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Title
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Permalink
https://escholarship.org/uc/item/4437v1xw

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Publication Date
2005-10-19

MERGER ANALYSIS AND THE TREATMENT OF UNCERTAINTY: SHOULD WE EXPECT BETTER?

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Abstract

Life is uncertain. So is merger analysis. There is a well developed set of tools to deal with decision making under uncertainty. Experience suggests that the federal antitrust agencies and the courts have yet to take full advantage of those tools. This chapter suggests ways that decision theory could be applied to merger analysis to improve enforcement and its impacts on consumer welfare.

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I.   INTRODUCTION

The central task of merger analysis is to develop predictions about the consumer welfare effects of combining two, previously separate firms.[1] Such predictions are almost inevitably subject to a high degree of uncertainty. It is often difficult to set market boundaries with precision; rarely can the magnitude and duration of a merger's effects on market power be forecast with great accuracy; and perhaps even more rarely can a merger's potential efficiencies be projected with high confidence. Consequently, the means by which antitrust agencies and the courts address uncertainty about a merger's effects are a critical part of the merger review process. Unfortunately, it is also an area that has received little systematic attention and in which current practices are obscure.

As we will discuss in more detail in the next section of this chapter, the agencies and courts have not been clear or consistent in articulating how they weigh and consider the several variables—including price effects, innovation benefits, competitive entry, and efficiencies—that factor into predictions about a merger's net effects on consumer welfare and which are subject to uncertainty. Moreover, in some instances, the agencies and the courts have adopted heuristics for treating uncertainty that can do a poor job of promoting consumer welfare and efficiency. Specifically, it sometimes appears that merger enforcement

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[1]   For purposes of this chapter, we are taking as given that the statutory objective of competition policy is to promote consumer welfare (see, e.g., FTC v. University Health, Inc. 938 F.2d 1206, 1222-23 (11th Cir. 1991); United States v. United Tote, Inc., 768 F. Supp. 1064, 1084-85 (D. Del. 1991)), notwithstanding strong economic arguments for the use of a total surplus standard (see, e.g., Oliver E. Williamson (1968) "Economies as an Antitrust Defense: The Welfare Tradeoffs," *American Economic Review,* **58:**1372-1376.

handles uncertainty by developing probability thresholds.[2] That is, upon being found to be of

low probability or to be supported by uncertain evidence, an event receives a weight of zero

in the decision calculus. This treatment can generate seriously inaccurate predictions of

consumer welfare effects when events have low probabilities of occurring but would have

significant effects if they did (e.g., a breakthrough innovation or significant competitive

entry).

The potential social and consumer costs of merger policy's failure to take explicit,

systematic account of the magnitudes as well as probabilities of a merger's predicted effects

will only grow as federal competition agencies increasingly apply merger policy to

technologically dynamic industries where it must consider changes in innovation—which are

particularly subject to uncertainty.[3]

Our central argument is that the U.S. antitrust agencies and courts could do a better

job of dealing with uncertainty than they have to date if they were to shift to the use of basic

decision theory.[4] The conventional decision-theoretic approach would be to estimate

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[2] There are other problems as well. For example, as discussed below, the agencies sometimes use arbitrary temporal cutoffs and give zero weight to effects several years into the future on the grounds that they are too uncertain.

[3] For a discussion of recent enforcement actions involving innovative industries, see Michael L. Katz and Howard A. Shelanksi (2005) "Merger Policy and Innovation: Must Enforcement Change to Account for Technological Change?" in *Innovation Policy and the Economy,* Vol. 5, Jaffe Lerner, and Stern (eds), Cambridge, MA: MIT Press, at 109.

[4] Several other authors have recommended the use of decision theory to shape competition policy. That work, however, focuses on the burden of proof. See, for example: Richard A. Posner (1973) "An Economic Approach to Legal Procedure and Judicial Administration," *The Journal of Legal Studies* **2**(2): 399-458; C. Frederick Beckner III and Steven C. Salop (1999) "Decision Theory and Antitrust Rules," *Antitrust Law Journal* **67:**41-76; David S. Evans and A. Jorge Padilla (2004) "Designing Antitrust Rules for Assessing Unilateral Practices: A Neo-Chicago Approach," AEI-Brookings Joint Center for Regulatory Studies, Related Publication 04-20; and Keith N. Hylton and Michael Salinger (2004) "Tying Law and Policy: A Decision Theoretic Approach," Boston University School of Law, Working Paper No. 01-04.

probability distributions for alternative potential outcomes and then use those probabilities as weights in projecting an expected net present value of a merger's effects on consumer welfare.

Below, we discuss why and to what extent the use of decision theory and the incorporation of expected values instead of probability thresholds can improve merger analysis and create greater welfare benefits. We also demonstrate how recognition of expected values can inform the appropriate standards for whether a party has met its burden of proof. Specifically, we address the extent to which the plaintiff should have to establish market definition with a high degree of likelihood.

II.   MEASURING A MERGER'S PROJECTED EFFECTS

The purpose of merger analysis is to provide a basis for enforcement agencies and the courts to decide whether to allow a proposed merger or to block it.[5] Either implicitly or explicitly, the agencies and the courts adopt decision rules that map characteristics of a proposed transaction into a probability that the transaction will be challenged (in the case of the agencies) or blocked (in the case of the courts). That is, there is a set of characteristics that will trigger a merger's being challenged and blocked, and another set of characteristics that will trigger a merger's being allowed to be consummated. Of course, given the complexity of merger analysis, the full lists of the elements in these two sets have never been

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[5]   Merger analysis is also used to assess alternative remedies, such as partial divestitures. Ultimately, the questions asked are the same: would the proposed transaction—in its originally proposed form or subject to modification—harm consumers?

fully expressed.[6] There is much learning by doing. When a particular fact pattern arises,

enforcement agencies and the courts apply various general principles and analytical

techniques to determine in which set the proposed transaction's characteristics lie.

Our concern in this chapter is with some of those techniques. How, for example, does

merger review balance potential consumer benefits from efficiencies against potential losses

from increased market power when neither efficiencies nor changes in market power can be

predicted with certainty? The agencies themselves have not articulated a consistent policy.

A.   What is Done?

In its 1996 report, "Competition Policy in the New High-Tech, Global Marketplace"

("1996 FTC Report"), the Federal Trade Commission ("FTC") came out squarely in favor of

taking into account both the magnitudes and probabilities of potential, merger-related

efficiencies. That position appears consistent with an expected value approach and contrary

to an approach that would drop efficiencies from consideration based on a low probability

alone. Yet the 1996 FTC Report never expressly states how the agency should use the

probabilities and magnitudes of efficiencies in analyzing a given merger.

Actual practice appears to depart from the 1996 FTC Report's recommendation and to

focus more heavily, if not sometimes exclusively, on the probabilities of merger effects with

little consideration of their possible magnitudes. Courts, for example, have often relied on the

U.S. Department of Justice ("DOJ") and FTC's *Merger Guidelines* to hold merging parties to

a standard of "clear and convincing" proof that a merger would produce pro-consumer

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[6]   The concentration thresholds set out in the U.S. Department of Justice and the Federal Trade
Commission, Horizontal Merger Guidelines, April 2, 1992 (revised April 8, 1997) (hereafter, *Merger
Guidelines*), § 1.5, provide a highly incomplete description.

efficiencies.[7] Such a stringent evidentiary standard has the practical effect of imposing a

probability threshold on efficiencies that has to be cleared before a court will take them into

account: if proven to a "clear and convincing" likelihood, then the efficiencies get counted

(although to what extent is not clear from the cases or agency practice), and if the evidence

falls short of proving that level of likelihood, then the efficiencies are rejected and receive no

weight at all.

The continuing applicability of the "clear and convincing" threshold has been open to

question since 1997, when the FTC and DOJ revised the *Merger Guidelines* to recognize

more formally that "mergers may generate efficiencies, which may benefit consumers and the

economy."[8] The DOJ has continued since 1997 to advocate a stringent standard of proof for

efficiencies before the courts, suggesting that the agencies may still, at least implicitly,

impose probability thresholds in their internal decision making.[9] In recent years, however,

some courts have rejected the "clear and convincing" language. The district court in *FTC v.

Staples* stated that such a standard would impose on defendants "the nearly impossible task of

rebutting a possibility with a certainty."[10] The court's statement accords not just with

common sense, but with decision theory as well. In contrast, the DOJ's position would

require that efficiencies be proved to a very high level of probability before they could be

balanced against anticompetitive merger effects, even if the anticompetitive effects had no

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[7]   See, e.g., U.S. v. Country Lake Foods, 754 F. Supp. 669, 680 n.13 (D. Minn. 1990); U.S. v. Rockford
        Memorial Corp., 717 F.Supp. 1251, 1289 (N.D. Ill. 1989).

[8]   Release, "FTC/DOJ Announce Revised Guidelines on Efficiencies in Mergers,"
        http://www.ftc.gov/opa/1997/04/effpress.htm (quoting FTC Chair Robert Pitofsky).

[9]   See David Balto, "The Efficiency Defense in Merger Review: Progress or Stagnation," *Antitrust ABA*
        16:74-81, n.39 and accompanying text (2001).

[10]   970 F. Supp. 1066, 1089 (D.D.C. 1997).

greater a likelihood of occurring or had a smaller expected value. In place of the clear-and-convincing standard, the *Staples* court applied a "credible evidence" standard: "defendants must simply rebut the presumption that the merger will substantially lessen competition by showing that the [FTC's] evidence gives an inaccurate prediction of the proposed acquisition's probable effect. Defendants, however, must do this with credible evidence."[11]

In a subsequent case, *FTC v. H.J. Heinz Co.*, the U.S. Court of Appeals characterized the necessary level of proof as that necessary "to ensure that those 'efficiencies' represent more than mere speculation and promises about post-merger behavior."[12] But even though the *Heinz* decision did not require that the efficiencies evidence be "clear and convincing," it did require that the efficiencies themselves be of "extraordinary" dimension.[13] If proponents of a transaction could not prove the merger-specific efficiencies to be "substantial", the court ruled, then the efficiencies could not rebut the presumption of harm where the merger would result in a high level of concentration.[14] It is unclear from *Heinz* whether the court was saying that lower (i.e., below "extraordinary") levels of merger-specific efficiency gains could not as a matter of law be used to rebut an anticompetitive presumption or that lower levels of efficiency would not as a matter of fact offset the competitive harms from high concentration. Either interpretation is problematic for effective merger review. If modest efficiencies will be achieved with a high probability, why should they be barred from consideration? In many cases, they may fail to offset the presumption of harm. But in cases

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[11]   Ibid.

[12]   246 F.3d 708, 721 (D.C. Cir. 2001).

[13]   Ibid. at 720.

[14]   Ibid.

where the probability of harm is moderate and the level of that harm low, even modest efficiencies could make the merger welfare-enhancing. Consequently, there seems to be no good reason to bar such efficiencies from consideration.

In the wake of *Staples* and *Heinz,* and taking into account that most mergers do not go to court but are instead resolved by agencies—at least one of which has sometimes continued to advocate a clear-and-convincing standard of proof for some potential merger-effects—it is difficult to tell how the various potential effects of a merger are accounted for in enforcement policy. What level of evidence of efficiency is considered "credible" or not "mere speculation?" What magnitude of efficiency is "extraordinary" or "substantial?" And, if the likelihood or magnitude of efficiencies or other post-merger effects falls below the foregoing thresholds, to what extent do they get counted?

Given the history of agency skepticism about efficiencies and the hard time parties have had getting efficiency evidence credited by the courts, the murky standards raise the prospect that merger enforcement is driven by likely outcomes to the exclusion of unlikely outcomes, even if the less likely outcomes would have major impacts if they did occur.

If merger review addresses uncertainty by overemphasizing the *likelihood* of particular outcomes and discounting the *importance* of those outcomes, except perhaps when that importance reaches "extraordinary" scale, then a small effect that has a high probability of occurring may weigh much more heavily in enforcement decisions than an effect whose probability is lower but whose consequence is of greater magnitude. Such an approach could have perverse effects on consumer welfare. The focus on probabilities to the exclusion of magnitudes leads a merger to be challenged and possibly blocked if it is found likely to give rise to consumer harm even if, for example, there were a 60 percent chance that consumers

would suffer $100 million in harm and a 40 percent chance that consumers would reap $200 million in benefit. In effect, the probability-oriented approach acts as if consumers are extremely risk averse, even for products that account for a small percentage of consumer expenditures.[15]

We do not mean to say that current merger practice completely disregards the magnitude of effects or that it focuses solely on probabilities. We do, however, think that current practices are not explicit and that both court decisions and agency practices appear to overly discount, if not ignore, events with less-than-likely probabilities. Agencies and to a lesser degree the courts may still impose standards of proof that can block from consideration important efficiency and innovation effects of a merger. Even the cases that reject stringent evidentiary standards for events like efficiencies still fail to articulate exactly how such uncertain outcomes should factor into merger predictions. They leave in place a "black box" in which efficiencies receive some unarticulated, vague weight and that provides little guidance for prospective merging parties.[16]

The focus on likely outcomes to the exclusion of other possibilities is not limited to efficiencies. At least in litigation, the agencies generally put forth a single likely scenario that drives their decision; they do not specify a range of possible, probability-weighted outcomes and explain why that range of outcomes justifies enforcement. Similarly, they routinely argue that entry is too unlikely for its effects to be counted, rather than adjust their projections of consumer harm toward zero by an amount reflecting the expected value of entry's effects.

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[15]   Moreover, as discussed below, it is well known that a consumer who is risk neutral with respect to income will be risk loving with respect to prices.

"Black box" also seems an apt description of the process behind the many merger review decisions that never result in an enforcement case. In most instances, the antitrust agencies clear mergers because consumer harms are very likely to be small even absent efficiencies and the agencies implicitly credit merger with creating some level of efficiencies as a default.[17] But what about cases in which significant increases in market power are possible but the mergers are cleared anyway? Do the agencies grant some approvals because the merger benefits are so great and/or of such high probability that they overwhelm possible price increases due to increased market power? Do less-than-likely but large potential efficiencies factor into merger approvals? If so how? Neither the *Merger Guidelines* nor court decisions provide much guidance on these questions.

The overall picture of current merger enforcement practice is therefore murky. In some cases the analysis of uncertain events is vague and unspecified, while in others the analysis handles uncertainty by eliminating unlikely events from consideration. There is a tendency to focus on "the" most likely outcome. Such unsystematic treatment of uncertainty affects several components of the framework through which the antitrust agencies currently make projections about a merger's overall effects. As the cases discussed above show, enforcement authorities and courts generally treat evidence of merger efficiencies with skepticism if not, sometimes, with hostility.

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[16]   David Balto, "The Efficiency Defense in Merger Review: Progress or Stagnation," *Antitrust ABA* **16:**74, n.39 and accompanying text (2001).

[17]   Michael L. Katz, "The Role of Efficiency Considerations in Merger Control: What We Do in the U.S." in *EC Merger Control: A Major Reform in Progress,* G. Drauz and M. Reynolds (eds.), Richmond, England: Richmond Law & Tax Ltd. (2003), at 218.

Moreover, the agencies are particularly likely to be dismissive of events that they do not project to take place in the very near future. Both competitive harms and merger benefits accrue over time and may vary over time. Similar to the treatment of uncertainty, the treatment of inter-temporal weights is often rather unsophisticated. Indeed, the two problems are linked. Partly in response to concerns that the future is highly uncertain, the antitrust agencies tend to take a relatively short-run perspective. For example, the *Merger Guidelines* tend to consider entry only within a limited time horizon.[18] And efficiency benefits that are predicted to be realized only with a lag are "given less weight because they are less proximate and more difficult to predict."[19] This approach of dismissing less-than-likely or temporally remote entry and efficiencies can lead to poor enforcement decisions by, for example, underestimating the effects of potentially revolutionary innovations (by the merging parties or competitors) that have some probability of having large effects over a period of several years.

We close our discussion of current practices by considering a hypothetical example that will allow us to illustrate differences between current practice and a well-grounded, decision-theoretic approach.[20] Consider a hypothetical merger of two pharmaceutical companies for which there is a 60-percent probability that the parties face little competition other than from each other and where merger would allow them profitably to raise price

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[18]   Specifically, for non-durable goods the agencies tend to look only two years forward, although the *Merger Guidelines* provide no rationale for this cutoff. (*Merger Guidelines,* § 3.2.) The agencies sometimes take a more sophisticated view, at least when deciding whether to file a case against a proposed merger, if not in court.

[19]   Ibid*,* footnote 37.

[20]   In the example below we will present a somewhat stylized depiction of current practice as a probability oriented approach. We recognize that enforcement is not based exclusively on probabilities, but we think it fair to say that the current approach emphasizes likely events over unlikely ones and, thus, for purposes of our comparison present it as probability based framework.

significantly, ceteris paribus. Suppose further that there is a 40-percent probability the merger will make R&D more efficient and facilitate an innovation in two years that will greatly reduce the costs of producing the relevant medication.

Consider application of the probability-oriented approach implicit in current enforcement and how that approach would address each element of our hypothetical.

- There is little question that the agencies would treat the 60-percent likelihood of a significant price increase as a likely harm of the merger. To our knowledge, the agencies have always credited harm that is more likely than not to occur.

- The efficiency prospect would likely receive no weight. The *Merger Guidelines* state that the agencies will consider "only those efficiencies *likely* to be accomplished with the proposed merger." [21] Similarly, efficiency benefits that are predicted to be realized only with a lag are given less weight.[22]

The likely result under the *Merger Guidelines'* approach is therefore that the reviewing agency would challenge the hypothetical merger: the agency would characterize the merger as likely to harm consumers through a price increase due to increased market power and would dismiss any potential efficiency benefits as speculative.

B.   What Should be Done

Now, compare how the merger analysis would come out under a decision-theoretic approach. As a threshold matter, it is worth saying a bit more about what we mean by such an approach.   Decision theory addresses how to make choices under uncertain conditions. For

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[21]   *Merger Guidelines,* § 4, emphasis added**.**

example, choosing which car to buy may involve uncertainty about the reliability of alternative makes and models; determining which investment to make involves uncertainty about returns; and deciding whether to clear or block a merger involves uncertainty about the prospective costs and benefits of the transaction. A decision-theoretic approach to making the choices in any of the above situations can be formalized as picking the course of action that yields the highest expected payoff to the decision maker, where the expected value of taking an action is equal to the payoffs associated with the different possible outcomes that can follow from that action weighted by the probabilities that those outcomes will occur if the action is taken.

Rational decision-making under this approach requires an understanding of: the set of outcomes that can potentially follow from alternative courses of action; the probabilities that the different outcomes will arise conditional on the course of action taken; and the payoffs associated with the different potential outcomes. In our simple hypothetical, there are four possible outcomes: (a) a significant increase in market power with no efficiencies; (b) a significant increase in market power with efficiencies; (c) an insignificant increase in market power with no efficiencies; and (d) an insignificant increase in market power with efficiencies.[23] There is a 36-percent chance that outcome (a) would arise, where this probability is calculated by multiplying the 60-percent chance of a significant increase in market power times the 60-percent chance that there will be no merger efficiencies. Similar calculations show the other probabilities to be 24 percent for (b), 24 percent for (c), and 16

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[22]   Ibid, footnote 37.

percent for (d). Finally, the decision maker needs to know the payoff associated with each outcome. Suppose that the respective payoffs for the different outcomes are: (a) -80 million; (b) 80 million; (c) -1 million; and (d) 160 million. The expected payoff from the merger measured in millions is found by multiplying each outcome's probability by the outcome's payoff and then taking the sum of those four products:

$$-80 \times .36 + 80 \times .24 - 1 \times .24 + 160 \times .16 = 15.76 \ .$$

In contrast to the threshold approach, the decision-theoretic approach indicates that the antitrust authorities should approve the merger in order to promote consumer welfare.

It is useful to describe this approach more formally to allow generalization. Let $\{X_1, X_2, ..., X_n\}$ denote the set of possible outcomes. For example, they could represent different prices that might arise if a merger were consummated. Let ρ_i denote the probability that outcome X_i will arise if the merger is approved. Note that the values of $\{\rho_1, \rho_2, ..., \rho_n\}$ are derived from the agencies and courts' analysis of the observable market conditions. Finally, let $u(X_i)$ denote the payoff associated with outcome X_i. Then, by definition, the expected payoff associated with allowing the merger is:

$$\sum_i u(X_i)\rho_i \ .$$

If one measures payoffs so that the baseline of blocking the merger gives rise to an expected payoff of zero, then the decision-theoretic approach will call for the merger to be blocked if

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[23]   In our example, either there are no efficiencies or efficiencies are fully realized. In practice, there may be several different levels of efficiencies that might be attained with positive probability. The expected-payoff readily generalizes to any number of possibilities.

the expected payoff from the merger is negative and approved if the expected payoff is

positive.

The fundamental point for policy is that the magnitude of each possible outcome (i.e.,

the size of $u(X_i)$) and not just whether it is likely (i.e., whether ρ_i is above some threshold)

must be taken into account if the welfare implications of a merger are to be fully understood.

Arbitrary thresholds for probabilities could rule out consideration of events with major

implications for consumers and that, in the repeated exercise of merger review, could add up

to major welfare costs across transactions.[24]

It is important to observe that the use of a payoff function gives this approach a high

degree of flexibility. The payoff function gives a score to each possible outcome, and that

score can capture a variety of different factors. One is the decision maker's attitude toward

risk. Suppose that X_i is the realized value of consumer surplus under outcome i. If the

antitrust enforcer's objective is to maximize consumer welfare and the enforcer is risk neutral,

then the enforcer will seek to maximize the expected value of X_i, which is $\sum_i X_i \rho_i$.

Enforcers may, however, be averse to variations in consumer welfare. That is, faced

with two actions that have the same expected level of consumer surplus, the enforcer may

prefer the one that involves less uncertainty about the resulting level. In fact, enforcers with

this aversion to risk might be willing to accept a lower expected level of consumer surplus in

return for less variability in the realized level of consumer surplus. Enforcers' risk aversion

can be captured by a payoff function that tends to fall faster in response to losses than it rises

from gains (a so-called concave function).[25]

Suppose that allowing a merger gives rise to a ½ chance that consumers will gain

$100 million in surplus and a ½ chance that they will lose $100 million in surplus. The

expected value of the merger's effects on consumer welfare is zero. Suppose, however, the

difference between $u(0)$ and $u(100,000,000)$ is less than the difference between

$u(-100,000,000)$ and $u(0)$. Then the expected payoff associated with allowing the merger,

$\frac{1}{2}u(-100,000,000) + \frac{1}{2}u(100,000,000)$ will be less than the expected payoff associated with

blocking it, $u(0)$.

A decision-theoretic approach does not dictate policy preferences regarding how

much, and what kinds, of risk to accept in making enforcement decisions. But it does require

that those policy preferences be made explicit. And, ideally, those choices will be well

thought out.

The payoff function can also capture other effects. Suppose, as is often the case, that

the projected post-merger outcome is characterized in terms of prices. A merger's effects on

consumer welfare are not fully captured by calculating expected price changes. This is so

because a given consumer's wellbeing may be affected asymmetrically by price increases and

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[24]   A similar point can be made regarding the use of temporal cutoffs. Entry four years in the future has
        less value than entry one year in the future, but it does not have zero value. Arbitrarily cutting off from
        consideration entry that occurs more than two years hence, as the *Merger Guidelines* often do, truncates
        the proper welfare analysis. The lesson from decision theory is to factor in magnitudes in addition to
        probabilities and to discount those magnitudes over the relevant time periods.

[25]   David M. Kreps, *A Course in Microeconomic Theory* (1990) at 82-83.

price decreases. Thus, the expected value of the effects of price changes on consumer welfare is not equal to the welfare effects of the expected price change.

To see why, consider a simple hypothetical example in which the market demand curve for a product is $\alpha - p$, where p is the price of the good and α is a constant equal to the "choke price." A price of p gives rise to consumer surplus of $\frac{1}{2}(\alpha - p)^2$. Observe that a ten-percent price increase lowers consumer surplus by less than a ten-percent price decrease raises it. [26] Therefore, if one is going to take the outcomes to be different prices, it is more accurate to take $u(X_i)$ to be the level of consumer surplus that arises when the price is X_i, rather than taking the price itself as the payoff.

Another useful observation is that the threshold approach can generate more than one error simultaneously. To illustrate this point, consider an additional complication in our hypothetical example. Suppose that, if the merger takes place and the market is sufficiently narrow that the merging parties will gain market power as discussed above, then there is a 50 percent chance that within two years a potential competitor will seek and gain approval from the Food and Drug Administration for a rival medication that will allow the rival to compete aggressively against the incumbent and dramatically cut the price of treatment from pre-merger levels. Further suppose that, absent the merger, or if the market is sufficiently broad that the merger would not give rise to a significant increase in market power, entry would not occur.

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[26]   The change in consumer surplus from the price increase is
$\frac{1}{2}(\alpha - 1.1 \times p)^2 - \frac{1}{2}(\alpha - p)^2 = -p(0.1 \times \alpha - 0.105 \times p)$. The gain in consumer surplus from the price decrease is $\frac{1}{2}(\alpha - 0.9 \times p_0)^2 - \frac{1}{2}(\alpha - p_0)^2 = p(0.1 \times \alpha - 0.095 \times p)$.

The *Merger Guidelines* approach imposes thresholds of timeliness, likelihood, and sufficiency on entry by new competitors.[27] In this case, entry would probably not meet the likelihood requirement because, if the merger occurs, there is only a 30-percent chance that entry would occur post merger (this probability is equal to the 60 percent chance that the relevant market is narrow times the 50 percent chance that entry would occur in the narrow market).

The possibility of entry, however, significantly increases the expected consumer benefits of the merger. Now there are six possible outcomes: (a) a significant increase in market power with no entry and no efficiencies; (b) a significant increase in market power with entry and no efficiencies; (c) a significant increase in market power with no entry but efficiencies; (d) a significant increase in market power with entry and efficiencies; (e) an insignificant increase in market power with no efficiencies; and (f) an insignificant increase in market power with efficiencies. There is an 18-percent chance of outcome (a), where this probability is equal to the 60-percent chance that the relevant market is narrow times the 50-percent chance that entry would not occur in the narrow market times the 60-percent chance that there are no efficiencies. Again, the other probabilities are calculated similarly. Assume that the payoffs associated with the respective outcomes are: (a) -80 million; (b) 200 million; (c) 80 million; (d) 240 million; (e) -1 million; and (f) 160 million. The expected payoff from the merger measured in millions is

$$-80\times.18+200\times.18+80\times.12+240\times.12-1\times.24+160\times.16=85.36\ .$$

[27]   *Merger Guidelines,* § 3.

Consideration of entry also raises the issue of how the agencies and the courts treat events that are realized with a lag. In terms of meaningfully projecting effects on consumers' economic welfare, it makes little sense to put almost no weight on the future. Moreover, for at least two reasons, using greater discounting (i.e., putting lower weights on all future consequences) to deal with uncertainty is likely to be a very poor heuristic. First, it is not the case that events farther in the future are always less likely to happen. For example, the probability that a drug trial is successfully completed in either of the next two years may be lower than the probability that it will be successfully completed in year three. Indeed, because *something* has to happen in the future, if the probabilities of some outcomes fall over time, then the probability of at least one other outcome must rise.

Second, even where events do become less certain over time (so that, although we know that something must happen, it is more difficult to predict which alternative will arise), there is no reason to believe that the expected values will always fall proportionately with time or the degree of uncertainty. The following example illustrates this point. Consider a project that lowers costs sufficiently to raise consumer welfare by 20 percent with probability ρ, by 0 percent also with probability ρ, and by 10 percent with probability $1 - 2\rho$. Higher values of ρ correspond to greater uncertainty (there is a greater chance that one of the extreme values of 0 percent or 20 percent is realized), but the expected consumer welfare benefit of the cost reduction remains constant at 10 percent. Discounting the cost reduction as a means of handling uncertainty throws out much of the information about the nature of the uncertainty and the shape of the probability distribution over possible outcomes.

The benefits of the expected welfare approach extend beyond the result in any single case. In addition to improving determination of the likely effects of a merger, decision theory can be used better to assess the long-run, deterrent effects of challenging a merger. The optimal rule for challenging a given merger can be determined only by taking into account the effects the rule has on the population of proposed mergers. For example, taking into account deterrence effects, it might be socially beneficial to challenge a merger that gives rise to $5 million in harm even if it costs $10 million to litigate. The reason is that this challenge might deter 20 such mergers from even being proposed in the future because of the threat of litigation.[28]

Such calculations should be based on a decision-theoretic approach because basing such calculations on the existing, threshold-oriented approach runs a substantial risk of compounding current errors over time rather than reaping benefits from deterrence. As our analysis above shows, the assessment of harm under the current framework might incorrectly exclude consideration of efficiencies that would be counted under a decision-theoretic approach. Hence, there is a risk that the enforcement action would be deterring mergers with positive expected welfare payoffs, thereby compounding harms rather than benefits. Decision theory thus helps agencies to make correct long-run decisions and better to account for a decision's effect on all transactions.

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[28]   Because this approach considers strategic interaction with other parties, it can be viewed as crossing over from decision theory to game theory.

C.   Distributional Issues

When a proposed merger can be expected to harm some consumers and benefit others,

potential distributional concerns arise. A decision-theoretic approach provides a clear and

structured framework in which to address such concerns.

There can be at least two reasons that the welfare consequences of a merger differ

across consumers. Consider each in turn. One reason is that the effect of a price change on a

consumer's welfare depends on the quantity that the consumer would purchase absent the

price change.[29] A post-merger price increase will harm current consumers of a product but

will not directly harm people who do not consume the product at the pre-merger price. A

post-merger price decrease, on the other hand, will benefit both current consumers of the

product *and* people who would consume the good if the pre-merger price were lower.

Because they cannot be harmed by the merger, but can benefit from it if efficiencies are

realized, consumers who are not current purchasers would—in an expected welfare sense—

gain from the merger. Depending on the size and likelihood of the efficiencies, however,

current purchasers might suffer expected welfare losses from the merger. Hence, there is a

distributional issue to address.[30]

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[29]   This fact is what underlies the non-linearity of consumer welfare with respect to price changes
discussed in the previous part.

[30]   Another implication of this phenomenon is that merger review should integrate the efficiencies analysis
and competitive effects analysis. Simply summing up separate, expected price changes would be an
improvement over the probability-oriented approach of current merger enforcement, but calculation of
an integrated expected-consumer-welfare effect would be even better. (footnote continues on next
page)

The other source of divergence in a merger's effects on different consumers' welfare levels derives from the fact that the price effects of a merger may vary over time. For example, issues of inter-temporal trade-offs under uncertainty arise when a merger's projected competitive effects on static pricing and on innovation run in opposite directions. Antitrust enforcers may face an uncertain trade-off between higher prices in the short run and lower quality-adjusted prices in the long run. The effects that price changes at different times have on a given consumer's welfare will depend, in part, on the timing of the individual's consumption and the discount rates that he or she applies to future benefits. Both factors may vary across consumers.

The use of an expected-payoff approach to assessing merger effects readily incorporates distributional preferences into merger enforcement. Distributional concerns can be incorporated by adopting payoff functions that give more weight to the welfare of some consumers than others. Or, enforcers may choose to weight all consumers' welfare equally. The expected-payoff approach is beneficial because it makes the distributional preferences explicit and makes the proper calculations subject to those preferences.

D.   Does the Law Allow the Right Thing?

Legal standards do not always cooperate with economic prescriptions. So it is worth asking whether Section 7 of the Clayton Act, under which the agencies and courts typically

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Gregory Werden offers a clever methodology that integrates the market power and efficiencies analyses and, in effect, allows one to determine if the price effects of the most likely efficiencies will outweigh the price effects of the most likely increase in market power. However, because Werden's computations are based on the most likely values of relevant variables, rather than computing the expected change in consumer welfare, it is subject to the criticisms of Part B above. (Gregory J. Werden (1996) "A Robust Test for Consumer Welfare Enhancing Mergers Among Sellers of Differentiated Products," *Journal of Industrial Economics,* **44:** 409-413.)

review mergers, dictates or prohibits any particular approach to analyzing a transaction's

consumer welfare effects. Section 7 bars mergers "where in any line of commerce or in any

activity affecting commerce in any section of the country, the effect of such acquisition may

be substantially to lessen competition, or to tend to create a monopoly."[31] As a textual matter

nothing in the statutory provision bars use of expected-value calculations or requires the

agencies and courts to focus only on particularly probable events.

On one hand, the words "may be" and "tend to" are the language of probability.

Common usage of "may" carries with it more a connotation of possibility than of likelihood.

The meaning of "tend" shades more in the direction of likelihood, but does not connote any

particular frequency or probability of an event's occurrence. In context of the statute, those

words suggest that anticompetitive harms should be credited by enforcement officials where

they are possible even if not probable. This might suggest, in turn, that pro-competitive

justifications, such as efficiencies or innovation, need to be proven with a much higher degree

of certainty so as to make the merger's benefits not just possible, but probable. Such a

reading of the statute would support the probability-threshold approach of the *Merger

Guidelines*.

The problem with the foregoing logic is Section 7's use of the words "substantially to

lessen competition." That part of the statutory text clearly contemplates not just directions

but magnitudes of effects, which in turn opens the door to (if not requires) some formulation

of the expected value of a merger's impact on competition. Without counting all of a

transaction's effects, negative and positive, there is no way to know whether as an overall

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[31]   15 U.S.C. § 18.

matter its harm to competition is "substantial" or not. The *Merger Guidelines* themselves

seem to recognize the need for expected value assessments even if, in applying the

Guidelines, the agencies have focused more narrowly on probabilities. For example, the

efficiencies section of the *Merger Guidelines* (§ 4) notes the importance of verifying both

"the likelihood and magnitude" of each asserted efficiency.[32]

E.   Implementation Issues

One might argue that expected welfare calculations under a decision-theoretic

approach to merger review are too difficult for agencies and courts to implement. Space does

not permit a full discussion of these issues here. Instead, we offer several observations. First,

with respect to the difficulty of implementation, we agree that it will sometimes be difficult

for parties or reviewing authorities to assign probabilities or values to a merger's predicted

effects. But this difficulty arises from the nature of the transactions under examination, not

from the use of any particular analytical tools or framework. Agencies and the courts make

such assessments—implicitly or explicitly—under any approach to merger evaluation. Our

recommended approach requires that implicit judgments of current practice be made explicit.

If parties say that it is too hard to form explicit beliefs about possible outcomes, then they are

confirming that their decision-making process has failed to consider important possibilities

and that its predictions are unreliable. Ignoring a hard-to-gauge possibility does not eliminate

its actual effect.

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[32]   However, this statement can also be read as excluding efficiencies from consideration unless they clear thresholds for likelihood and magnitude.

Second, the FTC has itself argued that the kind of analysis we advocate is feasible. As to productive efficiencies, for example, the 1996 FTC Report finds "[p]lant and production economies of scale are generally accepted as important to a firm's competitiveness and subject to reasonable assessment as to their magnitude and probability."[33] Although the FTC's report acknowledges that other kinds of efficiency—for example innovation efficiencies—are likely to be harder to evaluate and that, in general, "the precise quantification of the magnitude and probability of claimed efficiencies is impossible," the FTC does not shy away from an expected value approach.[34] It argues instead that "relative judgments can and should be made about the probability of a merger creating the claimed efficiencies, about the magnitude and timing of those efficiencies, and about the likelihood of those efficiencies having the claimed pro-competitive effect."[35] We agree with the FTC's assessment that implementation will pose challenges but that those challenges can be managed and do not provide a basis for rejecting decision-theoretic approaches to merger review.

Lastly, there may be reasons why policy makers wish to foreclose consideration of extremely uncertain events, regardless of what the effects would be if those events did ultimately occur. Practical realities regarding the reliability or availability of evidence for highly uncertain events, moral hazard problems related to verification difficulties, or preferences about the distribution of economic benefits may lead policy makers to cut off

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[33] Federal Trade Commission, "Competition Policy in the New High-Tech, Global Marketplace" (1996) at 32.

[34] Ibid. at 32, 34.

[35] Ibid.

low-probability tails and to impose a minimum probability threshold on events factoring into

an expected-value calculation. Our recommended approach does not preclude the imposition

of such cutoffs, although we urge that they be imposed only after careful consideration. What

is important is: (a) that the elimination of events from consideration in the merger analysis be

explicit rather than vague and implicit, and (b) that the analysis properly weigh those events

that enforcement agencies do factor into their framework.

III.   UNCERTAINTY AND THE BURDEN OF PROOF

In this section, we consider how uncertainty enters into allocation of the burden of

proof in merger cases. To some extent, we have already addressed this issue because the

question of burden is inherent in the question of how to measure a merger's projected effects.

Above, we argued that the burden for showing harm would be more sensibly stated as

showing that there is expected harm, rather than a significant probability of harm. In the

present section, we extend our analysis of burden by focusing on an issue of burden and

uncertainty that comes up at an intermediate stage of the analysis. Specifically, we will focus

on the burden of certainty that is assigned to plaintiffs with respect to market definition.

A.   What is Done

It is useful to begin by summarizing the mechanics of market definition as currently

practiced by the agencies and courts. There is a long-standing principle that two goods or

services are in the same relevant market if and only if consumers view them as sufficiently

close substitutes.[36] What does it mean to be sufficiently close? To some extent, oatmeal

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[36]   See, e.g., Stocking, George W., and Willard F. Mueller (1955) "The Cellophane Case and the New
Competition," *American Economic Review* **45:** 29-63, at 44-8.

competes with cable television for consumers' dollars, but that does not put oatmeal and cable television in the same product market. To give more precision to the concept of sufficiently close substitutes, the agencies often conduct the so-called hypothetical monopolist test.

The hypothetical monopolist test asks whether a hypothetical, profit-maximizing monopolist over a group of products in a given geographic area could profitably raise prices above a specified level by a small but significant amount for a sustained period of time.[37] The group of products considered in the test comprises a candidate relevant market. The actual relevant market is the smallest set of products the monopolist would need to control in order to raise prices profitably.[38]

A price increase will raise a hypothetical monopolist's profits unless unit sales volume falls sufficiently to offset the higher price received for the units sold.[39] Thus, the hypothetical monopolist test indicates that a set of products or a geographical area constitutes a relevant market if the hypothetical monopolist could make a small but significant and non-transitory increase in price without causing enough consumers to switch to substitute goods so that the price increase becomes unprofitable.

Now, consider how uncertainty enters the picture. Under the standard approach to merger litigation, the plaintiff has the burden of establishing a market definition which then serves as the basis for calculations used to establish a presumption of consumer harm due to increased concentration. The plaintiff's burden to establish market boundaries is often

[37] *Merger Guidelines,* § 1.0; *FTC v. Swedish Match,* 131 F. Supp. 2d 151, 160 (D.D.C. 2000); *California v. Sutter Health Systems,* 130 F. Supp. 2d 1109, 1120 (N.D. Cal. 2001). See, also, Katz, Michael L., and Carl Shapiro (2003) "Critical loss: Let's tell the whole story," *Antitrust* Spring: 49-56.

[38] *Merger Guidelines*, Sections 1.0 and 1.11.

[39] We are assuming that the baseline price is greater than or equal to incremental cost.

interpreted as an obligation to establish "the" bright-line boundary. Hence, some courts might dismiss or discount the plaintiff's case for being unable to establish a clear market boundary. This approach gives rise to at least two problems.

One problem is that bright lines may not, in fact, exist. The bright-line approach to market definition labels a supplier as either completely in or completely out of a market, where a supplier in the market is given 100 percent weight and a supplier out of the market is given zero weight in assessing competition. Actual markets often have no such bright-line boundaries. A market for differentiated products may better be viewed as a continuum, where different products compete with one another to varying degrees. Forcing plaintiffs to establish bright lines can thus impose a very high—possibly impossible—hurdle to clear.

A recent decision illustrates this point clearly. The DOJ lost its bid to block the merger between Oracle and PeopleSoft in large part because the trial court found that the Department failed to prove the product and geographic markets it had alleged in its complaint.[40] Interestingly, the trial judge in *Oracle* was well aware that it could be "difficult to identify 'clear breaks in the chain of substitutes' sufficient to justify bright-line market boundaries," especially in markets with similar but differentiated products.[41] But the court's recognition of the difficulty of defining such clear market boundaries did not lead it to lessen the government's burden of proving a market definition that would support its unilateral effects theory of harm in the case.

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[40]   *U.S. v. Oracle Corp.,* 2004 U.S. Dist. Lexis 18063 (N.D. Cal. Sept. 9, 2004).

[41]   Ibid at 41.

Another problem is that, even when such bright lines do exist, they may be difficult to establish with certainty. An important question is whether uncertainty about an intermediate stage of the analysis—here, market delineation—is of independent interest. We argue in the next subsection that uncertainty regarding market definition is best understood within the broad context of the overall analysis of consumer welfare effects.

B. What Should be Done

Economists have long raised questions about formal market delineation. Although one cannot predict the competitive effects of a merger without developing some sense of who the competitors are and what constraints that they apply to the merging parties' behavior (what might be termed market definition broadly conceived), it is far from evident that it is necessary or even helpful to define bright-line boundaries through application of a formal algorithm that is applied separately from the analysis of competitive effects.

Many economists hold the view that a proper economic analysis of a merger's effects does *not* require formal definition of bright-line boundaries. Proponents of the view that market definition may be superfluous include former chief economists of both principal U.S. antitrust agencies. For example, Professor Jonathan Baker, a former Director of the FTC's Bureau of Economics, observed:

> Indeed, if a merger can be shown to harm competition directly, antitrust should not need to spend much effort on market definition … . [I]f the likely harm to competition from a merger can be demonstrated directly, there exists a market where harm will occur, but there is little need to specify the market's precise boundaries.[42]

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[42]   Baker, Jonathan B. (1997) "Contemporary Empirical Merger Analysis," *George Mason Law Review* **5:** 347-61.

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Similarly, Professor Janusz Ordover, a former Deputy Assistant Attorney General for

Economic Analysis at the DOJ, wrote:

> From the perspective of economic theory, antitrust law's preoccupation with
> market definition has always seemed somewhat peculiar. Arguments for and
> against a merger that turn upon distinctions between broad and narrow market
> definitions are, to an economic purist, an inadequate substitute for, and a
> diversion from, sound direct assessment of a merger's effect.[43]

The thrust of the above arguments is that market definition is an indirect way of showing a

merger's effects and should not stand in the way of considering direct evidence of

competitive harm.[44]

If one believes that market definition is superfluous, then it follows that uncertainty

about "the" market definition should not in itself be an obstacle to successfully challenging a

merger. Suppose, for the sake of argument, that an appropriate market definition is an

essential step in merger analysis. What would be the appropriate treatment of uncertainty?

In many—if not most—industries, significant uncertainty is inherent in market

delineation and, thus, requiring the plaintiff to establish the market boundaries with a very

high degree of uncertainty would effectively preclude merger enforcement regardless of the

consumer welfare effects of a proposed merger. This does not appear to be a sensible policy.

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[43]   Ordover, Janusz A., and Daniel M. Wall (1989) "Understanding Econometric Methods of Market Definition." *Antitrust,* **3:** 20-25, at 20-1[footnote omitted].

[44]   Indeed, the very question asked by the hypothetical monopolist test raises issues about the separation of market definition and competitive effects analysis. Under the *Merger Guidelines'* approach, the answer to the following question provides the basis of market definition: Would a hypothetical monopolist with control and ownership of a particular set of products be able to raise price profitably in a significant way, holding the prices of other products constant? But why not make predictions about what *actual* suppliers would do rather than focus on a hypothetical monopolist? Specifically, why not ask directly whether the merging parties would find it profitable to raise price by a significant amount post merger? If one possesses the answer to that question, then the answer to the hypothetical monopolist question is superfluous. One distinction is that the second question does not entail holding other prices fixed. But in unilateral effects cases, an assumption along somewhat similar lines is made.

Moreover, it is hard to see how there is any specific probability threshold that would not be viewed as arbitrary.

A decision-theoretic approach would, at a minimum, ask if the boundaries actually mattered. In other words, the degree of uncertainty should be put in context. To a large extent, this approach comes down to saying that it is essential to remember that the purpose of delineating market boundaries is to structure the analysis of competitive effects.

Hence, one approach to mitigating the problems of uncertain market delineation is to: (1) ask where the dividing line matters; (2) allow the plaintiffs and defendants to make arguments about on which side of the critical line the "actual" market boundary lies without a requirement of certainty; and then (3) assess the expected competitive harms in the light of the uncertainty the fuzzy market definition creates for the probability that those harms will in fact occur.

A hypothetical example may sharpen the foregoing ideas. Suppose that products *A*, *B*, and *C* clearly are in the same relevant market, but it is unclear whether *D* and *E* are in the market as well. Suppose the plaintiff argues for a market defined as *A*, *B*, and *C*. Moreover, suppose the competitive effects analysis indicates that the merger poses a significant threat of competitive harms whether the market is defined as containing *A*, *B*, and *C* or *A*, *B*, *C*, and *D*. In this situation, the status of *D* is of no consequence for the analysis of consumer welfare effects. But if the plaintiff has not proven to the court's satisfaction that its proffered market definition properly excluded *D*, then the treatment of market definition as a formal threshold requirement could lead a trial court to dismiss or discount the plaintiff's case even though the point of debate—the inclusion of *D*—is economically irrelevant.

The situation might more realistically arise where *D* is not clearly irrelevant but instead is of debatable consequence for the plaintiff's theory of harm.[45] In such cases, the plaintiff will bear the burden of proving *D* is outside the relevant market even though there is some chance competitive harm will occur even with *D* in the market. Failure to carry that burden will likely undermine the plaintiff's case. The problem with such an outcome is that the case is decided not based on a failure directly to prove the transaction's expected competitive harms, but on a failure indirectly to prove a highly imperfect proxy for those harms.[46] To the extent alternative market boundaries give rise to distinct projected effects and neither alternative can be established with a high degree of confidence, merger analysis should not force an either/or choice between the alternative market definitions. Instead the analysis should account for the likelihood that the harms associated with the alternative market boundaries will result.

In summary, fuzzy market boundaries should not in and of themselves prove fatal to a plaintiff's case. For instance, to the extent that two different market boundaries give rise to the same implications for competitive effects, the difference is immaterial for the economic analysis. Whether this immateriality holds from a legal standpoint is a distinct question to

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[45] This kind of issue is particularly likely to arise in markets with spatial differentiation, where each supplier competes with its neighbors, which then has effects on their neighbors, but the decay of this chaining process—and thus where a *Merger Guidelines*-style relevant market ends—is difficult to determine.

[46] One might wonder why the plaintiff would not simply include *D* in the market on the grounds that the defendant would never attack the market definition for being over inclusive. In cases where the marginal product is clearly irrelevant, such an approach would make sense although the plaintiff might err by taking the narrower approach and feel that to switch to a broader definition during trial would undermine credibility. In cases where the effect of the marginal product is ambiguous but potentially undermines plaintiff's theory of harm, the plaintiff would want to plead the narrower market in the hope of eliminating consideration of *D's* potential effects. Moreover, in our experience, the government in practice often fails to take the broader approach, possibly in the belief that there is always some gain to the plaintiff from establishing a narrower market.

which we turn next.

C.   Does the Law Allow the Right Thing?

Would allowing for the possibility of a range of market boundaries, instead of

insisting on delineation of "a" specific market, be legally acceptable? The answer appears to

be yes, at least in antitrust contexts other than merger review. The Supreme Court held in

FTC v. Indiana Federation of Dentists that

> [s]ince the purpose of the inquiries into market definition and market power is
> to determine whether an arrangement has the potential for genuine adverse
> effects on competition, 'proof of actual detrimental effects, such as a reduction
> of output' can obviate the need for an inquiry into market power, which is 'but
> a surrogate for detrimental effects.'[47]

Other courts and commentators have followed the Supreme Court's lead on this point.

For example, the United States Court of Appeals for the Second Circuit stated that "[i]f a

plaintiff can show that a defendant's conduct exerted an actual adverse effect on competition

… this arguably is more direct evidence of market power than calculations of elusive market

share figures."[48] Professor Andrew Gavil has similarly argued that market share evidence

should not trump direct evidence of market power such as reduced output or higher prices,

suggesting that market delineation (when done to allow calculation of market shares) is not

legally essential to the analysis.[49]

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[47]   *FTC v. Indiana Federation of Dentists,* 476 U.S. 447, 458 (1986) (partly quoting 7 P. Areeda, Antitrust Law ¶ 1511, p.429 (1986)).

[48]   *Todd v. Exxon Corp.,* 275 F.3d 191, 206 (2nd Cir. 2001).

[49]   Andrew I. Gavil, "Copperweld 2000: The Vanishing Gap Between Sections 1 and 2 of the Sherman Act," *Antitrust L. J.* **68:**87, 99 (2000).

If the formalities of market definition can be skipped in favor of direct analysis of harm in monopolization and collusion cases, then there is no reason the same should not hold true for merger analysis where the issue—projected competitive harm—is similar. To be sure, merger analysis is often more prospective and predictive than other kind of antitrust cases, where the conduct at issue in the latter frequently has been ongoing for some time. That simply means, however, that direct effects may be easier to show in non-merger cases and not that direct evidence of market power shouldn't have the same priority in those merger cases where such evidence is available.

IV.   CONCLUSION

We have seen that there are a number of problems inherent in the current approach to uncertainty, which appears to: focus on "the" most likely outcome; treat unlikely events as impossible; use arbitrary temporal cut-off points to address the effects of time on uncertainty; and evidence poor recognition of the tradeoffs being made.

An unsophisticated treatment of decision making under uncertainty and over time can lead to misleading predictions of post-merger market conditions and of a merger's effects on consumer welfare. The resulting errors can run in both directions. For example, the courts might approve a merger that has a small probability of harming consumers but for which the harms would be very large if they occurred, or the courts might fail to recognize low-probability but high-impact efficiencies.[50]

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[50]   Similarly, the effects of myopia might run in either direction. For example, the agencies and courts might fail to recognize that there will be significantly fewer competitors in the future, or they might fail to recognize significant new entry that will be occurring as the result of ongoing innovation.

We have argued that the standard tools of decision theory offer a better approach. Specifically, the agencies and courts should:

- Account for uncertainty by estimating probabilities for various events and then calculating net expected benefits;

- Not make use of arbitrary probability or temporal cutoffs; and

- Address distributional concerns explicitly through the choice of payoff function.

We should not be understood as saying that our approach will make merger analysis "scientific" and automatic. Given the complexities of merger analysis and the inevitable limitations on data availability, there is still a strong element of judgment in formulating probabilities and projected magnitudes.[51] But even without making merger analysis completely formulaic, the importation of basic decision-theoretic principles into antitrust enforcement can have substantial benefits. Application of those principles will require agencies and courts to spell out their assumptions about the comparative values of all relevant probabilities and magnitudes, and to make transparent how they are weighing all the variables in their enforcement decisions. Such practices will improve both the transparency of the merger review process and the consumer welfare effects of merger enforcement decisions.

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[51]   Recent work in economics and psychology suggests that people systematically misestimate probabilities and exhibit other biases in making judgments under uncertainty. An interesting avenue for future research is to incorporate recognition of established biases into the analytical and litigation process. For example, one might want explicitly to impose a rule that various conditional probabilities have to be logically consistent with one another.

For an accessible survey of the many different biases, see Max H. Bazerman, *Judgment in Managerial Decision Making,* 5th ed., 2002, Hoboken: John Wiley & Sons, Inc. See, in particular, the discussion on pages 25 and 26 observing that many people ascribe a higher probability to event A than event B even when the occurrence of event A is conditional on event B's taking place.