging brands, the less likely it is that such a move would in fact occur in response to a post-merger price increase. As noted generally in the Merger Guidelines, the greater the sunk costs associated with product entry or repositioning, and the longer such supply responses take, the less likely they are to deter or defeat an anticompetitive price increase.

Notwithstanding the foregoing, rivals' responses do not necessarily reduce the profitability of a post-merger price increase. Game-theoretic analyses of pricing competition with differentiated products indicate that rivals will typically find it optimal to raise their prices in response to higher prices set by the merging firms. Accounting for these accommodating responses tends to increase, not decrease, the predicted post-merger price increase.

Merging parties in consumer-goods industries may be tempted to argue that brand name is unimportant, but they should be cautious in doing so. Such claims are not credible if the parties themselves have made substantial investments in brand equity, or if the deal price itself reflects substantial brand equity. Attempts to downplay the importance of brand names are particularly problematic if new brands historically have found it difficult to gain a secure foothold in the market.

In the recent bread merger the Division concluded that brand names were very important. The evidence also showed that a brand that achieved success in one region might not meet with acceptance in another area. Furthermore, new entry required significant sunk investments in brand promotion, as well as investments in a route delivery network. For these reasons and more our concerns were not alleviated by the prospect of product repositioning or entry.

In the facial tissue and baby wipes markets, we also found that entry takes significant time and expense. The baby wipes market had unique aspects that warranted an especially close look at the

dynamics of entry: the most likely entrants appeared to be firms with well-established brand names in related consumer products, and entry is surely made easier by the fact that there is relatively rapid turnover in demand in this market, since individual babies, and even parents with two or more children, soon outgrow the need for wipes. Nonetheless, entry into this market has proven difficult, and the prospect of entry did not alleviate our concerns.

In both cases, as in all mergers, the Division analyzed whether a price increase, or a reduction in quality, would remain profitable, after accounting for rivals' supply-side responses. The history of brand entry, exit, and positioning, and the associated costs, is relevant for this portion of the analysis.

Step 4: Synergies. If a post-merger price increase is profitable, even after accounting for rivals' responses as well as consumer substitution, the merger is likely to be anticompetitive. Consumers likely will be harmed by the combination, unless it truly offers substantial efficiencies that lower incremental costs. Reductions in incremental costs can offset the incentive to raise price, since the merged entity, like any firm, will have an incentive to set a lower price, the lower are its incremental costs.

To be relevant, the cost savings must truly stem from synergies specific to the merger. If one firm alone can achieve lower costs by expanding its scale of operations, that should occur through competition, not merger. Furthermore, if they are to benefit consumers, the synergies typically must lower incremental costs.[23]

Market Definition and Market Shares

In my experience the main battlefield in litigated merger cases is market definition. However, any attempt to make a sharp distinction between products "in" and "out" of the market can be misleading if there is no clear break in the chain of substitutes: if products "in" the market are but distant substitutes for the merging products, their significance may be overstated by inclusion to the full extent that their market share would suggest; and if products "out" of the market have significant cross-elasticity with the merging products, their competitive significance may well be understated by their exclusion.

Since we need to define markets to identify the lines of commerce affected by the merger, it may be tempting for counsel to argue for a very broad market if there is no clear break in the chain of substitutes. This may be inconsistent, however, with a careful application of the Merger Guidelines, which can lead to a market boundary between very similar products. In the pens case, testifying on behalf of Gillette, I agreed with the Division that one could define a market boundary based on price, even though pens were sold at a continuum of prices. Judge Lamberth accepted this principle in his opinion.[24] In the case of geographic markets the mere fact that there are gas stations or supermarkets all over Los Angeles does not necessarily imply that the geographic markets for these products are as broad as the entire L.A. area. Nor is there a single market for all food, despite the fact that it is difficult to draw boundaries between food groups.

On the other hand, an anticompetitive merger cannot be disguised by arguing for a very narrow market so as to quarantine the merging parties in separate "markets." Suppose that Brands A and B propose to merge, but Brand X is situated between them. Suppose further that a merger between Brands A and X would lead to at least a 5 percent price increase, and likewise for a merger between Brands B and X. Defense counsel might be tempted to argue that A and X form a market, and that B and X form a market, but that A and B are not in the same market. Still, if the Diversion Ratio between A and B is significant (albeit smaller than between A and X or between B and X), the merger of A and B could well harm consumers. In this case, it is appropriate for the Division to use a price increase of more than 5 percent in defining the market, as suggested in the Merger Guidelines.

Once markets are defined, using the Guidelines approach there remains the issue of how to use the firms' market shares in differentiated-products markets. As the Guidelines point out, market share numbers must be interpreted in conjunction with evidence about the proximity of the merging brands. If the merging brands are close together, the Diversion Ratio is likely to be high, and any given level of market concentration is more troubling. The reverse is true if the brands are distant.

If all the brands in the market are roughly equidistant from each other, then the market shares of various brands will be proportional to their Diversion Ratios, making emphasis on the two brands' market shares very appropriate. The Guidelines look to both the sum of the market shares of the merging brands (to see if this sum exceeds 35 percent in evaluating unilateral effects) and to the product of the market shares (which will reflect the number of consumers who regard the merging brands as their first and second choices, and determines the increase in the HHI).

As illustrated above, if the brands are equidistant from one another, information about market shares can be combined with a measure of the overall market elasticity of demand to estimate the Diversion Ratio between the merging brands. This estimated Diversion Ratio can then be combined with information about premerger margins to give at least a rough estimate of the profit-maximizing post-merger price increase.

In arguing for a broad market, a common tactic is to calculate a "critical elasticity" of demand for a group of products being considered as a market,[25] and then argue that the true elasticity is above this critical level, making a 5 percent price increase unprofitable. This method must be used with great caution in the context of differentiated products, to avoid at least two pitfalls. First, there is no reason to restrict attention to a uniform price increase of 5 percent for the purposes of market definition if a single firm controlling the entire product category would find it optimal to increase the prices of different brands by different amounts. Second, care must be taken to ensure that the claimed "market" elasticity is consistent with information about each brand's own elasticity of demand and the cross-elasticities of demand among the products in the category. Remember, the "market" elasticity will be lower than the individual brand elasticities of demand, and significantly so if the Diversion Ratios are large. If each brand sells at a high markup, this is strong evidence of a

low price elasticity for each brand, which is inconsistent with a high "market" elasticity of demand. If the premerger markups are large and the Diversion Ratios among the brands are large, claims of a large "market" elasticity of demand are not credible.

Unilateral Effects in the Courts

In addition to the growing use of the approach described here by Antitrust Division economists, courts have also incorporated this type of analysis into their reasoning. For example, in the pens case, Gillette, Parker Pen, and other firms such as Cross, Schaeffer, and Mont Blanc, offered fountain pens, roller ball pens, ball point pens, and mechanical pencils at a continuum of prices. I employed the methods sketched out here to develop my testimony on behalf of Gillette, although we lacked data on prices and quantities for premium pens to econometrically estimate the Diversion Ratio. This same general methodology was employed by George Rozanski in his analysis for the Antitrust Division. Although Gillette and the Division agreed it was appropriate to focus on unilateral effects, we disagreed about how to interpret the evidence of substitution between fountain pens and roller ball and ball point pens, and on the difficulty of product repositioning.

Similarly, in the cereals merger between Kraft and Nabisco,[26] economic experts for both sides, relying on supermarket scanner data and survey evidence, spent considerable time estimating elasticities of demand for the purposes of evaluating unilateral effects. Judge Wood's opinion discussed unilateral effects at great length, emphasizing the econometric estimates of cross-price elasticity between the key merging brands, Grape Nuts and Shredded Wheat, for evaluating possible anticompetitive unilateral effects.

Conclusion

Mergers in markets with differentiated products may seem a confusing area, and the case law provides less guidance than one might like regarding how to define markets to include "reasonable substitutes." The Merger Guidelines, and the consensus view among economists of how to analyze competition in differentiated-product industries, together provide a consistent, valid, and reliable way of evaluating proposed horizontal mergers involving differentiated products. Central to the analysis are the Diversion Ratios between the two merging brands, which measure the fraction of customers of each brand that consider the merging brand their second choice. In cases where detailed price and quantity data are available, Diversion Ratios can be calculated based on estimated elasticities of demand. Alternatively, the Diversion Ratios can be estimated based on whatever pieces of evidence are available, including more qualitative information.

If a significant proportion of consumers regard the merging brands as their first and second choices, the Diversion Ratios will be high, and the merger will indeed create an incentive to raise price, particularly if premerger Gross Margins are large. This incentive can be undercut by rivals' product repositioning, by entry, or by credible synergies. ●

[1] I am referring here to the Cournot model of quantity competition, which dates back to 1838. *See* Joseph Farrell & Carl Shapiro, *Horizontal Mergers: An Equilibrium Analysis*, 80 AM. ECON. REV. 107 (1990) (applying this model to mergers); *Asset Ownership and Market Structure in Oligopoly*, 21 RAND J. ECON. 275 (1990) (exploring the welfare properties of this model, with applications to mergers and other transfers of assets among rivals).

[2] In assessing mergers among suppliers of homogeneous products, the main amendment to a structural approach urged by economics is that it is important to consider the elasticity of demand facing today's suppliers in the aggregate. If entry is easy, or if other distinct products offer good substitutes, the elasticity facing today's suppliers of the homogeneous good will be high. And, if today's suppliers indeed face highly elastic demand, anticompetitive effects are less likely to be significant, for any given market structure. In fact, a strong case can be made that the danger of anticompetitive effects in these markets can be gauged by the ratio of the HHI to the market elasticity of demand. One of the many strong points of the Merger Guidelines is that their "hypothetical monopolist" approach to market definition explicitly incorporates the aggregate elasticity of demand into the market definition exercise.

[3] It is important to measure incremental cost properly in calculating the premerger margin. For example, if a firm is facing capacity constraints, one must include some capital costs in the measure of incremental cost. Also, the time frame and scale over which incremental costs are measured should be commensurate with the unilateral effects being studied.

[4] Economists have long realized that firms selling differentiated products have some "market power" in a technical economic sense, although typically not nearly enough to rise to the level of "monopoly" power. In the 1930s Joan Robinson and Edward Chamberlin developed the theory of "monopolistic competition" to describe markets in which each firm has a distinct product, but competes with several or many other firms. JOAN ROBINSON, THE ECONOMICS OF IMPERFECT COMPETITION (1933); EDWARD CHAMBERLIN, THE THEORY OF MONOPOLISTIC COMPETITION (1933). By the 1990s economists have made great progress in understanding competition with differentiated products, offering a sound foundation for merger enforcement in such industries.

[5] Let me emphasize that the reliability of this analysis depends very much on the data and other evidence upon which it is based. Ideally, the analyst should conduct a sensitivity analysis to make sure the results are not overly sensitive to specific simplifying assumptions that must be made.

[6] Bertrand Equilibrium refers to the pattern of prices that prevails if each firm sets the price of its brands taking as given the prices of the other brands. This is also known as a "Nash Equilibrium" in prices. Nash Equilibrium is the dominant method by which economists model "noncooperative," i.e., non-collusive, behavior among rivals. Bertrand equilibrium is not the only possible equilibrium concept, but, absent clear evidence to the contrary, it is a very useful workhorse.

[7] I do not want to leave the impression that the actual analysis precisely tracks the four steps outlined below, rather these four steps form a conceptual road map.

[8] This analysis will then have to be repeated for Brand B to see if its price will rise after the merger. If the merged entity has an incentive to raise either price significantly, the merger may be anticompetitive. Furthermore, if the firms own multiple brands, the four steps outlined here will need to be repeated for each individual brand owned by either firm. With multiple brands, not only must the analysis be repeated, but we must keep track of diversion to all brands owned by the merger partner when considering the repricing of any given brand.

[9] In practice, economists often estimate the merging brands' own- and cross-price elasticities, from which the Diversion Ratio can be calculated. I find the Diversion Ratio more intuitive and easier to work with, so I frame the discussion in terms of the Diversion Ratio.

[10] More generally, the formula is $D_{AB} = (E_{AB}/E_A)(x_B/x_A)$, where D_{AB} is the Diversion Ratio from Brand A to Brand B, E_A is the own-price elasticity of Brand A, and x_A and x_B are the unit sales of Brands A and B respectively. Robert Willig, *Merger Analysis, Industrial Organization Theory, and Merger Guidelines*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY: MICROECONOMICS 281 (1991), also notes that the ratio of the cross-price to the own-price elasticity measures the share of the marginal sales of one brand that will divert to another in response to a price increase.

[11] In other words, among a group of brands that are all equally "close" or "distant" substitutes, Diversion Ratios are proportional to market shares. This is the essence of the "logit" model of demand. *See* Willig, *supra* note 10, for a discussion of the role of market shares in differentiated product markets using the logit model. For further detail on using the logit model to analyze mergers, see Gregory Werden & Luke Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy*, 10 J.L., ECON. & ORG. 407 (1994).

[12] Of course the effects of a merger cannot be predicted based on data analysis alone. To be reliable, any data analysis must pass a reality check based on business documents and the testimony of industry participants.

[13] United States v. Interstate Bakeries Corp., Civil Action No. 95C-4194 (N.D. Ill. filed July 20, 1995)

[14] United States v. Kimberly-Clark Corp., Civil Action No. 3:95 CV 3055-P (N.D. Tex. filed Dec. 12, 1995).

[15] The elasticities obtained from the econometric estimation of demand were introduced into an industry model of the pricing of all brands to estimate the unilateral effects of the merger. Some of the modeling methods employed are described further in Gregory Werden & Luke Froeb, Simulation as an Alternative to Structural Merger Policy in Differentiated Products Industries (Economic Analysis Group Discussion Paper EAG 95-2 Sept. 1995).

[16] This figure is obtained by dividing Brand B's market share of 15% into the combined share of all the brands to which customers of Brand A turn, which is 75%. This is an application of the $s_B/(1-s_A)$ formula provided above.

[17] Symmetry means that the two brands have equal unit sales and Gross Margins prior to the merger and that the Diversion Ratio from A to B is the same as that from B to A. This formula also assumes that each merging firm sells a single brand prior to the merger. The analysis is more involved and the formulas much more complex if the brands are not symmetric or if the merging firms sell multiple brands prior to the merger.

[18] In fact, the constant elasticity assumption becomes logically untenable as the sum of the Gross Margin and the Diversion Ratio approaches or exceeds unity. The dangers associated with the constant elasticity assumption are greater, the larger are *m* and *D*.

[19] I believe that the percentage price increases predicted by the logit model tend to be comparable to those of the linear model, although I am unaware of any comparably simple formula in the two-firm symmetric logit model.

[20] The magnitude of the optimal price increase depends not only on the premerger Gross Margin and Diversion Ratio, but also upon how quickly elasticity itself rises as price rises above the premerger level. In principle, this information can be obtained from the data or from other evidence of how consumers would respond to price changes. Incorporating such information is an essential "reality check" if simple formulas like the ones displayed here are to be used.

[21] Although it is difficult to generalize, and the Antitrust Division certainly is not wedded to any single approach, there are some sound reasons to use formulas based on linear or logit demand systems for these purposes in preference over constant-elasticity systems. This is what the Division has done in recent investigations. As I noted above, however, econometricians often estimate constant-elasticity of demand systems empirically. All I can say with confidence is that the demand system used to predict post-merger price increases should, as much as possible, conform to the qualitative as well as quantitative evidence that is available.

[22] Oligopoly theory generally predicts that horizontal mergers will lead to at least marginally higher prices if they generate no efficiencies, although the tendency towards higher prices can be thwarted by product repositioning or entry. This tendency is perhaps clearest in the case of differentiated products and pricing (Bertrand) competition, where rivals typically will choose to raise prices if the merging parties do so. *See* Raymond Deneckere & Carl Davidson, *Incentives to Form Coalitions with Bertrand Competition*, 16 RAND J. ECON. 473 (1985). However, the same result applies with quantity (Cournot) competition, even though rivals typically increase output as the merging firms restrict output. Even with these responses, horizontal mergers under quantity competition lead to higher prices unless they generate synergies. This is the "No Synergies Theorem" proven in Farrell & Shapiro, *Horizontal Mergers*, *supra* note 1.

[23] The issue of how to measure incremental costs remains, however. This involves questions of time and questions of scale, at least. The longer the time frame over which we are looking, the more costs tend to be variable, or incremental, rather than fixed. And some categories of costs may be incremental with respect to large customers, but not small ones. In the extreme case of one customer, such as the Department of Defense for some weapons systems, cost savings in virtually any category may be passed along to the customer, at least to some degree.

[24] United States v. Gillette Co., 828 F. Supp. 78 (D.D.C. 1993).

[25] The "critical elasticity" is the minimum elasticity for which a 5% price increase would be unprofitable.

[26] New York v. Kraft General Foods, Inc., 1995-1 Trade Cas. (CCH) ¶ 70,911 (S.D.N.Y. 1995).