A Critical Analysis of Critical Loss Analysis

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Abstract

Critical loss analysis is often used to argue that firms with large margins have more to lose from a reduction in sales and hence are less likely to increase prices. This argument ignores the implication of economic theory that profit-maximizing competitors that do not coordinate their pricing only have large margins if their customers are not very price sensitive. We explore the implications of critical loss analysis using an internally consistent model of oligopoly. We show that for a given degree of substitutability between the merging firms' products, firms with larger pre-merger margins will raise prices more than firms with smaller margins. This reinforces the traditional view that mergers are more likely to harm consumers when the merging firms have greater market power, as measured by their margins. We also derive internally consistent formulas for evaluating the profitability of price increases when defining markets and evaluating unilateral competitive effects.

I. Introduction

Critical loss analysis is a widely-used technique in antitrust practice.[1] The basic idea is simple. One asks: "given a price increase of X percent,[2] what would the percentage loss in unit sales have to be to make the price increase unprofitable?" This loss is referred to as the "critical loss for an X-percent price increase." If the actual loss is less than the critical loss, the price

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[1] The use of critical loss analysis was first suggested by Barry C. Harris and Joseph J. Simons, "Focusing Market Definition: How Much Substitution is Necessary?" *Research in Law and Economics*, v. 12, 1989, p.207-226. Since it was proposed, it has appeared in numerous White Papers presented to the antitrust agencies, numerous pre-trial affidavits, and expert testimony offered on behalf of antitrust defendants.

[2] The analysis applies equally well for any potential price increase.

which would imply that the current price is not profit-maximizing).[4] This means that when margins are larger, a price increase will usually result in *fewer* lost sales than when margins are smaller. In short, the argument that a large percentage of sales would be lost in the event of a price increase is typically inconsistent with the existence of large pre-merger margins for profit maximizing firms.

A second fundamental error of the standard critical loss analysis is that it ignores the importance of the degree of substitutability (e.g., the cross elasticities of demand or diversion ratios) among the products of the firm considering the price increase. The greater the cross elasticities, the more the firm will profit from increasing the price of one product because it will capture a larger percentage of the lost sales through increases in the sales of its other products. As an extreme example, consider a merger that would combine two products that have zero or very low cross elasticities between each other. A post-merger price increase on one of the products would not significantly raise the sales of the other, so the merger provides little or no incentive to raise price. On the other hand, suppose the merging firms have very high cross elasticities between each other. In this case, a price increase for one of the merging products results in substantial sales diverted to the other product, increasing the merged firm's profits. If margins are high, so that the diverted sales are highly profitable, the merged firm will have a relatively higher incentive to raise price absent offsetting entry, product repositioning, or efficiency gains.

In the "hypothetical monopolist test" outlined in the Merger Guidelines for defining markets, the hypothetical monopolist always controls multiple products. The question of whether a price increase would be profitable *cannot* be answered without accounting for the

[4] This assumes that the firms are not coordinating their behavior. If the firms are tacitly colluding, then margins

cross elasticities among the products under the monopolist's control. Similarly, since a merger alters the set of products under a firm's control, the analyst *must* account for cross elasticities when assessing the profitability of a post-merger price increase. However, critical loss analysts often fail to do this.

The important roles of the margin/elasticity relationship and cross elasticities for optimal pricing are stressed in economics and business school courses on pricing and strategy. However, the implications of these factors for critical loss analysis are not widely appreciated in the antitrust community. The purpose of this article is to clarify the role of these factors in firms' pricing decisions and to explore rigorously the implications of these factors for critical loss analysis.[5]

We examine critical loss analysis using a standard Bertrand pricing model, which is the most widely-used framework in economics for modeling oligopoly among price-setting firms that do not coordinate their behavior. We focus on differentiated products, although the central result that high margins tend to make post-merger price increases more likely also emerges from standard theories of competition among producers of homogenous products.[6] The analysis is applicable both to market definition, where the merger would be a hypothetical merger to monopoly, and competitive effects analysis, where the question is whether it would be profitable for the merging firms to increase price after the merger. By explicitly modeling oligopoly price-

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[5] We should note that our critique does not invalidate the critical loss *formula* derived in Harris and Simons (op. cit.) as an algebraic statement about the loss necessary to make a given price increase unprofitable. Our criticism is directed at the application of the formula without regard to whether the assumptions and conclusions in the

setting and carrying out an internally consistent analysis within this framework, we obtain the following results: (1) For a given degree of product substitutability between the products (that is, a given cross-price elasticity or diversion ratio), larger margins make it *less* likely that the actual loss will exceed the critical loss from a price increase.

significantly greater than the cost savings from a small reduction in output.

Assumptions 1 and 2 are core premises of competition policy toward horizontal mergers. The assumption that profit maximization "provides a good first approximation in describing business behavior"[9] is a basic postulate of most of economic analysis. Profit maximization is also a key assumption of critical loss analysis, which involves balancing the gains and losses from a price increase. The assumption that mergers make coordination more likely may not hold

differentiated product in competition with several other firms.[10] To simplify the analysis, we assume linear demand and constant marginal cost. We also assume that each firm chooses its own price unilaterally to maximize profits prior to the merger.

Suppose firms A and B propose to merge. The government believes that the appropriate product market for analyzing the merger includes only products A and B. The merging firms contend that the market is broader. In support of their claim, the merging firms' consultants present a standard critical loss analysis. They argue as follows:

> The percentage margin earned by firms A and B is 60 percent. Thus, the "critical loss" in unit sales above which a 5 percent price increase would be unprofitable is 7.7 percent. The testimony indicates that a 5-percent increase in the prices of products A and B would likely result in a loss in unit sales of A and B of at least 10 percent, which exceeds the critical loss. This means that a 5 percent price increase would not be profitable, so the relevant product market must include other products in addition to products A and B.

This argument is typical of the critical loss analyses presented in numerous antitrust cases. In order to evaluate it, we first need to understand how the critical loss is determined.

The critical loss for an X-percent price increase is the percentage reduction in quantity required for the price increase to leave profits unchanged.[11] Calculating the critical loss requires balancing two effects: 1) a given price increase raises the profit margin earned on all units that are sold, but 2) it also reduces the quantity demanded resulting in fewer units being sold. The critical loss is the percentage reduction in quantity such that these two effects just balance. If the

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reduction in unit sales is greater th

where $m = (p-c)/p$ is the margin measured as a percentage of the price. Since $\Delta p/p$ is just the percentage price increase, condition (3) implies that the critical loss for an X-percent price increase is

$$\text{(4)} \qquad Critical\ Loss = \frac{X}{X + m}.$$

The formula for the critical loss in (4) shows that for a given price increase of X percent, the critical loss is smaller the larger is the margin. Intuitively, the larger is the margin, the greater the profit lost from a given reduction in quantity, so the smaller the reduction in quantity required for a given price increase to be unprofitable.

If the margin is 60 percent, as the merging firms in our example contend, the critical loss from a 5 percent price increase is

$$\text{(5)} \qquad Critical\ Loss = \frac{.05}{.05 + .6} \cong .077,$$

or about 7.7 percent. In the example, the merging firms argue that the unit sales lost from a 5 percent price increase on both products would be at least 10 percent. Since this loss exceeds the critical loss, they conclude that a 5 percent price increase would not be profitable. The implication they draw is that the price increase would cause enough customers to switch to other products that the price increase would be unprofitable, suggesting that the relevant market must .j /TT1 5(lt m)9

The calculation is simply algebra, and formula (4) is certainly correct. The problem arises in the interpretation of (4) in light of evidence about the actual loss from a given price increase. Economic theory tells us quite a bit about the relationship between the actual loss from a price increase and the critical loss expressed in (4). An antitrust argument that is grounded in economics must recognize this relationship when evaluating evidence about the actual loss from a price increase. We will show that, by ignoring this relationship, the standard critical loss analysis is internally inconsistent and often leads to faulty conclusions.

We begin our critique by describing what economic theory tells us about the actual loss in unit sales from a given price increase. It is helpful conceptually to think about breaking the price increase into two steps involving first an increase in the price of product A and then an equivalent increase in the price of product B.[13] A price increase of X percent for product A causes a reduction in the quantity demanded for product A. Because products A and B are substitutes, it also causes an increase in the demand for product B. Denote the own elasticity of demand for product A as E^{Own} and the cross elasticity of demand for product B with respect to the price of product A as E^{Cross}.[14] An X-percent increase in the price of product A causes the unit sales of product A to fall by the amount of the price increase times the own elasticity of demand,

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[13] If the firms have multiple products, then one needs to consider how increases in the prices of each product affect the demand for all of the products of both firms. The analysis is similar, though more complex, and the qualitative conclusions for critical loss analysis are unchanged.

[14] The own elasticity of demand for product A is the percentage reduction in unit sales for product A divided by the percentage increase in its price for a small increase in price. The cross elasticity of demand for product B with respect to the price of product A is the percentage increase in unit sales for product B divided by the percentage increase in the price of product A for a small increase in price. We follow the convention of expressing own elasticities as positive numbers even though the change in own quantity from a price increase is negative. Technically, these definitions are for "point" elasticities corresponding to small price changes, which generally may differ from "arc" elasticities appropriate for evaluating the effects of larger price increases like those contemplated by the merger guidelines (e.g., 5 and 10 percent). While arc elasticities are usually defined using the average price and quantity as the base, we use the initial price and quantity as the base since the merger guidelines measure percentage price increases using initial prices as the base. With arc elasticities defined this way, the point and arc elasticities are equivalent under the special case of linear demand.

i.e., by XE^{Own} percent. Similarly, the price increase causes the unit sales of product B to rise by the amount of the price increase times the cross elasticity of demand, or XE^{Cross} percent. Since products A and B are symmetric in this example, an X-percent increase in the price of product B causes the unit sales of product B to fall by XE^{Own} percent and the unit sales of product A to rise by XE^{Cross} percent. Combining these effects, a price increase of X percent for both products A and B causes a reduction in the unit sales of $X[E^{Own} - E^{Cross}]$ percent for both products. So the actual loss in percentage terms experienced by the hypothetical monopolist from an X-percent price increase is

(6) $$Actual\ Loss = X[E^{Own} - E^{Cross}].$$ [15]

One more step is necessary before we can assess the consistency of standard critical loss analysis. The pre-merger margins of firms A and B provide information about the extent to which consumers are willing to substitute away from their products. A profit maximizing firm raises price to the level at which the benefit of an additional price increase on each unit sold is just offset by the reduction in sales due to the additional price increase. Denote the quantity of product A by q^A, the increase in the price of product A by

(11) $$Actual\ Loss \quad X\left[\frac{}{m} \quad E^{Cross}\right] > \frac{X}{X+m} = Critical\ Loss$$

Recall that the merging firms in our example argued that the actual loss from a 5 percent price increase for both products would be 10 percent or more. However, if we accept the merging firms' assumption that the margin is 60 the actual loss that a hypothetical monopolist experiences from a given price increase is also smaller the larger is the margin.

In our example, the actual loss to the hypothetical monopolist from a 5 percent price increase cannot exceed 8.3 percent. This is the actual loss when the cross elasticity between products A and B is zero (to see this, set $E^{Cross}=0$ in (14)). Note that this amount is greater than the critical loss of 7.7 percent in the example, so that it is still possible for the actual loss to exceed the critical loss and for the *conclusions* of the critical loss analysis to be correct. However, the actual loss exceeds the critical loss in the example only if the cross elasticity is quite small, i.e., only if

$$\text{(15)} \qquad \textit{Actual Loss} = .05[\frac{1}{.6} - E^{Cross}] > \frac{.05}{.05+.6} = \textit{Critical Loss}\,.$$

Condition (15) is true only if $E^{Cross} < .13$. This is a fairly low cross elasticity, indicating that products A and B are not especially close substitutes. For example, the diversion ratio from A to B would have to be less than 8 percent. Again, this is in line with standard intuition: in a concentrated industry with high margins and significant diversion ratios, a merger is likely to be anticompetitive in the absence of offsetting efficiencies, entry, or product repositioning.

Although the discussion to this point has focused on the effects of combining two products, it should be apparent that the analysis extends straightforwardly to the effects of combining any number of symmetric products. In particular, an X-percent price increase for N symmetric products is profitable if the *sum* of the cross elasticities between any one of the N products and the N-1 rival products in the group exceeds the critical cross elasticity, or if the *sum* of the diversion ratios exceeds the critical diversion ratio.[21] Formulas 6 through 15 are still valid,

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[21] The analog of equation (6) for the N-product case is *Actual Loss* = $X[E^{Own} - (N\text{-}1)\mathrm{E}^{\mathrm{Cross}}]$. The sum of the diversion ratios from one product to the other N-1 products is the "aggregate diversion ratio" defined by Katz and

but the cross elasticity E^{Cross} is interpreted as the sum of the cross elasticities between one of the products and the other products in the group. Similarly, the diversion ratio is interpreted as the "aggregate diversion ratio" from one product to all the others in the group. Using this interpretation, it is possible to use conditions (12) and (13) to conduct the hypothetical monopolist test for more than two products. The formulas are exact when products are symmetric. A more complex calculation is required for asymmetric cases. However, a

Another important special case is constant elasticity demand, which assumes that the elasticity does not change with price. Table 2 presents the critical cross elasticities and diversion ratios for the constant elasticity case.[22] The critical values are significantly lower in this case than they are under linear demand. This difference arises because the actual loss from a given price increase is smaller under c

Table 2: Critical Cross Elasticities and Diversion Ratios for the Profitability of an Increase in the Price of N Symmetric Products – Constant Elasticity Demand

	1% Price Increase		**5% Price Increase**		**10% Price Increase**	
Margin	Critical Cross Elasticity	Critical Diversion Ratio	Critical Cross Elasticity	Critical Diversion Ratio	Critical Cross Elasticity	Critical Diversion Ratio
10%	0.38	3.8%	1.05	10.5%	1.14	11.4%
15%	0.17	2.5%	0.56	8.4%	0.71	10.7%
20%	0.09	1.8%	0.33	6.7%	0.47	9.4%
25%	0.06	1.4%	0.22	5.4%	0.32	8.1%
30%	0.04	1.1%	0.15	4.4%	0.23	6.9%
35%	0.03	0.9%	0.10	3.7%	0.17	5.9%
40%	0.02	0.7%	0.08	3.0%	0.13	5.0%
45%	0.01	0.6%	0.06	2.5%	0.09	4.3%
50%	0.01	0.5%	0.04	2.1%	0.07	3.6%
55%	0.01	0.4%	0.03	1.8%	0.06	3.0%
60%	0.01	0.3%	0.02	1.4%	0.04	2.5%
65%	0.00	0.3%	0.02	1.2%	0.03	2.1%
70%	0.00	0.2%	0.01	0.9%	0.02	1.7%
75%	0.00	0.2%	0.01	0.7%	0.02	1.3%
80%	0.00	0.1%	0.01	0.6%	0.01	1.0%
85%	0.00	0.1%	0.00	0.4%	0.01	0.7%
90%	0.00	0.1%	0.00	0.3%	0.01	0.5%

Note: For a price increase on $N \geq 2$ products, the critical cross elasticity (critical diversion ratio) is compared with the sum of the cross elasticities (diversion ratios) between one product and each of the N-1 other products in the group.

Readers will no doubt notice that the critical values in Tables 1 and 2 are quite different from each other. This shows that the profitability of a particular price increase is quite sensitive to the shape of the demand curve. While unfortunate, since in most cases the shape of the demand curve is unknown, this is unavoidable. It does suggest, however, that one should be cautious in using the critical values in Tables 1 and 2 to evaluate mergers. One way to approach this issue is to view Table 1 as "conservative" in predicting when mergers might be problematic, and to view Table 2 as "conservative" in the opposite sense of stopping mergers that have any chance of being problematic. Alternatively, if one does have information about the shape of the demand curve, the techniques in this article could be used to derive critical cross elasticities and diversion ratios for the profitability of different price increases.[23]

B. Can Critical Loss Analysis Be Consistent with Economic Theory?

Our critique of standard critical loss analysis illustrates how to modify it to make it consistent with static Bertrand oligopoly theory, the most widely-used theory in economics to analyze price competition among imperfectly competitive firms that do not coordinate their pricing. The key predictions of this theory are given in conditions (12) and (13). The important factors for determining the profitability of a price increase are the pre-merger margin and the cross-elasticity of demand or diversion ratio. If the cross elasticity or diversion ratio is less than a critical value that varies inversely with the margin, then the price increase is not profitable.

The standard critical loss formula is an algebraic calculation that is not based on any assumptions about firms' pre-merger behavior. Thus, standard critical loss analysis -- comparing the critical loss formula with evidence about the actual loss -- does not incorporate the consistency requirements of any economic theory. Under most economic theories, higher margins tend to be associated with lower own-price elasticities of demand. The idea is that it only makes sense for a firm to charge high prices (hence high margins) if its customers are not very price sensitive. Standard critical loss analysis effectively ignores this relationship. Therefore, standard critical loss analysis can be consistent with economic theory only in environments in which the usual inverse relationship between margins and own-price elasticities does not hold.

In the introduction, we described four key assumptions of our analysis, at least one of which would have to be violated for standard critical loss analysis to be consistent with

[23] Of course, if one knows the shape of the demand curve, one could simulate the *profit-maximizing* post-merger prices to examine the competitive effects of the merger. In our view, this is the best technique for evaluating the competitive effects of a merger.

economic theory. One possibility is that firms fail to pursue profit maximization as their objectives. However, a basic premise of critical loss analysis is that firms *do* evaluate the profitability of a post-merger price increase. Thus, the failure of firms to maximize profits cannot be taken seriously as a justification for conducting standard critical loss analysis.

A second possibility is that firms engage in coordinated pricing prior to the merger, which yields higher margins than implied by the inverse elasticity rule, i.e., $m > 1/E^{Own}$. Pre-merger coordination is certainly a possibility in any merger situation, but standard critical loss analysis still suffers consistency problems in this case. One potential problem is the erroneous conclusion that markets are broad because a hypothetical monopolist who is already charging a monopoly price cannot profitably raise price further. One way to address this problem is by using non-collusive prices as the base for evaluating the profitability of a price increase. However, this places the analysis back into the framework we have developed, in which standard critical loss analysis suffers precisely the consistency problems we have described. A complete investigation of critical loss analysis under coordinated behavior would require an economic theory that permits coordination, predicts the degree of coordination prior the merger, and predicts how the degree of coordination would change with the merger. Such an analysis is beyond the scope of this article. However, it is worth noting that pre-merger coordination is usually viewed as grounds for blocking a merger. The economic logic for this view is that coordination is usually more likely to break down the less concentrated is the industry.

The other potential way that critical loss analysis can be consistent

Consider first the case of kinked demand. If the reduction in quantity from a small price increase exceeds the increase in quantity from a small price decrease, then the firm's own-price elasticity will be higher at prices above the prevailing price than it is at prices below this price. Facing this type of demand, it may pay a profit-maximizing firm to raise price up to the point of the kink, but then not raise price any further. In this situation, the inverse elasticity relationship may not hold, and it is possible that $m > 1/E^{Own}$ (recall E^{Own} is the elasticity defined for an *increase* in price from the prevailing level). If the margin exceeds the inverse of the own-price elasticity at the profit-maximizing price, then the critical cross elasticities and diversion ratios will be higher than the values reported in Tables 1 and 2. Further, for given values of the own- and cross-price elasticities, the higher is the margin, the smaller is the maximum price increase that will be profitable. This is consistent with the prediction of standard critical loss analysis.

A kink in marginal cost can have similar effects. For example, suppose that the merging firms are currently capacity constrained, so that the marginal cost of expanding output is very high, but the cost savings from reducing output are quite low. In this case, the margin earned on the units sold up to capacity can be quite high, potentially higher than the inverse of the own elasticity. As with the kinked demand example, the inverse elasticity relationship may not hold in the short run (until capacity quite situationginal costdo.00e distant geographic area. On the other hand, if customers are numerous and have heterogeneous preferences, they will substitute to other products at a variety of different prices. In this case the *aggregate* demand across all customers will look relatively smooth because customers will gradually substitute to other products as price is increased.

Kinked costs of the type described above may arise in the short run in some industries in which plants typically operate at capacity and expansion is expensive. On the other hand, if de-bottlenecking can be accomplished in increasing amounts at increasi

A. Tenet Healthcare

In the *Federal Trade Commission, et al. v. Tenet Healthcare Corporation, et al.* (Tenet Healthcare), two owners of hospitals in the Poplar Bluff, MO area were attempting to merge. Tenet, the acquiring firm, owned one hospital in Poplar Bluff (Lucy Lee) and another hospital (Twin Rivers) within an hour's driving time. Doctor's Regional Medical Center (DRMC), the acquisition target, was a single hospital in Poplar Bluff. In addition, there were four small regional hospitals within an hour's driving time. The merging hospitals provided both primary and secondary care. The smaller hospitals provided only primary care. The FTC claimed that the relevant geographic market included these seven hospitals. The defendant argued that the relevant market included several other hospitals more than a one hour drive from Poplar Bluff, including one very large hospita or that demand or cost curves were kinked at or just above the pre-merger price.

If one uses the information that the margins provide about the willingness of customes to switch, however, the story is likely quite different. Conditions (12) and (13) imply that a 5 percent price increase by both hospitals after the merger would be unprofitable if and only if

$$\frac{.05}{.659(.05+.659)} = .107 > E^{Cross}$$

or

$$\frac{.05}{.05+.659} = .071 > Diversion\,Ratio\,.$$

That is, a five percent price increase by both hospitals would have been profitable unless the hospitals were not very close substitutes, with a cross elasticity less than .107 and a diversion ratio less than 7.1 percent. This implies that more than 92 percent of the patients at either Lucy Lee or DRMC would have as their second choice some hospital outside of Poplar Bluff instead of the other hospital in Poplar Bluff. This seems unlikely, given that Lucy Lee and DRMC were less than 3 miles apart, while competing hospitals providing both primary and secondary care were over 50 miles away.[25] Thus, it is not surprising that other evidence in the record indicated that the two hospitals in Poplar Bluff were highly competitive. For example, third party payers attributed their success in obtaining discounted rates to "the fierce competition" between the two hospitals.[26]

As is often the case in standard critical loss analysis, the large margins asserted by the defendant's expert were not consistent with testimony about the willingness of customers to switch. In this case, a telephone survey presented by the experts purported to show that many

[25] The other Tenet hospital, Twin Rivers, was less than 50 miles away and did provide both primary and secondary care.

patients would switch to other hospitals if faced with a 5 percent price increase. How can this inconsistency be explained or resolved? If we assume that the testimony about the how readily customers would switch products was valid (in this case, the telephone survey), one of five

By presenting this example we do not intend to suggest that there is no role for testimony s(to chan thenc its estimate of the *market* elasticity of demand for loose leaf chewing tobacco.[27] The market demand that was estimated was a smooth curve with no kinks. The market elasticity was estimated to be 2.3, which implied an actual loss from a 5 percent price increase of 10.6 percent.[28] Since the estimated actual loss of 10.6 percent exceeded the critical loss of 8.3 percent, the report claimed to have shown that a 5 percent price increase by a hypothetical monopolist of loose leaf chewing tobacco would be unprofitable. The expert's conclusion was that the relevant product market should include moist snuff in addition to loose leaf chewing tobacco.

The expert's calculation, based on standard critical loss analysis, is mathematically correct. However, the estimated market elasticity is inconsistent with margins as high as the expert claimed. With margins of 55 percent, the elasticity of demand for a single brand would be 1.82 (1/.55=1.82) if prices were chosen unilaterally prior to the merger. If the margin were higher, the elasticity would have to be even smaller. Since the elasticity of demand for the whole market must be less than the elasticity of demand for a single brand, the claimed market demand elasticity of 2.3 is inconsistent with profit maximization.[29]

Again, this example is not meant to disparage the use of demand estimation for defining markets and/or assessing market power in antitrust investigations. Our point is that econometric estimates of demand elasticities must be consistent with other evidence about substitution, such as that implied by margins. One cannot simultaneously claim that demand is very elastic for the purposes of estimating lost sales from a price increase and that margins are very high, requiring that demand must be very inelastic.

We explained above that in addition to margins, the cross elasticities of demand among the merging firms' brands are critical for evaluating the profitability of a post-merger price increase. The defendant's expert report in Swedish Match did not provide estimates of the cross-elasticities among loose-leaf brands. However, it did present an estimate of the cross-elasticity of demand for *all* loose leaf chewing tobacco with respect to a price index for all moist snuff. This cross elasticity was estimated to be .5. Given this much substitution between two *different* types of smokeless tobacco --- loose leaf chewing tobacco and moist snuff --- it seems likely that the amount of substitution between the two leading brands of loose leaf chewing tobacco would also be significant. By using equation (12), however, one can see that the cross-elasticity between the two brands would have to be much smaller than the cross elasticity between loose-leaf and moist snuff to make a post-merger price increase of 5 percent unprofitable:

$$\frac{.05}{.55(.05+.55)} = .152 > E^{Cross} .$$

So, unless the cross elasticity between two different types of smokeless tobacco is more than three times greater than the cross elasticity between the two leading brands of one type of smokeless tobacco (loose-leaf), the defendant's own econometric analysis suggested that the merging firms would have found a 5 percent price increase to be profitable post-merger.

V. Conclusion

We have shown that the inference typically drawn from critical loss analysis --- that high margins make a merger less likely to be anticompetitive --- is often inconsistent with economic theory. Firms set their margins to maximize their profits. The more close substitutes there are for a firm's product, the lower the firm's margin must be to prevent customers from switching to those products. Conversely, the fewer the number of close substitutes a firm faces, the higher the margin will be. Thus, when two or more substitutes come under common ownership, the degree to which competition is reduced (loosely speaking) is greater when margins are high (because there is less competition to begin with) than when margins are low. Therefore, it should not be surprising that economic theory predicts that mergers tend to lead to greater, not smaller, price increases when margins are high rather than when margins are low. Conversely, theory predicts that mergers in more competitive markets (those with lower margins) are less likely to cause significant price increases than mergers in less competitive markets (those with higher margins), contrary to what critical loss analysis purports to show. In summary, it is the approach of the Merger Guidelines (mergers in concentrated markets are more likely to be anticompetitive) that is consistent with economic theory, not critical loss analysis as it is typically practiced.

Where does this leave critical loss analysis as tool in antitrust practice? In our opinion, critical loss analysis has led to enormous confusion about the economic factors that govern firms' pricing incentives. The technique has been mis-used so frequently that arguments that are inconsistent with basic economic theory have almost gained a measure of legitimacy in antitrust cases. It is now common for people to assume that high pre-merger margins imply broader markets and/or a smaller likelihood of anticompetitive effects. This article has shown that this assumption is not correct because it is generally not consistent with basic economic theory.