THE RELEVANCE FOR ANTITRUST POLICY OF THEORETICAL AND EMPIRICAL ADVANCES IN INDUSTRIAL ORGANIZATION

Dennis W. Carlton[*]

INTRODUCTION

This paper discusses some of the recent theoretical and empirical advances in industrial organization over the last two decades, and explains their relevance, if any, to the analysis of antitrust problems. My principle conclusion is that it is a mistake to use solely the latest research tools to analyze competition. The recent advances in both theory and empirical work should definitely improve our ability to understand the competitive process but should be viewed as a complement, not as a substitute, for the more traditional studies.

Although it is always desirable to have additional tools to analyze a problem, it is important not to discard already proven tools. Specifically, there are some basic studies of markets that have proven useful and economists should continue to conduct them. These studies involve the application of microeconomic theory to data. They force the analyst to test whether his perception of how the markets work squares with the facts. Such studies include analyses to identify the products that compete with each other, analysis of entry and exit, the consequences of entry and exit, analysis of the importance of advertising and product quality, determination of the prevalence of price discounting, and, if possible, studies of the relationship between price and market concentration. Although these studies may, in certain circumstances, have limitations, some of which are addressed by the new tools, these studies continue to have merit and are often essential to understanding how competition in a market occurs. Indeed, many times certain natural experiments occur, such as sudden new entry, which can allow definitive analysis of the relationship between concentration and pricing.

Although the basis of antitrust analysis should remain the rigorous application of microeconomic theory to industry facts, and traditional analyses should continue to be important, there is no question that relatively re-

---

[*] Graduate School of Business, The University of Chicago; National Bureau of Economic Research. This paper was presented at the George Mason Conference on Antitrust, January 14, 2003. I thank Janice Halpern, Jerry Hausman, and Aviv Nevo for helpful comments.

cent advances in both theory and empirical methods have improved our ability to understand competition. Part I discusses the implication of the development and use of game theory. Game theory has become a standard tool in microeconomics and, although its predictions can often be ambiguous, has provided practical insights into the competitive process. After discussing the very broad area of game theory, Part II discusses specific areas where theory has improved our understanding of certain industry practices, such as strategic behavior, raising rivals' costs, and tie-ins. I also discuss some provocative work by John Sutton that links high concentration to fierce competition. On the empirical side, Part III discusses some breakthroughs in structural demand estimation, merger simulation, and the modeling of entry and exit. In the discussions of these new theoretical and empirical results, I highlight their likely relevance for antitrust practitioners.

I. GAME THEORY

The development and application of game theory[1] to industrial organization has been rapid over the last two decades. Indeed, game theory has had a major influence in all branches of microeconomics. Game theory applied to industrial organization attempts to explain behavior in a world characterized by a few firms who face uncertainty about their environment and their rivals.

Game theory models can become quite complicated and, when applied to problems in industrial organization, the results often are quite sensitive to what appear to be minor assumptions. Indeed, in some settings, almost any pricing outcome, from pure competition to monopoly, can be the equilibrium outcome of oligopoly behavior. This indeterminacy has led to much criticism of the value of game theory. This criticism is misplaced because game theory has definitely identified some key facts and explained why they can be central to an understanding of competition and strategic behavior. However, it is true that game theory alone cannot be a guide to practical

---

[1] Game theory was developed by JOHN VON NEUMANN & OSKAR MORGENSTERN, THEORY OF GAMES AND ECONOMIC BEHAVIOR (1944), to explain outcomes in environments where strategic behavior occurs. Further advances include John Nash, *Non-Cooperative Games*, 54 ANNALS OF MATH. 286 (1951), R. DUNCAN LUCE & HOWARD RAIFFA, GAMES AND DECISIONS (1957), and THOMAS C. SCHELLING, THE STRATEGY OF CONFLICT, (1960). The application of game theory to economics began in earnest with the work of John C. Harsanyi, *Games with Incomplete Information Played by "Bayesian" Players*, 14 MGMT. SCI. 159-182, 320-334, 486-502 (1967-1968), Reinhart Selten, *The Chain Store Paradox*, 9 THEORY & DECISION 127-159 (1978), and David M. Kreps & Robert Wilson, *Sequential Equilibria*, 50 ECONOMETRICA 863 (1982). Most modern treatments of industrial organization use game theory. *See, e.g.*, JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION (1988); DENNIS CARLTON & JEFFREY PERLOFF, MODERN INDUSTRIAL ORGANIZATION (2000).

enforcement when the theoretical results are sensitive to altered assumptions or when almost any pricing can be an equilibrium. It is a serious mistake to confuse the theoretical possibility of competitive harm with the fact of harm and to base policy on theoretical results alone.

A good example of such confusion arises in the literature on predatory pricing.[2] Significant contributions to game theory have been developed in the context of predatory pricing.[3] Despite the significance of these contributions to game theory, it is unfortunate that the context of these purely theoretical models involved predatory pricing. Generations of economists are now exposed to game theory in a way that leads to a misperception of the empirical frequency of predation. They mistake the frequency of theoretical articles on the topic with the frequency of empirical examples of the phenomenon. Despite the number of theoretical articles on predatory pricing, the overwhelming consensus has remained unchanged; the empirical importance of price predation is slight.

Despite frequent theoretical results, which are fragile in the sense that they can change dramatically with relatively minor changes in assumptions, game theory has improved our ability to understand competition. It highlights the importance of some key points that, although perhaps previously understood at some level, had received only passing attention. One key insight involves the way that sunk costs—costs that, once made, cannot be recouped—can alter the competitive environment. The expense of building a highly specialized plant that has no use other than production of a particular item, is an example of a sunk cost. Game theory teaches us that sunk costs can enable a firm to make credible threats. A firm will not pay attention to idle threats of its rivals. For example, a claim by a firm that it will price at a low level to dissuade entry is not credible if such pricing is not profitable in the event of entry. Although reputation can sometimes create credibility, sunk costs can do so in a convincing way. If an incumbent has entered a market by building a specialized plant, then a rival contemplating entry must expect future competition from the incumbent who is unlikely to exit the industry. That is not necessarily true if the incumbent has entered a market by renting very general production facilities. In such a case, the incumbent could, in response to a rival's entry into one market, use the facilities for production of a product in another market that faces less competition. Therefore, sunk costs can help an incumbent deter the entry of a rival.

Game theory has resulted in the development and flourishing of the field of strategic behavior in which one studies how a rival who acts early

---

2 For a discussion of this literature, see CARLTON & PERLOFF, *supra* note 1, at Ch. 11.

3 *See, e.g.*, Paul Milgrom & John Roberts, *Predation Reputation and Entry Deterrence*, 27 J. ECON. THEORY 280 (1982).

can irreversibly affect the state of competition to its advantage in anticipation of future competition. For example, suppose two firms are competing with each other and expect to do so in the future. If one firm can invest successfully in research and development to lower its future costs, then such investments will provide that firm with a competitive advantage in the future. Its incentive to invest in research can be even greater than it would be if the firm was a monopolist. By exploiting its advantage in research and development, the firm is behaving strategically. Every major business school has courses on such strategic behavior.

Game theory also can clarify thinking in Section I cases. In some of these cases, the legal issue is whether a certain information exchange constitutes "agreement." In "Communication Among Competitors,"[4] we showed that the relevant economic issue is whether, but for the exchange of information, price would have been elevated. The legal issue whether "agreement" occurs is shown to be irrelevant to both the relevant economic issue and identifying per se violations (even when there is no effect on price). The reason is that game theory shows that "agreement" lacks a clear economic definition when used outside of the context of legally enforceable contracts.

So, my bottom line is that game theory has demonstrated how some issues such as sunk costs, credibility of threats, and sequential competition, can be essential to understanding competition in a particular market. However, although there are some examples where game theory can improve our understanding of some antitrust issues (e.g., "agreement" in Section I cases), in general, game theory alone is unlikely to produce insights that are sufficiently robust to provide a clear guide to the implementation of antitrust policy.[5] I now turn to a few specific instances where theory (including game theory) has improved our understanding of antitrust issues and discuss whether and how the new understanding of antitrust issues should alter our views of the appropriate antitrust policy.

II. RAISING RIVALS' COST AND STRATEGIC BEHAVIOR

A firm will always want to see its rivals' cost rise relative to its own and can benefit even if its own costs rise. For example, a firm may support

---

4 Dennis W. Carlton, Robert H. Gertner & Andrew M. Rosenfield, *Communication Among Competitors: Game Theory and Antitrust*, 5 GEO. MASON L. REV. 423, 440 (1997).

5 Game theory has had an enormous effect on the development of the theory of auctions. Game theory has been used to design auction rules that maximize revenues to the sellers. The most notable example was the design of the FCC spectrum auctions. Therefore, it is possible that game theory could be used to understand the consequence of certain collectively determined auction rules in an antitrust proceeding.

a government regulation to tax energy if its rivals are much more energy intensive than the firm. Although costs and the market price will likely rise as a result of the regulation, and thereby reduce demand, the firm will be benefited relative to its rivals and could gain a sufficient share of the (reduced) demand so that its profits rise. Of course, it would be even better if the firm was exempt from the regulation, but the theory of raising rivals' costs explains why it can be in the interests of the firm to raise everyone's costs as long as rivals' cost rise faster than its own.

It is possible to conceive of much strategic behavior in the context of raising rivals' costs. My earlier discussion of game theory showed that a firm that can act before its rivals can undertake irreversible investments that alter the competitive landscape to its advantage in the future. Previously, I gave the example of building a plant, but there are many other examples of strategic behavior. For example, engaging in research and development or advertising, developing high quality products, expanding capacity or engaging in vertical integration all can be viewed as strategic acts to benefit the firm at the expense of its rivals.

The great difficulty from a practical standpoint of designing antitrust policy is that although one can show how strategic behavior in these cases can sometimes harm consumers, we also know that all these acts can generally help consumers. Indeed, many of these acts form the essence of competition. This brings us right back to the earlier criticism of game theory. Theory alone cannot guide one to proscribe certain strategic behavior. And if one says that the data must determine which strategic acts harm competition, and which do not, I caution that creating a significant possibility of antitrust liability for engaging in competition through research and development, advertising, quality improvement, or capacity expansion would likely chill competition generally, and therefore would be unwise.

There has been an attempt to preserve the concept of anticompetitive strategic behavior by defining it as behavior that would not be profitable, but for the harm it inflicts on rivals. I am skeptical that such a definition would generally prove useful. Consider the case of advertising. What is the relevant "but for" world in which to apply the definition? Is it with a rival who does not advertise? This does not make sense because as long as advertising has some positive benefit to consumers, the fact that firms would be better without it (if they could collude to eliminate it) does not mean that consumers would be better without it. Again, the problem is that any competitive act harms rivals and helps the firm that engages in the act; and to condemn competitive acts because it harms rivals would chill competition.

A *Exclusion and Tie-In Sales*[6]

Anticompetitive harm arising from the imposition of exclusivity requirements, either through exclusive dealing, exclusive territories, or tie-in sales, has long been a concern of antitrust law. The concern has been that these requirements exclude rivals from competing by foreclosing possible customers from rivals. Yet, considerable theoretical doubts lingered about the ability of these exclusionary practices to impede competition.[7]

The key insight, perhaps implicit in earlier discussions, but first clearly identified by Michael Whinston,[8] is that in a world with other than constant returns to scale and perfect competition, exclusionary practices can harm competition. In a series of different models, Whinston shows how tie-in sales can adversely affect competition. To provide one illustration, due to R. Gertner, consider a resort island consisting of locals and tourists. Suppose that there are several local restaurants but only one hotel, which also has its own restaurant. Suppose that this hotel decides to tie the provision of rooms to the provision of meals, so that meals in the hotel restaurant are bundled into the room price, creating an incentive for the hotel guests to eat in the hotel restaurant. The consequence is that there will be fewer patrons for local restaurants. If there are scale economies in running a restaurant, then there may be many fewer local restaurants. The result could be to concentrate the restaurant sector and create market power in restaurants. In such a case, the market power of the hotel combined with a tie-in sale could create market power in restaurants. This scenario is exactly what the traditional antitrust foreclosure theory always worried about. The foreclosure theory raises the concern that competition in the tied market (e.g., restaurants) was foreclosed to competitors as a result of the tie-in.

The Microsoft case stimulated much research on the ways that tie-in sales can harm competition.[9] A significant insight is that, in a setting with market power and scale economies, a tie between a monopolized product and a non-monopolized product can protect the monopolized product (i.e., the tying product) from competition.[10] In this use of tie-in sales, the goal of

---

6 For a more extensive discussion of the topics in this section, see Dennis W. Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal—Why Aspen and Kodak are Misguided*, 68 ANTITRUST L.J. 659, 683 (2001).

7 *See, e.g.*, Richard A. Posner, ANTITRUST LAW (2001).

8 Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837, 859 (1990).

9 *See, e.g.*, Michael D. Whinston, *Exclusivity and Tying in U.S. v. Microsoft: What We Know, and Don't Know*, 15 J. ECON. PERSP. 63, 80 (2001).

10 *See, e.g.*, Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON. 194, 198-212 (2002); Carlton, *supra* note 6, at 683.

the tie-in is not the traditional antitrust concern with the creation of market power in the tied product, but the preservation of market power in the tying product. So, according to this theory, Microsoft tied its browser (Internet Explorer) to its operating system (Windows), not to create market power for its browser, but to preserve its market power in operating systems. The focus of this research is on the dynamic nature of competition in which product change is continuous. This research explains why, in dynamically evolving industries, the tying of complements can be important to retain market power in the primary market. The theory seems to fit several of the facts of the Microsoft cases and the earlier cases involving IBM.

Similar theoretical breakthroughs have clarified our understanding of exclusive dealing. One concern with exclusive dealing had been why dealers would agree to exclusivity if the consequence were that a supplier would exclude rivals and become a monopolist that would charge dealers high prices. Rasmussen *et al.*,[11] later amended by Segal and Whinston,[12] show that because of a free rider problem, dealers may voluntarily choose to abide by exclusivity restrictions even if the consequence is the creation of additional market power in the supply of the product. The simple insight is that if there are many dealers, and each thinks that the others will sign an exclusivity arrangement with the dominant supplier, then one dealer's decision will have no effect on the survival probability of a supplying firm (because one dealer is too small to matter). Hence, there is nothing lost by signing an exclusive dealing arrangement with the dominant supplier. The basic idea is that a little advantage in supplying a product can be used, through exclusivity arrangements, to foreclosure a rival from effective distribution, thereby creating additional market power for the supplying firm with the initial advantage.

These theoretical clarifications should be enormously helpful in applying antitrust doctrines, as I have elaborated elsewhere.[13] I find useful the distinction between exclusionary restrictions imposed on others (e.g., dealers) and exclusionary restrictions created by unilateral action (e.g., product design and vertical integration). The antitrust laws have traditionally been much more hostile to restrictions on third parties than to restrictions that result from transactions within the firm (e.g., vertical integration). This is a reasonable approach if one believes that it is more costly to intervene into the activities within a firm than into activities between firms. Although I have never seen this proposition empirically supported, it sounds reason-

---

11 Eric B. Rasmusen, J. Mark Ramseyer & John Shepard Wiley Jr., *Naked Exclusion*, 81AM. ECON. REV. 1137, 1145 (1991).

12 Ilya R. Segal & Michael D. Whinston, *Naked Exclusion: Comment*, 90 AM. ECON. REV. 296, 309 (2000).

13 Carlton, *supra* note 6, at 683.

able. Therefore, I would generally subject only restrictions on third parties to antitrust scrutiny, and then apply the insights of the new theoretical developments that I have just discussed. The difficult balancing of costs and benefits under the rule of reason would still remain, but at least now there are sensible theories to understand how costs can arise from these practices.

B. *Entry Concentration and Competition*

In the 1974 book, "Industrial Organization: the New Learning,"[14] several authors stressed that some industries become concentrated because the most efficient firms expand. The insight of this literature is that concentration is determined as the outcome of the competitive process and that high concentration could benefit consumers. Building on these insights, Sutton and his co-authors have developed an area of research that explores in depth the link between competition and concentration when entry is possible. Their research focuses on how concentration is likely to change as market size grows. If scale economies at the firm level determine concentration, then concentration should fall as market size grows and more firms can fit in the industry. Sutton's research shows that this is sometimes, but not always, true.[15]

To fix ideas, imagine three different models of competition (i.e., three different competitive games). In one, all firms act like a perfect cartel, charging the monopoly price. In another, firms behave in a Cournot fashion; they regard the output of other firms as beyond their control and choose optimally their output. In the third model, firms compete in a Bertrand fashion, and regard other firms' prices as beyond their control and choose optimally their price.

The three models differ in how close price will be to marginal cost for any given number of rivals. In the cartel case, there is no competition and price is set at the monopoly level. In the Cournot case, price is initially set at the monopoly level and declines to marginal cost as the number of competitors increases. In the Bertrand case, as long as there are two competitors, price is set at marginal cost. With only one firm, both Cournot and Bertrand yield the monopoly outcome. I have illustrated these outcomes in Figure 1 below.

---

[14] Harvey J. Goldschmid, H. Michael Mann & J. Fred Weston, INDUSTRIAL TRIAL CONCENTRATION: THE NEW LEARNING (Harvey J. Goldschmid et al. Eds., 1974).

[15] John Sutton, SUNK COSTS AND MARKET STRUCTURE: COMPETITION, ADVERTISING, AND THE EVOLUTION OF CONCENTRATION (1991); John Sutton, TECHNOLOGY AND MARKET STRUCTURE—THEORY AND HISTORY (1998).

FIGURE 1

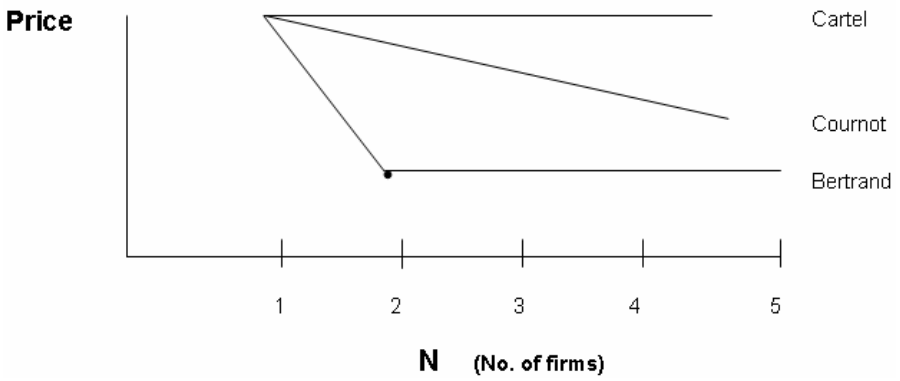


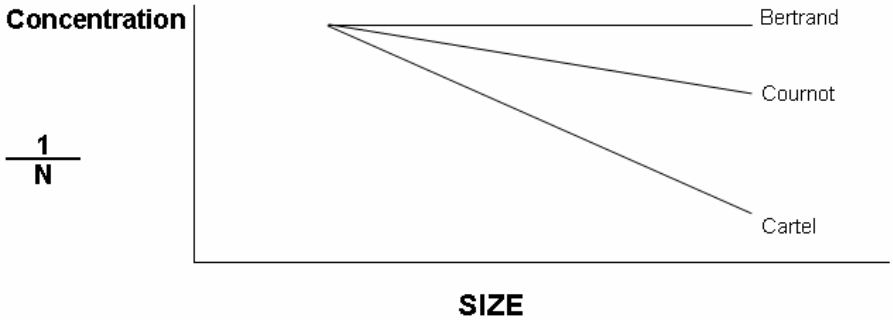
Figure 1 illustrates that for any given number (N) of firms, the price depends on how competitive the firms are toward each other. As the assumed behavior (i.e., cartel, Cournot, Bertrand) becomes more competitive, price is set closer to marginal cost. As the diagram illustrates, for $N > 1$, Bertrand is more competitive than Cournot, which is more competitive than a cartel.

Sutton asks what determines the number of firms in the market. Suppose that there are constant returns to scale and a fixed cost to enter. Consider the cartel case first. Since there is a fixed cost of entering, firms will enter until the cartel profits of the last entrant are zero. So, for example, if at the cartel solution industry profits equal \$100, then there will be ten firms if the entry cost is \$10.

In general, profits per firm will depend on price, which will depend on the type of competition (as shown in Figure 1) and on total industry output (which will depend on how many customers are in the market (market size)). Here is where the interesting results start emerging. Since industry profits are highest for the cartel, the cartel solution will have the most number of firms for any given size market! The least competitive model produces the lowest concentration. For the cartel case, as market size grows, the price remains at the cartel level, yet concentration falls. For the case of Cournot competition, as the market size grows, more firms enter to drive profit to zero and price falls to marginal cost. For the case of Bertrand competition, we get a somewhat unusual result that price starts out at the monopoly level but then, even as market size grows, additional firms never enter because the vicious expected price competition eliminates the possibility of profitable entry. In less extreme models, the result becomes that entry occurs as market size grows, price drops precipitously and the low prices keep profits so low that not much additional entry occurs.

Figure 2 illustrates these outcomes.

FIGURE 2



The paradoxical result, illustrated in Figure 2, is that for any given market size, low concentration coincides with the least competitive market structure, the cartel. This finding of Sutton underscores and lays bare the difficulty of using concentration as a measure of the competitiveness of different industries. Concentration has different implications for how close price is to marginal cost depending on the way in which firms compete with each other (e.g., cartel, Cournot, Bertrand). Even in highly concentrated industries, mergers may not raise any antitrust issues if the market is already characterized by vigorous competition.

Sutton also investigates the case where there is a distinction between "exogenous" and "endogenous" sunk costs. The case we have just studied with a fixed cost of entry is the case of "exogenous" sunk cost in which the size of the sunk cost is known and beyond the ability of an individual firm to influence that cost. But Sutton emphasizes another possibility: that the fixed cost could depend on how the firm chooses to compete. For example, the firm could choose to advertise its product more heavily or invest in research and development to improve product quality. These decisions raise the fixed costs of entry. Such a case is called the case of endogenous fixed costs.

The case of endogenous fixed costs is interesting because, unlike the case in Figure 2, concentration no longer generally falls as market size grows. Imagine two towns, one small and one large. The small town has two local newspapers of low quality. The large town, which could support several local newspapers of low quality, also has two newspapers but of very high quality. Even though the two towns differ in size, concentration is the same because of quality competition. Sutton's work emphasizes that there are important dimensions other than price that firms compete on, and this competition (by affecting fixed costs) affects market concentration.

Again, Sutton is underscoring and providing further support for a well known antitrust principle: comparisons of concentration across markets cannot predict differences in consumer welfare. For example, allowing a newspaper merger in response to a shrinking population could allow more vigorous quality competition and benefit consumers, as compared with leaving the number of newspapers unchanged.

III. ADVANCES IN EMPIRICAL ANALYSIS

I will focus on two advances in the empirical area—structural demand estimation combined with merger simulation, and empirical findings regarding entrants—and discuss their relevance for antitrust practitioners.

A. *Structural Demand Estimation Combined with Merger Simulation*

1. Techniques

Much antitrust analysis requires an understanding of the ability that a firm (or several firms) has to exercise market power. One approach to this problem in the case of differentiated products is to estimate the demand curve facing each firm assuming that the products of each firm are differentiated. For example, in the case of beer, each brand and type of beer (e.g., Miller Lite Beer) could be viewed as a separate product and the analyst could try to estimate the demand curve for a particular type and brand of beer as a function of its price and the prices of related beer products. The difficulty in estimating such a demand curve has been that if one treats each product as separate, there are so many parameters to estimate that it is not possible to estimate them accurately. One approach to this problem is to impose sufficient constraints on the substitution patterns among the many products to permit accurate estimation. The danger is that the constraints could so determine the type of substitution patterns that are estimated that the goal of the analysis, which is to identify the important substitute products, is undermined.

To fix ideas, consider a commonly used demand scheme, the logit, to analyze market shares of differentiated products. The logit demand says that the relative market share of two products depends on the difference in their market prices. This assumption makes it easy to estimate demand, but it has the unfortunate property that all elasticities and cross elasticities are determined solely by market shares. Products with big shares always have

lower price elasticities than products with small shares, all else equal. Though this may sometimes be true, it need not always be the case. This property (together with a related property on cross elasticities) guarantees that the analyst will always find mergers between firms with high shares more objectionable than those between firms with low shares, independent of actual substitution patterns.

There are several ways to address this problem. One is to group similar products in "nests" and to impose a particular pattern of substitution on products within the same nest and across different nests. For example, one can think of a consumer deciding between a "nest" of light beer versus a "nest" of regular beer. If the light beer nest is chosen, one can then ask which particular product within the nest is chosen. This approach implies a structure of substitution not as constraining as the logit, but also imposes the simplifying assumption that, once a particular nest (i.e., lite beer) is chosen, the particular brand of lite beer that is demanded will depend only upon the properties of light beer brands and not on the prices of individual products outside the nest (e.g., the price of Miller regular beer). This multi-stage structure of decision-making can be modeled as nested logit or (if one wants to have even fewer restrictions) with what is referred to as Almost Ideal Demand System ("AIDS").[16] The AIDS model allows more general patterns of substitution flexibility than the nested logit formulation.[17]

Once the demand system is estimated, one can calculate mathematically what the implied price increases will be if two firms merge, as long as costs are known.[18] The basic idea is that, if the analyst knows the extent to which two products substitute for each other, he can calculate, under any hypothesized model of competition, how the prices will increase as a result of a merger when one firm becomes responsible for setting the prices of competing products.[19] This approach has become quite common in the antitrust analysis of mergers involving differentiated products.

Although the nested logit and AIDS model have been successfully estimated and used in antitrust analysis, another approach developed by Berry, Levinsohn and Pakes ("BLP")[20] makes explicit that consumers differ

---

16 See Jerry Hausman, Gregory Leonard & J. Douglas Zona, *Competitive Analysis with Differentiated Products*, 34 ANNALES D'ECONOMIE ET DE STATISTIQUE 159, 178 (1994).

17 Another model with greater flexibility than nested logit is the Principles of Differentiation (PD) model of Timothy F. Bresnahan, Scott Stern & Manuel Trajtenberg, *Market Segmentation and the Sources of Rents from Innovation: Personal Computers in the Late 1980s*, 28 RAND J. OF ECON. S17, S44 (1997).

18 Often the analyst uses the estimated price elasticities to infer marginal cost, a procedure fraught with the potential for large errors.

19 *See, e.g.*, Jerry Hausman, Gregory Leonard & J. Douglas Zona, *Competitive Analysis with Differentiated Products*, 34 ANNALES D'ECONOMIE ET DE STATISTIQUE 159, 178 (1994).

20 Steven Berry, James Levinsohn & Ariel Pakes, *Automobile Prices in Market Equilibrium*, 63

in both observable and unobservable traits. By averaging over all consumers, BLP can estimate the underlying heterogeneity and a very general demand system which, in aggregate,[21] can have very flexible substitution patterns among products. The techniques can be quite complicated and, as before, the demand system must be interacted with some model of competition to produce equilibrium prices. Finding the equilibrium prices can require a complicated simulation which adds to the difficulty of using this technique. I am not aware of any research that compares the accuracy in simulating the effects of mergers of AIDs modeling to the BLP approach.[22]

2. How Reliable Are These New Tools

Given that some of these new empirical techniques to assess mergers require many assumptions, some question the reliability of these techniques. I do not think that there is a long enough track record yet to definitively assess the reliability of these techniques. My own view is that, regardless of the concern with how one models competition, the improved estimation of direct and cross elasticities is a significant benefit that will provide a better understanding of likely constraints on price. When combined with sufficient data (typically scanner price data collected at the point of sale), these techniques often permit elasticities and cross elasticities to be estimated with precision. Knowledge of the elasticities and cross elasticities gives the analyst a lot of information about potential constraints on pricing.

One intriguing finding from use of these more sophisticated demand systems is that demand elasticities, estimated with much simpler assumptions and with techniques that are easier to implement than BLP's, are often considerably lower than those estimated with the BLP approach.[23] This

---

ECONOMETRICA 841, 890 (1995).

21 At the level of the individual consumer, the model becomes a logit whose drawbacks I have already discussed.

22 See, Aviv Nevo, DEMAND FOR READY TO EAT CEREAL AND ITS IMPLICATION FOR PRICE COMPETITION, MERGER ANALYSIS, AND VALUATION OF NEW GOODS, Ph.D. Thesis, Harvard University, ch. 6 (1997), for a comparison of demand estimation in the ready to eat cereal industry; and Craig Peters, *Evaluating the Performance of Merger Simulation: Evidence from the U.S. Airline Industry*, Department of Justice Discussion Paper (2003), for a comparison in the airline industry. Peters does show that the PD model performs better than nested logit in a merger simulation in the airline industry. *See* Bresnahan et al., *supra* note 17.

23 *See, e.g.*, AUSTAN GOOLSBEE & AMIL PETRIN, THE CONSUMER GAINS FROM DIRECT BROADCAST SATELLITES AND THE COMPETITION WITH CABLE TELEVISION (National Bureau of Economic Research, Working Paper No. 8317,2001). A similar finding can appear in the AIDS literature when one contrasts estimation results using methods (ordinary least squares) that ignore how price is formed with estimation methods that take into account this formation (instrumental variables).

suggests that more traditional methods of estimating demand elasticities overstate the amount of market power. One possible reason for this overstatement is that an analyst is often unable to measure quality of the good. Therefore, consumers facing a high price may not reduce consumption as much as expected because they obtain an offsetting improvement in quality. As a result, the analyst may incorrectly conclude that consumption is not sensitive to price, when in fact the correct conclusion is that consumption is sensitive to price, holding quality constant. It is this last concept that is the relevant one for understanding market power.

There are four major drawbacks to these new empirical tools. First, there is often an implicit assumption that the retail demand for the product translates into the wholesale demand for the product. This is a crucial step, because it is usually mergers of manufacturers, not retail distributors, that raise antitrust issues. Therefore, the demand curve faced by manufacturers is the relevant one. The retail demand curve will translate simply into the demand curve faced by manufacturers only if retailing is competitive. This strikes me as a problem that can be addressed and corrected, though I have not seen it done.

The second drawback of these techniques is that, to predict price after a merger, the analyst needs an estimate of (marginal) cost. Often, the analyst estimates cost, not by using cost data, but instead by using a combination of demand elasticities and an assumption about competition. For example, if I assume that a firm is a monopolist, estimate its price elasticity of demand to be 2, observe a price of $10, then I can use the optimal pricing formula for a monopolist to calculate that marginal cost is $5.[24] But it makes me a bit nervous and strikes me as a bit odd to estimate costs indirectly exclusively through a combination of demand elasticities and an assumption on competition, rather than directly from cost data. I am confident that this issue can be addressed by using information about costs.

The third drawback is that the focus of the analysis is exclusively on price competition and ignores other aspects of competition, such as product quality or advertising. As I have already pointed out, Sutton[25] has shown how competition in dimensions other than price can have significant effects on concentration. Even though there is no published study of this topic, conceptually, there is no reason why the same techniques used to solve for the equilibrium prices, cannot also be applied to solve for each firms' equilibrium qualities.[26] Therefore, again, this third drawback strikes me as one that can be addressed.

---

24 (P - C)/P = -1/e. is the optimal pricing formula where P is price, C is cost and e is the price elasticity of demand.

25 *See* Sutton, *supra* note 15.

26 To solve for equilibrium, in addition to postulating the type of competition amongst the firms,

The fourth significant drawback, and perhaps the most difficult one to overcome, is that to predict the post-merger equilibrium prices, the analyst must specify the type of competition prevailing before and after the merger. By type of competition, I do not mean the number of firms. Instead, I mean the form of "game" (e.g., Cournot where quantities of rivals are assumed fixed, or Bertrand, where prices of rivals are assumed fixed). Typically, this "game" is assumed to remain unchanged both pre-merger and post-merger. But this assumption is the heart of the antitrust issue. How will the coordinated interaction of N-1 firms differ from that of N firms? Will firms play the same form of the game pre-merger as post-merger? To assume that there is no difference may risk understating competitive harm from a merger. This is a difficult issue on which little progress has been made.

This empirical approach to structural demand estimation and merger simulation has not yet focused on the fundamental issue of how the competitive game will change after a merger. Rather than through the use of structural estimation, this issue can be addressed by taking advantage of certain natural historical experiments that allow one to estimate directly the effect of having, say, one fewer firm on the equilibrium price.[27] The key is to find instances where the number of firms differ, as for example, when there are local geographic markets with different numbers of competitors. In such cases, one can then see directly how, all else equal, price and other dimensions of competition vary with the number of firms and obtain a direct answer to the question of how competition will change if there is a reduction in the number of firms as the result of a merger. There is a subtlety in this reasoning, though, that is quite important. In order for the analyst to draw conclusions about the relation of price to number of firms, it is necessary that the number of firms be "exogenous"—that is, not be determined by pricing. For example, consider the railroad industry. The number of railroads serving a particular city pair is determined by history—whether someone once built a railroad there—and probably is not influenced much by current pricing. In such a case, one can use the natural experiment of having a different number of firms serving different city pairs as a basis for inferring the relationship between price and number of firms that can then be used in merger analysis.[28]

---

one needs to know the costs for each possible quality of product. Estimating this cost information could be difficult.

27 CRAIG PETERS, EVALUATING THE PERFORMANCE OF MERGER SIMULATION: EVIDENCE FROM THE U.S. AIRLINE INDUSTRY (Department of Justice Discussion Paper, 2003), shows how the direct analysis of price on concentration allows for about as good predictions of prices post merger in the airline industry as the more complicated structural demand estimation followed by merger simulation.

28 When the number of firms is not exogenous, one must use special statistical techniques to estimate the relationship between price and number of firms.

Another example involves a case, Toys R Us,[29] in which I testified. In my analysis,[30] I recognized that a major toy seller, Walmart, was entering new regions of the country as part of its general business strategy. Because toys comprise a small fraction of Walmart's sales, its decision to enter an area likely had little to do with the pricing of toys. Hence, where Walmart was present was not determined by toy prices. Therefore, one could use the relationship between prices before and after Walmart's entry to evaluate the degree of market power in the selling of toys. That relationship could then be used to assess merger activity among retailers of toys.

B. *Empirical Studies of Entry*

Let me conclude by highlighting a small but growing body of research regarding firm size, growth, and entry. This literature is noteworthy for some general findings that should shape how one judges competition in an industry. It has long been recognized that the possibility of expansion by existing firms, or entry by new firms, can be a powerful disciplining force on price.[31] In our simplest models, which are often used to guide intuition, we assume that all firms are the same, and that expansion costs are similar for existing and new firms. Entry occurs when needed to drive price down to competitive levels. Yet, for the most part, the studies in this literature show quite different patterns than those that this simple model predicts.[32]

First, firms seem to be enormously heterogeneous, both in their efficiency, pricing, and product characteristics. Second, the rate of gross entry is correlated with the rate of gross exit across industries, indicating a tremendous amount of churning in many industries, especially among small firms. Third, the ultimate success of an entrant, as well as its initial size, depends heavily on its previous experience in the industry. It may be easy to enter many industries at a small scale, but it also may be hard for these entrants to grow into viable and significant competitors. This research underscores what I believe is an accurate characterization of the current policies of the Department of Justice and Federal Trade Commission regarding the use of entry as a defense to an allegation that market power exists, or will exist, as a result of a merger. In order to make such a defense successfully, one must be prepared to present evidence that entry has occurred in

---

29 Toys "R" Us v. FTC, 221 F.3d 928 (7th Cir. 2000).

30 Dennis W. Carlton & Hal S. Sider, *Market Power and Vertical Restraints in Retailing: An Analysis of FTC v. Toys 'R' Us*, in THE ROLE OF THE ACADEMIC ECONOMIST IN LITIGATION SUPPORT (Daniel Slottje ed., 1999).

31 *See* CARLTON & PERLOFF, *supra* note 1, at Ch. 3.

32 *Id*. at Ch. 4.

the industry under analysis in the past (or is likely to occur in the future) in a timely way and at a sufficient scale to constrain price.

CONCLUSION

Advances in both theory and econometrics sharpen our ability to better evaluate antitrust issues. But the overzealous use of new techniques should not blind us to the value of traditional analyses. Empirically based analyses, which may benefit from new econometric techniques and findings, combined with solid microeconomic theory that includes game theory, will remain the hallmark of careful antitrust analysis.