

The State of Critical Loss Analysis: Reply to Scheffman and Simons

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Scheffman and Simons' (S&S's) principal defense of critical loss analysis (CLA) is that "it is 'just arithmetic' and completely neutral as to the appropriate theoretical model that best explains any real life market."¹ If this characterization were accurate, and if CLA were likely to give the right answer in merger analysis most of the time, we would applaud its use. However, we do not believe that this is the case.

First, CLA involves much more than "just arithmetic." It requires *estimating* margins and demand elasticities using a consistent economic framework. Estimation is highly involved, and a consistent framework is required for the estimates to have meaning. By "consistent framework" we mean an estimation framework that incorporates basic axioms of economics. S&S say that they are not anti-economic theory, but their characterization of CLA as "just arithmetic" leaves significant doubt. If CLA really were "just arithmetic," economics would have *no* role.²

Second, the model-free nature of standard³ CLA that S&S praise so strongly is the heart of the problem with the technique. We fully accept the scientific principle known as "Occam's Razor," which strives for simple theories with the fewest assumptions necessary to explain observed phenomena. However, standard CLA is so model-free that it can generate predictions that are inconsistent with basic economic principles (e.g., optimizing behavior). In short, we think standard CLA takes Occam's Razor much too far. In our view, this has led to erroneous predictions in important merger cases. We also believe it has diverted attention away from the real factors that govern premerger and post-merger pricing incentives.

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CLA Is More Than "Just Arithmetic"

Scheffman and Simons' three-step approach to implementing CLA is as follows:

1. Estimate the incremental margin and calculate the volume the hypothetical monopolist would have to lose to make the hypothesized price increase unprofitable (the "Critical Loss" or "CL");
2. Separately determine as a factual matter what the Actual Loss in volume is likely to be as a result of the hypothesized price increase (the "Actual Loss" or "AL");

¹ David T. Scheffman & Joseph I. Simons, *The State of Critical Loss Analysis*, Antitrust Source, Nov. 2003, at 2, <http://www.abanet.org/antitrust/source/nov03/scheffman.pdf>.

² The cornerstones of economics are optimizing and equilibrium behavior among firms and consumers. Arithmetic is a tool used to build and support these cornerstones, but it has nothing to do with the cornerstones themselves.

³ By "standard CLA" we mean CLA conducted according to the three-step approach presented by S&S.

3. Compare estimates of Actual Loss with Critical Loss. If the former is larger than the latter, then the market must be expanded.”⁴

Step One requires estimating the premerger incremental margin. Although antitrust analysts often apply simple arithmetic to accounting data to obtain crude estimates of margins, it is well understood that accounting data can yield unreliable estimates of economic margins. The most significant problem is that accounting costs may not reflect actual economic costs. Therefore, a reliable estimate of the economic margin requires a more elaborate analysis. One approach is to use econometric methods to estimate the firm’s cost function using data on output and factor prices. This is seldom done in merger analysis because of time constraints and the cost of assembling and analyzing the appropriate data. What is typically done instead is to check whether margins estimated from accounting data are consistent with other information relevant to the firm’s optimal pricing decision.⁵ For a profit-maximizing firm, relevant information includes evidence about how the firm’s sales would respond to changes in its price. So a careful estimate of the margin, which critical loss analysis requires, involves much more than arithmetic.

Step Two requires estimating the actual loss that would result from a hypothetical price increase. Estimating consumer responses to changes in prices is also a complex undertaking. A variety of information may be relevant, including testimony, business planning documents, survey evidence, and econometric estimates of demand. All of these methods yield imperfect estimates of the actual loss. As a result, regardless of the method used, one should check whether estimates of demand elasticities are consistent with other evidence that provides information about demand elasticities. For a profit-maximizing firm, this includes evidence about the firm’s margin. While the exact relationship between the margin and the elasticity of demand will vary based on the particular theory of oligopoly employed, we know of no economic theory in which firms have positive price-cost margins that are invariant to demand elasticities.⁶ Again, a careful estimate of the actual loss, which critical loss analysis requires, involves much more than arithmetic.

Step Three is the only one of the three steps outlined by S&S that is “just arithmetic.” However, this step requires comparing the actual loss from Step Two with the critical loss from Step One. The quality of the inference one can draw from this comparison is only as good as the quality of the estimates in the first two steps, which both involve much more than arithmetic.

On the Linkage Between Margins and Demand Elasticities

We find it curious that S&S would use the word “separately” in Step Two of their description of critical loss analysis: “Separately [i.e., separately from margin estimation] determine as a factual matter what the Actual Loss in volume is likely to be.” Since there is no economic theory under which a profit-maximizing firm will have a positive margin that is independent of the demand elasticities (actual losses) it faces, the S&S approach of separating margin and demand analysis can, and often does, lead to predictions that are not consistent with any economic theory.

⁴ Scheffman & Simons, *supra* note 1, at 3.

⁵ This consistency check is appropriate even if margins are based on econometric estimates of the firm’s cost function.

⁶ There are economic theories under which a firm may have zero economic margin regardless of the demand elasticity. For example, an upstream firm selling to a downstream monopolist may find it optimal to charge a wholesale price equal to marginal cost and use a fixed fee to collect its profit. In this example, the wholesale price does not depend on the demand elasticity. However, this example is not relevant for the application of CLA to industries in which firms have positive margins.

“One should not increase beyond what is necessary the number of entities required to explain anything.”

—Occam’s Razor

To understand this point, it helps to consider a simple example that illustrates one way that separating margin and demand analysis can lead one astray. Consider a merger between two firms, A and B, which have constant marginal cost, do not face binding capacity constraints, and are unable to coordinate their pricing prior to the merger. Suppose the estimate of the premerger margin for both A and B is 50 percent, and the estimate of the aggregate elasticity of demand for products A and B is 3 at prices within, say, 5 percent of the premerger price. This means that the actual loss in unit sales from a 1 percent increase in the prices of both A and B would be 3 percent. The critical loss for a 1 percent price increase in this case is about 2 percent.⁷ So the application of standard critical loss analysis would suggest that a 1 percent price increase would not be profitable because the estimated actual loss exceeds the estimated critical loss. We have seen critical loss analyses like this numerous times.

The problem with this type of critical loss analysis is that, in this example, the premerger prices of firms A and B exceed the monopoly price. We know this because the monopoly margin is no higher than the inverse of the elasticity, 33 percent, which is less than the premerger margin of 50 percent.⁸ Therefore, firms A and B could increase their premerger profits by cutting price either unilaterally or in concert. This example shows that the critical loss analysis embodied in S&S's three-step approach need not be consistent with profit maximization. This runs counter to their claim that the only assumption required for CLA is "the simple assumption of profit-maximization."

One might argue that this example amounts to a straw man, since we chose the numbers and the assumptions (smooth demand and costs and no premerger coordination)⁹ to illustrate how the prediction from standard CLA may be inconsistent with economic theory. However, we have seen many critical loss analyses that commit this logical error. An example is the critical elasticity analysis conducted by the defendant's experts in the *Swedish Match* case (see the discussion in our original article).¹⁰ A less obvious inconsistency in standard CLA occurs when the cross elasticity (or diversion ratio) between the products of the merging firms is too large for the margin assumed in the CLA analysis to be consistent with profit maximization. We have argued that this inconsistency was present in the critical loss analysis presented by the defendant's expert in the *Poplar Bluff* case (see our original paper).¹¹ We have seen numerous other examples that we are not at liberty to discuss because the information cannot be made public.

⁷ Recall that $Critical\ Loss = (\% Price\ Increase) / (\% Price\ Increase + Margin)$. In this example, the critical loss equals $1 / (1 + 50)$, which is slightly less than 2%.

⁸ Given the assumptions in this example, the optimal premerger margin is $Margin = (Price - Marginal\ Cost) / Price = 1 / Own\ Elasticity\ of\ Demand$.

⁹ We believe these assumptions represent the "normal" case in differentiated products environments. In most of the empirical work that has been done testing oligopoly models, the investigators have not found a reason to allow for kinked demand or costs, suggesting that the assumption of smooth demand and costs is a reasonable approximation in many instances. Coordination tends to be difficult in differentiated product environments. Of course, there are exceptions.

¹⁰ Daniel P. O'Brien & Abraham L. Wickelgren, *A Critical Analysis of Critical Loss Analysis*, 71 ANTITRUST L.J. 161, 182–84. The experts in *Swedish Match* also assumed that demand and costs were smooth and that there was no premerger coordination. In a subsequent article on this issue, one of the *Swedish Match* experts appealed to premerger coordination (see http://www.nera.com/wwt/newsletter_issues/4795.pdf). Specifically, he argued that *Swedish Match*'s "perceived" own elasticity of demand was higher than its actual elasticity because a price reduction was likely to set off a price war. If true, that would indicate that the chewing tobacco firms were engaged in a form of tacit coordination prior to the merger.

¹¹ See O'Brien & Wickelgren, *supra* note 10, at 179–82.

As we noted in our original paper, special conditions,¹² such as kinked demand or costs, or premerger coordination, may in some cases reconcile evidence about margins and the actual loss with rational economic behavior.¹³ S&S also appeal to kinked demand or costs as possible ways to reconcile estimates of margins and the actual loss with rationality. However, they do not offer specifics on the nature of the required kinks, how to evaluate their presence, or what other implications the kinks might have for evaluating the merger.¹⁴ We have seen numerous examples of standard CLA where one of these conditions was required for the reported margins and actual losses to make any sense. However, we have never seen a critical loss analysis in which the presenter appealed to any of these conditions. Our position is that if demand is known to be kinked, then this fact should be incorporated in the oligopoly theory used to evaluate the merger.¹⁵

S&S also suggest that bargaining between the buyer and seller might be sufficient to reconcile evidence of margins and the actual loss with economic theory. The way S&S address this point is illustrative of our problem with their approach. They point out that when firms bargain over prices, margins may not equal the inverse of demand elasticity. However, they go no further than this. They do not attempt to explore how bargaining might affect the margin-elasticity relationship, nor do they examine the implications that negotiated prices might have for CLA. In fact, bargaining does alter the relationship between margins and elasticities, but it typically does not sever the relationship completely, as assumed in standard CLA. This is illustrative of the fundamental problem with CLA: it encourages the mechanical application of a formula based on imprecise estimates without regard to whether the estimates and predictions make sense given the prevailing market institutions.

S&S apparently do not find it important to be explicit about the particular special conditions (e.g., kinks at or coordination on the premerger price) that may be required to reconcile evidence about margins and the actual loss. Instead, they would apparently argue that if some special condition is required to make the evidence consistent, then some special condition “must” actually hold. However, an alternative explanation that is at least as plausible is that the estimates used in the CLA are wrong. S&S seem to believe that kinked demand or costs at the prevailing price, or premerger coordination, or some other unspecified special condition, are more likely occurrences than the mis-estimation of margins or the actual loss (demand elasticity). We do not understand the basis for this belief. As we discussed above, developing estimates of margins and the actual loss are highly involved tasks. Our position, which we stated in our original paper, is as follows: in instances in which special conditions like kinked demand, kinked costs, or premerger coordination on the prevailing price are required to reconcile estimates of margins and the actual loss

“Everything should

be as simple as it is,

but not simpler.”

—Albert Einstein

¹² By “special conditions” we mean conditions that tend not to appear in the initial exposition of oligopoly theory in undergraduate textbooks. For the purposes of this discussion, we include kinked demand, kinked costs, and coordinated behavior in this category.

¹³ It is important to note that an actual kink is required. Smooth, but rapidly changing, demand elasticity does not make this analysis consistent with economic theory because it will still be the case that a small price decrease would increase the profits of the two firms prior to the merger.

¹⁴ The nature of the assumed kink is important. For example, one theory of kinked demand is that the demand facing an individual firm may be more sensitive to price increases than to price reductions because rivals may tend to follow price increases but not price reductions. This theory, originally due to Paul Sweezy, *Demand Under Conditions of Oligopoly*, 4 J. POL. ECON. 568 (1939), is now recognized as a naive form of tacit coordination. See JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* 240–44 (1988).

¹⁵ For example, the consultants for the defendants in *Swedish Match* assumed that demand was smooth (not kinked) at prevailing prices in their estimate of the actual loss. This assumption rules out kinked demand as a potential way to reconcile their results. The remaining possible explanations are kinked costs, such as capacity constraints, premerger coordination, or erroneous estimates of the margin or actual loss.

with economic theory, if the parties do not present evidence that one of these conditions is plausible, then one should infer that either their margin or actual loss estimates are very inaccurate.

The Use of Economic Models in Antitrust Analysis

S&S say that the beauty of CLA is that it does not require any assumptions beyond profit maximization. By contrast, they say that our analysis (as well as that of Katz and Shapiro) “depend[s] on the applicability of their (too simplistic, in our view) economic models to the facts of a particular merger and industry.”

We have emphasized the importance of looking at all the evidence and using it to develop a consistent picture of the market. That is, there should at least be a reasonable economic model for which one’s estimates of the market demand elasticity, cross-elasticities, and existing margins are all consistent with profit maximization. Of course, the parties may disagree about what economic model is most appropriate for the industry in question. The great benefit of economic modeling is that it forces the analyst to be explicit about the assumptions driving the analysis. The debate over the appropriate model then boils down to a debate about which assumptions are most appropriate given the prevailing market institutions.

We demonstrated above that in some cases the S&S approach can lead to predictions that are not consistent with profit maximization. In other cases, a great deal of imagination may be required to reconcile estimates of margins and the actual loss with economic theory. We see little beauty in this.

As to the simplicity of the assumptions we used in our critique of standard CLA, we emphasized that the particular oligopoly model chosen was not important for our main points. We noted that standard CLA ignores completely the relationship between margins and elasticities and the role of cross elasticities, and we explained the consequences of these omissions. We noted that the prediction of standard CLA—that mergers are less likely to be anticompetitive when margins are high—is inconsistent with most oligopoly theory. Although we chose the model of differentiated Bertrand competition to make these points, we noted that we could have made them using other widely-used oligopoly models, including that of Cournot competition or that of a dominant firm facing a competitive fringe. Our key points are quite robust.

We agree with S&S that the Bertrand model we employed in our article is relatively simple. When competition takes place on dimensions other than price, or when dynamic considerations play a role, the oligopoly theory used to analyze the merger should account for these factors, if they are significant. However, the S&S characterization of the static Bertrand model as “simplistic” is quite curious given that their CLA completely ignores the margin-elasticity relationship that almost any model of profit-maximizing behavior requires. The Bertrand model, by contrast, assumes rational behavior among competing oligopolists. Its two main building blocks are profit maximization and equilibrium behavior, which are the fundamental building blocks of all of oligopoly theory. The assumption that competition is static (one period) and that firms compete by choosing price (Bertrand) are details that can be changed to correspond to the specific institutions. The main points in our article rely on the two key building blocks, not on the specific assumption of Bertrand competition.

S&S appear to dislike using economic theory to analyze mergers. They say that the Bertrand model is too simplistic for merger analysis, yet they offer no alternative framework for making consistent predictions. They say that they are not anti-economic theory, but their failure to incorporate relationships implied by economic theory into their critical loss analysis leaves significant doubt. Merger analysis is prospective and therefore requires the intellectual discipline imposed by basic

economic reasoning. Standard CLA, as presented by S&S, is not enough to make valid predictions about the effects of mergers on a consistent basis. More structure is required. We think the static Bertrand model does quite well explaining behavior in some environments (e.g., differentiated markets where premerger coordination is unlikely, firms are not capacity constrained, and price is the most important strategic variable). However, it is clear that this model does not fit every situation. If S&S do not like the static Bertrand model for analyzing differentiated products mergers, then they are free to adopt (or develop) an alternative model that fits the market institutions better in a given situation. However, they need to use some economic model in order to make predictions that are consistent with economic theory. Standard CLA does not do this. ●