Should New Merger Guidelines Give UPP Market Definition?

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I. INTRODUCTION

In an important recent paper,[2] Joseph Farrell and Carl Shapiro (hereafter "FS") propose a new quantitative approach to assessing the competitive impact of horizontal mergers that does not involve defining a relevant market. I believe that FS have made a significant contribution that has the potential to improve merger enforcement. In what follows I describe their approach, propose a slight modification, and note that, like any purely quantitative technique, it must be used with care and common sense.

Like most economists, I agree with FS that market definition is often problematic, particularly when products are differentiated, and that the traditional market definition approach is often not the best way to assess competitive impact. Market definition involves the implicit assumption that for any given set of products a boundary can be drawn in geographic and product space including those products and, possibly, others such that all products within the boundary compete directly with each other but do not compete to any important extent with any product outside the boundary. Even when products are homogeneous, geographic markets that come close to satisfying this assumption are sometimes hard to identify. When products are differentiated, however, as they commonly are in modern economies, it is often painfully clear that nothing like such a sharp boundary exists: *ReaLemon* and *Whole Foods* are two among many possible examples.[3] Even though in such cases most economists would place more weight on methods of assessing the competitive impact of mergers that do not rely on market definition, courts generally view market definition as an essential component of the case.

II. THE FS PROPOSAL

FS propose using a particular measure of upward pricing pressure ("UPP"), to assess competitive impact instead of (or, perhaps, in addition to) the traditional market definition approach. They present several versions of UPP; I focus here on the simplest.

Suppose competing single-product firms 1 and 2 propose to merge and become divisions 1 and 2 of the merged firm. It is reasonable to assume that each firm's pre-merger price maximizes its profits, which I label Π_1 and Π_2, respectively. I will also use these labels to denote the profits of divisions 1 and 2, respectively, of the merged firm.

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[1] This paper is descended from a talk given at the LECG Newport Summit, October 3, 2009. I am indebted to Summit participants for a useful discussion and to David Evans and Glen Weyl for comments on an earlier version of this paper that led to substantial revisions.

[2] Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*, University of California, Berkeley, November 28, 2008.

[3] *See* Richard Schmalensee, *On the Use of Economic Models in Antitrust: The ReaLemon Case*, U. PA. L. REV., 127 (April 1979): 994-1050, and Federal Trade Commission v. Whole Foods Mkt. Inc., Court of Appeals for the D.C. Circuit, Case 07-5276, Decided 29 July 2008.

FS consider how the merger would change pricing incentives, starting at pre-merger prices. Suppose that the first thing that happens after the merger is that division 1 raises its price, P_1, just enough to lower its output by one (very small) unit. By the assumption that P_1 maximized firm 1's profits, this tiny change will have a negligible impact on Π_1.But it will raise the merged firm's profit by increasing the sales and profits of division 2.Using division 2's pre-merger marginal cost, the increase is

(1) $\Delta\Pi_2 = D_{12}[P_2 - C_2]$,

where P_2 and C_2 are division 2's (pre-merger) price and marginal cost, and $D_{12} < 1$ is a diversion ratio, the fraction of division 1's lost sales that would go to division 2.

On the other hand, if increased efficiency reduces C_1 to $(1 - E_1)C_1$ post-merger, with $0 < E_1 < 1$, division 1's profit-maximizing price is also reduced, and the hypothesized small price increase would actually lower its profits. A little calculus gives the impact as

(2) $\Delta\Pi_1 = - E_1 C_1$.

Combining these two effects gives the FS measure of upward pricing pressure for division 1.Holding everything else constant, it is profitable for the merged firm to instruct division 1 to increase its price by (at least) a small amount if

(3) $\Delta\Pi_1 + \Delta\Pi_2 = D_{12}[P_2 - C_2] - E_1 C_1 \equiv UPP_1 > 0$.

It does not seem logically consistent, however, to take into account the fall in division 1's marginal cost in (2) but to ignore the change in division 2's marginal cost in (1).[4] Considering the post-merger cost changes in both divisions yields an alternative measure of upward pricing pressure for division 1:

(4) $D_{12}[P_2 - (1 - E_2)C_2] - E_1 C_1 \equiv UPP_1^* = UUP_1 + E_2 D_{12} C_2$

Clearly, if UPP_1 is positive, so is UPP_1^*.Intuitively, UPP_1^* is likely to be the more informative about the likely post-merger price increase, since it takes account of all post-merger cost changes.(I return to this point below.)

FS show that, under relatively weak assumptions, if both UPP_1 and UPP_2 (which is defined by (3) with 1's and 2's interchanged) are positive, the merged firm's profits are increased by raising both its prices.[5] (I conjecture that a similar result can be proven for the UPP*s, but I have not attempted to do so.) They propose that a merger be presumed anti-competitive and subjected to more intensive analysis if both these quantities are positive for some positive "default" value for the efficiency parameters E_1 and E_2.

III. MEASURING MARGINAL COST

Any quantity like UPP or UPP* (or, for that matter, Critical Loss) that depends heavily on marginal cost is difficult to measure precisely. It is not uncommon in practice to use average variable cost as an estimate of marginal cost, but that estimate is typically biased downward,

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[4] I am indebted to Glen Weyl for this point.

[5] These assumptions are not completely innocuous, however. For an example in which this proposition does not hold, *see* E. Glen Weyl & Michal Fabinger, *Pass-Through as an Economic Tool*, working paper, pp.29-39 (October 29, 2009). *Available* at SSRN: http://ssrn.com/abstract=1324426.

particularly under competitive conditions.[6] Even a perfectly competitive firm that sets price equal to marginal cost has to cover its fixed costs in long-run equilibrium, so that if

price = marginal cost = average total cost = average fixed cost + average variable cost,

it must be that marginal cost exceeds average variable cost, with the difference equal to fixed cost per unit of output and thus, generally, varying directly with capital intensity. While it is possible in principle for firms facing relatively inelastic demand curves to be in equilibrium with marginal cost below average variable cost, this seems unlikely to be the typical case. This, of course, is "merely" a measurement problem, not a matter of principle, but I believe it is a more serious measurement problem than is often recognized.

IV. EFFICIENCY

For a merger with no efficiency gains, UPP and UPP* are always positive. Rather than use case-specific estimates of price-reducing efficiencies (i.e., reductions in marginal costs), FS propose simply to assume and employ a single, default value for all cases. While I recognize that efficiencies are difficult to estimate in practice, it is hard to see the merit in deciding in advance to ignore any relevant case-specific information that might be present—whether one is using UPP or UPP* as a diagnostic tool or employing the traditional Guidelines market definition approach. It would seem to be preferable to begin with a default value for efficiencies but to depart from it if the merging parties can convincingly argue that they will do better or if they fail to make a credible showing that there will be any significant efficiencies at all.

V. POST-MERGER PRICE CHANGES

Merger enforcement has generally been focused on preventing mergers that would produce a significant (and non-transitory) price increase, but UPP (and UPP*) directly measures only the profitability of a tiny increase from pre-merger prices. It does not indicate whether the merger would produce more than a tiny price increase. Imagine starting to walk up a hill in fog so dense that you can only see a few feet ahead. The steepness of the path at the bottom of the hill is like UPP. Just as the steepness of the path at the bottom doesn't tell you how high the hill is, so the magnitude of UPP doesn't tell you how large the post-merger price increase would be.

In their Section 3, FS show that if one knows the UPPs and the shapes of the relevant net demand curves (net of competitive reactions, that is), one could use the UPPs to produce estimates of the post-merger price increase and thus concentrate enforcement resources on mergers likely to produce substantial price increases. They provide formulae for doing this that depend on pass-through rates; the rates at which cost increases are passed through to higher prices.[7] But because pass-through rates depend on curvatures of demand curves (not just their slopes or elasticities) and competitive interactions and are hard to estimate in practice, FS seem reluctant to use these price change estimates.[8]

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[6] For a clear recent discussion of this point, *see* Russell Pittman, *Who Are You Calling Irrational? Marginal Costs and the Pricing Practices of Firms*, Discussion Paper EAG 09-3, Antitrust Division, US Department of Justice, June 2009.

[7] For a comprehensive treatment of pass-through rates and their uses in economic analysis, *see* Weyl & Fabinger, *supra* note 5.

[8] For an instructive examination of this point and a demonstration that pass-through assumptions can have dramatic effects on predicted post-merger price changes, *see* Luke Froeb, Steven Tschantz, & Gregory J. Werden, *Pass-Through Rates and the Price Effects of Mergers*, INT'L J. OF INDUS. ORG., 23, 703-15, (December 2005).

Since price increases are the focus of concern in merger enforcement, however, it seems better to make decisions about where to concentrate enforcement resources on estimates of post-merger price changes, even if one has to make additional assumptions to obtain them, than estimates of upward pricing pressure, a quantity unrelated to any measure of consumer harm. The tools that FS have developed enable one to obtain plausible estimates of post-merger price changes using only the information necessary to compute UPP or UPP*.

Consider a simple blackboard example. Firms 1 and 2 both have constant marginal cost equal to C and face symmetric demand curves:

(5) $$Q_i = \alpha - \beta P_i + \gamma P_j; i,j = 1,2, i \neq j, 0 < \gamma < \beta,$$

where the Q's are quantities demanded. For these demand curves both diversion ratios are equal to $D = \gamma/\beta$, and both pre- and post-merger equilibria are symmetric. Under these assumptions and the assumption that the impacts of other firms' price changes triggered by the merger on the demands of the merging firm are small enough to be ignored, it is straightforward to compute the pre- and post-merger prices and thus the actual percentage price change:

(6) $$\Delta P/P = UPP^*/[2P(1 - D)] = [DM - E(1 - D)(1 - M)]/[2(1 - D)] \equiv PCAL,$$

where $M = (P - C)/P$ is the (common) pre-merger percentage markup over marginal cost, and PCAL is short for Price Change Assuming Linearity. PCAL is increasing in M and D and decreasing in E, as one would expect. In this example, the information needed to compute UPP* is sufficient to compute the post-merger price change exactly. If the two firms have different values of price, marginal cost, E, and the demand parameters in (5), the situation is more complex algebraically, but not conceptually: the information necessary to compute UPP_1^* and UPP_2^* is sufficient to compute the post-merger price change exactly if demand is linear.[9]

Equation (6) shows that in this example UPP* provides a more natural vehicle than UPP for analysis of post-merger price change.[10] But it also shows that UPP* by itself is not a good predictor: Under demand linearity two mergers with the same value of UPP* but very different diversion ratios would produce very different post-merger price changes. Since post-merger price changes are what matter, if we knew that demands were linear it would seem clearly better to employ an estimate like PCAL as a screening device rather than any estimate of upward pricing pressure.

There is no reason to believe that demand curves are generally linear, of course, and thus no basis for asserting that estimates like PCAL are likely to be particularly accurate in most cases.[11] But that's not what matters in merger enforcement. In that context, what matters is

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[9] If one has estimates of pre-merger prices, quantities, marginal costs, efficiencies, and diversion ratios, all of which are necessary to compute UPP or UPP*, one can write down six equations in the six unknown demand parameters: two demand equations (5) linking actual prices with actual quantities, two diversion rate equations $D_{ij} = \gamma_j/\beta_i$, and two first-order conditions for the optimality of pre-merger pricing. Solving for estimates of the six demand parameters and using the other estimates, one can directly compute estimates of the post-merger price changes. There are undoubtedly more efficient ways of doing this, but developing them would take me far beyond the bounds of this paper.

[10] The estimate of post-merger price change that FS propose in their equation (6) becomes $2UPP/(4 - D^2)$, using the pre-merger firm-specific pass-through rate under demand linearity, which will almost always underestimate the actual price change under linearity.

[11] *See* Froeb et al, *supra* note 8 for a discussion of merger simulation techniques of this sort.

whether such estimates would do a better job than quantities like UPP of alerting enforcement authorities to those mergers most likely to have significant anticompetitive effects. If all demands were linear, the answer would be clear. Even if though they were (probably) not, I would argue that ranking mergers by estimated post-merger price increase seems more likely to generate an appropriate enforcement agenda than ranking them by a better estimate of a less directly relevant quantity like upward pricing pressure.[12] On the other hand, if formulaic simplicity is of paramount importance, one might choose to employ a measure like UPP or UPP* despite its indirect relation to consumer welfare.

In the presence of differentiation, it is important not to avoid rigid, formulaic use of any quantitative screening device. Consider, for instance, an intersection of two busy roads at which there are only two gasoline stations, and suppose there are stations fairly densely situated along both intersecting roads and elsewhere in the surrounding large urban area. The two stations in the intersection propose to merge. While one might be able to ignore product differentiation here, geographic market definition would be problematic. Taking the whole of the large urban area as a market would surely understate the impact of any merger that involved stations in only part of the area, while any smaller market could be (validly) attacked for omitting close competitors of firms within the alleged market. A two-station, one-intersection market would be laughed out of court—and properly, I would think.

Now consider formulaic use of UPP, UPP*, or PCAL. The best available measure of marginal cost is almost certain to be the wholesale price of gasoline, and both stations will set their prices above that measure in order to cover their fixed costs. Since each of these stations is the other's closest competitor, both diversion ratios are likely to be substantial. The merger may reduce fixed costs of various sorts, but it is unlikely to lower the wholesale price of gasoline. Thus, unless the analysis involves a default efficiency parameter with an unjustifiably large value, both UPPs and UPP*s are likely to be substantial, along with post-merger price change estimates like PCAL. But most economists would expect competition from stations not in the intersection to make anything beyond tiny post-merger price increases unsustainable. Support for this sort of expectation, based on other information about the marketplace, should be sufficient to rebut predictions based on formulaic analysis of upward pricing pressure or estimates of post-merger price increases that rest on unverified assumptions about demand functions.

VI. CONCLUSIONS

As I stated at the outset, I believe Farrell and Shapiro have made a significant contribution to the economic analysis of mergers that has the potential to improve merger enforcement. Most economists agree with them that the traditional market definition approach is often not the best available method to assess competitive impact, particularly in markets with differentiated products, and most of us hope that courts will come to recognize that whatever Congress meant by "in any line of commerce or in any activity affecting commerce in any section of the country," they did not mean "in a well-defined antitrust market." I have argued here that the FS approach can be improved by modifying it slightly to handle post-merger cost

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[12] The main advantages of the assumption of linearity are tractability and familiarity. If some other functional form with a priori reasonable properties proves to be more tractable, it could be used instead to estimate post-merger price changes. Or one could employ several different functional forms, choosing among them only if the choice substantially affected enforcement priorities.

changes consistently and to focus directly on post-merger price changes and that it should be used carefully and with due regard for other relevant evidence.