

2010 Merger Guidelines: Empirical Analysis

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Empirical analysis of mergers has advanced significantly since the 1992 Horizontal Merger Guidelines were issued.² In particular, direct estimates of the outcome of mergers through the use of merger simulation models became widespread soon after 1992.³ These models are quite useful in the analysis of potential unilateral effects arising in a merger involving differentiated products. Since merger simulation models are necessarily based on assumption about how firms behave, the assumptions have implications which may not fit well in a particular situation and should be checked, when possible.⁴ Nevertheless, merger simulation models have been used to analyze mergers in the United States, the European Union, the United Kingdom, Australia, New Zealand, Brazil, and Slovenia.

In considering the analysis of unilateral effects, the 2010 Guidelines are a significant advance over the 1992 Guidelines.⁵ The 1992 Guidelines applied a market share benchmark of 35% and concentrated on whether a significant share of purchasers of one merging firm's product regard the other firm's product as their second choice.⁶ However, this approach was misguided because market shares are indicative of consumer's second choices only if the "independence of irrelevant alternatives" (IIA) property holds for consumer demand. This property assumes that the choice between two competing products does not depend on what other products are available to a consumer. For example, the choice of a given consumer between a Bud Light and a Miller Lite does not depend on whether a Coors Light is

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² U.S. Dep't of Justice & Federal Trade Comm'n, Horizontal Merger Guidelines (1992, rev. 1997), *available at* <http://www.ftc.gov/bc/docs/horizmer.shtm..>

³ *See, e.g.,* Jerry A. Hausman, Gregory Leonard & J. Douglas Zona, *Competitive Analysis with Differentiated Products*, 34 ANNALES, D'ECONOMIE ET DE STATISTIQUE 159 (1994); Gregory J. Werden and Luke M. Froeb, *The Effect of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy*, 10 J.L. ECON. & ORG. 407 (1994). I first presented a merger simulation model at a DOJ seminar in 1991, before the 1992 Guidelines issued.

⁴ *See, e.g.,* Dennis Carlton, *Does Antitrust Need to be Modernized?*, 21 JOURNAL ECON. PERSP. 155 (2007); Jerry A. Hausman & Gregory K. Leonard, *Using Merger Simulation Models: Testing the Underlying Assumptions*, 23 INT'L J. INDUS. ORG. 693 (2005).

⁵ U.S. Dep't of Justice & Federal Trade Comm'n, Horizontal Merger Guidelines (2010), *available at* <http://www.ftc.gov/os/2010/08/100819hmg.pdf>.

⁶ 1992 Guidelines § 2.211.

also available. The implication for consumer demand is that diversion ratios are proportional to volume shares, which means that the products are “equally differentiated” in the common usage of economists. This assumption is unrealistic in many situations.⁷

Econometric tests that can be used to test the IIA property often reject it.⁸ This finding also has implications for merger simulation models. Standard logit models typically should not be used in merger simulations models because at both the aggregate and individual levels they impose the IIA property. More flexible demand models should be used, such as the Almost Ideal Demand System for continuous goods and models that allow covariance to exist among the unobserved attributes for discrete goods.⁹

The 2010 Guidelines replace the market share approach for the analysis of differentiated product mergers with a diversion ratio approach that leads to calculation of “upward pricing pressure.” The 2010 Guidelines explain that the diversion ratio is the fraction of unit sales lost by the first product due to an increase in its price that would be diverted to the second product. The use of diversion ratio analysis follows:

Adverse unilateral price effects can arise when the merger gives the merged entity an incentive to raise the price of a product previously sold by one merging firm and thereby divert sales to products previously sold by the other merging firm, boosting the profits on the latter products. Taking as given other prices and product offerings, that boost to profits is equal to the value to the merged firm of the sales diverted to those products. The value of sales diverted to a product is equal to the number of units diverted to that product multiplied by the margin between price and incremental cost on that product. In some cases, where sufficient information is available, the Agencies assess the value of diverted sales, which can serve as an indicator of the upward pricing pressure on the first product resulting from the merger.¹⁰

⁷ See, e.g., Jerry A. Hausman, *Project Independence Report: An Appraisal of U.S. Energy Needs up to 1985*, 6 BELL J. ECON. 517 (1975).

⁸ Jerry Hausman & Daniel McFadden, *Specification Tests for the Multinomial Logit Model*, 52 ECONOMETRICA 1219 (1984).

⁹ For Almost Ideal Demand Systems used in merger simulation models, see Hausman, et al., *supra* note 3. For discrete choice models that do not impose the IIA property at the individual level, see Martin Burda, Matthew Harding & Jerry Hausman, *A Bayesian Mixed Logit-Probit Model for Multinomial Choice*, 147 J. ECONOMETRICS 232 (2008).

¹⁰ 2010 Guidelines § 6.1.

In common with merger simulation models, using the value of diverted sales does not require market definition or the calculation of market shares or HHIs. This change is a significant advance over the 1992 Guidelines approach.

Nevertheless, there are some limitations to the upward pricing pressure approach described in the 2010 Guidelines. The upward pricing pressure approach is essentially limited to the situation of a single product for each merging firm, while in reality many mergers of firms that produce differentiated products involve more than a single product each. An economic reason exists for this situation, since firms can introduce new products using brand recognition for existing products in a less costly manner, e.g., Honey Nut Cheerios, and these new products also sometimes permit higher prices for existing products.¹¹

A more significant limitation is that the analysis considers the effect of the merger on only one product at a time when it is more informative to consider the effect on both products. The price of one product is held constant when the upward pricing pressure is computed for the other product, while in reality both prices will change in a merger. Consider as an example a product with a large amount of sales that merges with a product with a small amount of sales. The typical outcome is that the expected price change on the high sales product will be quite small, while the expected effect on the small sales product can be quite large. A weighted average of both price changes, where the weights are relative sales, is more informative than considering the expected effect individually by product. The upward pricing index for the two products cannot be combined in an informative manner by taking a weighted average.

However, the most significant shortcoming of the 2010 Guidelines approach is that the final result is an “upward pricing pressure” estimate, not the expected change in price, which is the focus of unilateral effects analysis of mergers of differentiated products and the measure (to first order) of the

¹¹ I analyze this outcome in Jerry A. Hausman, *Valuation of New Goods Under Perfect and Imperfect Competition*, in *THE ECONOMICS OF NEW GOODS* 209-237 (Timothy F. Bresnahan and Robert J. Gordon, eds. 1997).

change in consumer welfare. Expected changes in prices are also more straightforward to consider than a measure of upward pricing pressure.

In this article, I propose an alternative approach that uses the same information as the 2010 Guidelines' upward pricing pressure approach. Under my proposed approach, bounds are estimated for the predicted price changes using a merger simulation model. These estimated bounds are more informative than the upward pricing pressure estimates.

The diversion ratio is the key empirical factor needed in the 2010 Guidelines approach. I have significant concerns how this factor will be estimated by the Agencies. A risk exists that the Agencies' estimates will be "guesstimated" from a few of the merging firms' documents or customer interviews, or that an assumption equivalent to the IIA assumption will be used. In my view, an econometric demand model should be used to estimate the diversion ratio whenever possible.¹² In the following, I assume that a useable diversion ratio has been estimated and the Agencies have made an upward pricing pressure estimate for each merging product.

Here is how the cross price elasticities of demand can be recovered from the margin and the diversion ratio. The diversion ratio from product 1 to product 2 equals the ratio of the cross price elasticity of product 2 (with respect to the price of product 1) divided by the own price elasticity of product 1, multiplied by the ratio of unit sales of product 2 divided by the unit sales of product 1. Under the assumption of a single product firm, the own price elasticity is equal to the negative inverse of the price cost margin, $M_1 = -1/e_{11}$ where e_{11} is the own price elasticity of demand for product 1 and $M_1 = (p_1 - mc_1)/p_1$ and p_1 is price and mc_1 is marginal (incremental) cost. The numerator of M_1 is also used to calculate the upward pricing pressure (for good 2) so no additional information is required. Thus, an estimate of the diversion ratio implies an estimate of the cross price elasticity, which is the fundamental economic measure of competition between two products.¹³ Given the estimates of the cross price

¹² Of course, if an econometric demand model had already been estimated, there seems little reason not to perform a merger simulation rather than an upward pricing pressure calculation.

¹³ In many situations estimation of one diversion ratio implies the value of the other diversion ratio, so only one diversion ratio needs to be estimated.

elasticities and the own price elasticities, predicted price changes follow from solving the two equations for $\mathbf{p} = \{p_1, p_2\}$ the post-merger prices:¹⁴

$$s_1(\mathbf{p})e_{11}(\mathbf{p})\frac{p_1 - mc_1}{p_1} + s_2(\mathbf{p})e_{21}(\mathbf{p})\frac{p_2 - mc_2}{p_2} = -s_1(\mathbf{p})$$

$$s_1(\mathbf{p})e_{12}(\mathbf{p})\frac{p_1 - mc_1}{p_1} + s_2(\mathbf{p})e_{22}(\mathbf{p})\frac{p_2 - mc_2}{p_2} = -s_2(\mathbf{p})$$

where the e 's denote the elasticities of demand, the s 's are revenue shares, and the mc 's are marginal cost.¹⁵

A potential concern with using this approach is that the results will depend on the particular shape of the demand functions because the elasticities, e.g. $e_{21}(\mathbf{p})$, depend on the prices that may change with the merger.¹⁶ Econometric estimation will allow determination of the shape of the demand curve and sensitivity analysis can be performed on the predicted price changes in a merger simulation model. Here I am limiting myself to the situation where an econometric demand system has not been estimated (perhaps due to lack of data) and I use the same data to calculate predicted price changes as the 2010 Guidelines use to estimate upward pricing pressure. A useful result is that one can demonstrate that a lower and upper bound for predicted price changes can be estimated using the above equations, in the class of generalized Box-Cox demand functions with “typical” (convex to the origin) shapes, using the linear demand curve to estimate the lower bound and the log-linear demand curve to estimate the upper bound.¹⁷ Both of these demand curves are commonly used in economic analysis where the linear demand curve has

¹⁴ Numerical computer software is necessary to solve the equations, but software currently exists that allows the equation to be solved with a Smartphone or a laptop computer. The equations are derived and explained in Jerry A. Hausman and Gregory K. Leonard, *Economic Analysis of Differentiated Products Merger Using Real World Data*, 5 GEO. MASON L. REV. 321 (1997). Here I am holding prices of other goods constant as does the upward pricing pressure analysis of the 2010 Guidelines.

¹⁵ The marginal costs may change with the merger due to economic efficiencies. I do not consider the analysis of efficiencies in this paper. For an analysis, see Jerry A. Hausman and Gregory K. Leonard, *Efficiencies from the Consumer Viewpoint*, 7 GEO. MASON L. REV. 707 (1999).

¹⁶ See, e.g., Hausman & Leonard, *supra* note 12; Luke Froeb, Steven Tschantz & Gregory J. Werden, *Pass-Through Rates and the Price Effects of Mergers*, 23 INT'L J. INDUS. ORG. 703 (2005).

¹⁷ See Jerry Hausman, *Sources of Bias and Solutions to Bias in the CPI*, 17 J. ECON. PERSP. 23 (2003) and Hausman & Leonard, *supra* note 13, for a discussion of this type of analysis. Convexity to the origin follows from the usual assumption regarding marginal rates of substitution.

prices and quantities in linear form and the log linear demand curve has prices and quantities in logarithmic form.

Data from an actual, recent merger analysis demonstrates this approach. Suppose a merger of two products is under analysis. The first product has a share of 38% and a gross margin of $M_1 = 0.45$. The second product is considerably smaller with a share of 4% and a gross margin of $M_2 = 0.30$. Assume the diversion ratios are 0.0334 (from the first product to the second product) and 0.1236 (from the second product to the first product), and the upward pricing pressure of the two products is 0.01 for the first product and 0.056 for the second product. These estimates are somewhat difficult to interpret given the absence of a natural calibration approach.

The own price elasticities and cross price elasticities required to solve for the price changes in the equations I discussed above can be estimated from the gross margins and the diversion ratios. With the linear demand curve assumption, the predicted price change for the larger product is a 0.6% price increase. The predicted price change for the smaller product is a 2.9% price increase. The weighted average price increase for the two products is 0.8%. Assuming that the non-merging firms do not increase their prices, the weighted average price increase for the entire category of products is 0.3%. These estimates provide a lower bound estimate. For the log-linear demand curve assumption, the predicted price change for the larger product is a 1.9% price increase. The predicted price change for the smaller product is an 11.2% price increase. The weighted average price increase for the two products is 2.8%. Assuming that the non-merging firms do not increase their prices, the weighted average price increase for the entire category of products is 1.2%. These estimates provide an upper bound for predicted price increases. The predicted price changes are straightforward to interpret in terms of the goals of merger analysis, which is to consider potential price changes arising from a merger and the effect on consumer welfare. They would seem small enough that no competitive concerns would arise.

These results should be interpreted with the well-recognized provisos that the bound calculations I have described here always lead to predicted price increases as long as the diversion ratios are greater than zero. Thus, the predicted changes should be substantial before significant concerns arise. Also,

these calculations assume no entry or product repositioning will occur. Finally, price-decreasing effects of potential efficiencies (synergies) can be an important counteracting effect to potential price increases, as the 2010 Guidelines recognize. The upward pricing pressure measure has the undesirable property that it will increase when efficiencies cause the marginal cost of the other merging product to decrease, but the estimated weighted average of price changes will typically not have this property.

I consider this predicted price change bounds approach to be superior to the 2010 Guidelines upward pricing pressure approach because predicted price changes are more straightforward to interpret in terms of the goals of merger analysis, which is to consider potential price changes arising from a merger and the effect on consumer welfare. At the same time, the bounds approach does not require any more information than is required to calculate the upward pricing pressure measure.