Behavioral Antitrust

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Abstract

In this chapter, I review the rational economic man model and contrast it with evidence of bounded rationality that has emerged since the last quarter of the previous century. I discuss the implications of bounded rationality for research in industrial economics, with particular attention to the analysis of predation, collusion, and entry. I conclude by drawing implications for the antitrust rules toward dominant firm behavior that come out of the *Matsushita* and *Brooke Group* decisions.

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1 Introduction[1]

In 1890, responding to a wave of popular unrest, the United States adopted the Sherman Antitrust Act. The economics profession had no direct input into the legislative process.[2] Economists supported the antitrust laws as setting guidelines within which market processes could work (Fetter, 1932; Simons, 1934). But while economists commented on applications of the antitrust laws, antitrust policy remained largely the province of the legal profession until the Celler-Kefauver Act of 1950 broadened the coverage of U.S. merger policy (Bok, 1960; Hovenkamp, 1988).

In the 1962 *Brown Shoe* decision, its first decision under the revised merger law, the U.S. Supreme Court stressed the role of economic analysis in assessing the future impact of a proposed merger on market performance.[3] For interpretation of industry economic data, courts and enforcement agencies turned to mainstream industrial economics and the empirically-based structure-conduct-performance paradigm. But the Celler-Kefauver Act lent force to a reinterpretation of the political economy of antitrust economics that was already underway at the University of Chicago.[4] This Second Chicago School came to view antitrust policy as the thin edge of the collectivist wedge, and sought to narrow the reach of antitrust.[5]

[1] For overviews of the evolution of U.S. antitrust policy, see Kovacic and Shapiro (2000), Stucke (2007, Section II.A).

[2] Economists and other academics did, however, participate in the broad public debate that preceded passage of the Sherman Act (Martin, 2008). Economists John Bates Clark and Jeremiah Jenks helped draft what became the Clayton Act of 1914 (Fiorito, 2013).

[3] 370 U.S. 294, 323, footnote 38: "Subsequent to the adoption of the 1950 amendments, both the Federal Trade Commission and the courts have, in the light of Congress' expressed intent, recognized the relevance and importance of economic data that places any given merger under consideration within an industry framework almost inevitably unique in every case. Statistics reflecting the shares of the market controlled by the industry leaders and the parties to the merger are, of course, the primary index of market power; but only a further examination of the particular market – its structure, history and probable future – can provide the appropriate setting for judging the probable anticompetitive effect of the merger."

[4] Director and Levi (1956), Martin (2007), Van Horn (2011, 2013).

[5] See Elzinga (1991, p. 124): "In 1964, concurrent with the rise of Senator Barry Goldwater to national prominence, Herbert Stein authored a piece defining conservative economics to the readership of the Washington Post .... Stein divided conservative economics into three varieties: 'Wall Street' ..., 'Chicago' ..., and 'Main Street' .... Stein (whose graduate work in economics was at Chicago) wrote that the 'Chicagoans are as wholehearted exponents of strong antitrust legislation as will be found in the country

Scholars who viewed the determinants of market performance through this lens were harshly critical of mainstream economic analysis of the determinants of market performance, on the ground that it lacked a solid theoretical foundation (Posner, 1979, p. 931):[6]

> A clue to the nature of the Harvard school of industrial organization is that its practitioners were so fond of doing studies of competition in particular industries—airlines, tin cans, aluminum, rayon, Douglas firs, etc. These studies exemplified the particularistic and non-theoretical character of the field. The powerful simplifications of economic theory—rationality, profit maximization, the downward-sloping demand curve—were discarded, or at least downplayed, in favor of microscopic examination of the idiosyncrasies of particular markets.

The "economic theory" that is meant is the neoclassical model of perfectly competitive markets, which carries with it the assumption that economic agents are (or may be treated as if they are) unboundedly rational.

A tenet of the Second Chicago School, the "good approximation" assumption, was that (Reder, 1982, p. 12) "in the absence of sufficient evidence to the contrary, one may treat observed prices and quantities as good approximations to their long-run competitive equilibrium values." Over the decade from the late-1970s to the late 1980s, three aspects of the "good approximation" vision of market processes have been particularly influential for U.S.

today ...' and ascribed to the University of Chicago brand of conservative economics 'constant government vigilance to preserve competition' as being 'essential', adding that 'such action is not 'intervention.' (1964, p. El). In short, Stein contended that Chicago economics embraced the kind of antitrust policy that Henry Simons proposed. After the article appeared, Aaron Director, then Simons' successor as the economist-in-residence at the law school, communicated to Stein that Chicagoans do not view antitrust that way anymore."

[6] The critique of studies of competition in particular industries has not stood the test of time. First, as we have seen (footnote 3), the Supreme Court expected that the "industry framework" of analysis would be "almost inevitably unique in every case." Second, the game-theoretic approach that has succeeded the S-C-P framework in industrial organization is a vast library of industry-specific theoretical and empirical models. Third, it is a persistent finding of experimental tests of models of imperfectly competitive markets that the details of institutional form "often dominate the effects of structural characteristics of the market" (Wellford, 2002, p. 41). This means that attention must be paid to industry-specific details if the determinants of market performance are to be understood.

antitrust policy. These are the views that predation is implausible and infrequent, that collusion is fragile and generally ephemeral, and that entry is a more-or-less automatic corrective mechanism that promptly tames the private exercise of market power. The result of this influence has been a reorientation of U.S. antitrust away from giving equal weight to collusion and anticompetitive dominant firm behavior[7] to the elevation of collusion as[8] "the supreme evil of antitrust."

From about the same time,[9] research by behavioral economists has cast doubt on the assumptions and implications of the unbounded rationality model. These findings have implications for many branches of economics.[10] They have implications for antitrust policy as well. The implications of behavioral research for antitrust policy toward collusion and strategic anticompetitive behavior, and for the weight to be given to the possibility of entry in formulating that policy, are the subject of this chapter.[11]

In Section 2, I review the development of the rational economic man[12] model in economics. In Section 3, I examine evidence of bounded rationality. In Section 4 I discuss behavioral industrial organization and its implications for antitrust and competition policy. Section 5 concludes.

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[7] In view of the high profile of the Standard Oil Company in the two decades before passage of the Sherman Act, one may make the case that anticompetitive behavior by dominant firms was the primary concern of the Sherman Act at the time of its adoption. The provisions of the 1914 Clayton Act, developed by John Bates Clark over a long period, aimed to allow firms to realize the benefits of large-scale operation, if such there were, but block them from preventing competitors from doing the same.

[8] *Verizon* v. *Trinko*, 540 U.S. 398 (2004), 408.

[9] See footnote 37.

[10] See, for example, the chapters in Diamond and Vartiainen (2007).

[11] Stucke (2011) discusses the implications of behavioral economics for collusion deterrence policy. Cooper and Kovacic (2012) consider the bounded rationality of administrators at antitrust enforcement agencies.

[12] I paraphrase Posner (1998, fn. 3) in writing that "The term 'rational man' is not intended to connote gender. Economic analysis ... assumes that women are rational to the same degree as men (and vice versa)." Ostrom (2000) uses the gender-neutral term "rational egoist," and that might be preferable, but "rational economic man" seems too embedded in the economics literature to try to change at this late date.

2 Unbounded Rationality[13]

2.1 Smith and the Classicals

Rationality entered economics with the work of Adam Smith,[14] simply as a plausible descriptive assumption about individual behavior in markets (Arrow, 1986a, p. S387):

> Among the classical economists, such as Smith and Ricardo, rationality had the limited meaning of preferring more to less; capitalists choose to invest in the industry yielding the highest rate of return, landlords rent their property to the highest bidder, while no one pays for land more than it is worth in product.

McNulty (1967, p. 396) argues that when Smith wrote, rationality in this sense was "a familiar concept in economic writing,"

> and that its analytical function was its recognized tendency to bring market price to a level which would eliminate both excessive profits and unsatisfied demand, that is, to the lowest level sustainable over the long run.

What is meant by rationality in this sense is that active firms, in pursuit of their own self-interest, raise price if there is excess demand for their products, lower price if there is excess supply. Active firms expand capacity, and new firms enter, if profits are above average at current prices, and reduce capacity

[13] For a survey, see Casson (1990).

[14] Moore (1906, fn. 1) ascribes the same idea to Quesney. Grampp (1948) and Sen (2008, p. 857) make the case that Smith's view of man was not narrowly economic. Coase, considering *The Wealth of Nations* and *The Theory of Moral Sentiments*, writes flatly (1976, p. 545-6) "It is wrong to believe, as is commonly done, that Adam Smith had as his view of man an abstraction, an 'economic man,' rationally pursuing his self-interest in a single-minded way. Adam Smith would not have thought it sensible to treat man as a rational utility-maximiser. He thinks of man as he actually is—dominated, it is true, by self-love but not without some concern for others, able to reason but not necessarily in such a way as to reach the right conclusion, seeing the outcomes of his actions but through a veil of self-delusion." Ashraf *et al.* (2005) reach very much the same conclusion. Coase's position has something in common with that of Vernon Smith (1998), who reads Adam Smith as invoking economic man for impersonal exchange, and sympathy (reciprocity) for personal exchange.

or exit if profits are below average at current prices. Consumers similarly adjust purchases, to maximize own utility, as prices change.

This notion of rationality went hand-in-hand with the view of competition as a process, that is, rivalry (Stigler, 1957, pp. 2-3). It was in this sense that the term "competition" was understood, in the English-speaking world, for much of the nineteenth century.[15] It implied movement toward an equilibrium defined by equal rates of return on all activities (Arrow and Hahn, 1971, p. 1):[16]

> Adam Smith's "invisible hand" is a poetic expression of the most fundamental of economic balance relations, the equalization of rates of return, as enforced by the tendency of factors to move from low to high returns.

When John Stuart Mill (1848, p. 242) wrote the often-quoted "[O]nly through the principle of competition has political economy any pretension to the character of a science," it was with reference to competition in this sense.[17]

2.2 Cournot

But it was Cournot's concept of competition that bore fruit in the twentieth century, not Smith's.

Cournot (1838) lay dormant for English-speaking scholarship until his work was highlighted by Marshall, who wrote in his *Principles* that (1890, p. xi) "Cournot's genius must give a new mental activity to everyone who passes through his hands." Cournot *defined* competitive equilibrium as a state in which each firm faced a horizontal demand curve. This (Stigler,

[15] Thus, Edgeworth (1881, p. 6) writes "Economics investigates the arrangements between agents each tending to his own maximum utility." (This is quoted by Moore, 1906). Edgeworth continues "Politics and (utilitarian) Ethics investigate the arrangements which conduce to the maximum sum total of utility."

[16] See similarly Stigler (1957, p. 15; 1963, pp. 54-55) and Richardson (1975, p. 351). Stigler further writes (1957, p. 15): "Rates of return on resources will be equalized only if their owners have complete knowledge of future returns (in the case of durable resources), and it seems improper to assume complete knowledge of the future in a changing economy."

[17] It is less often noted that Mill continued "it would be a great misconception of the actual course of human affairs, to suppose that competition exercises in fact this unlimited sway."

1957, p. 5) "precise and elegant" characterization lent itself to mathematical formulation, and led, inexorably, to the conditions outlined by Knight (1921, pp. 76–79) for a market to be perfectly competitive.

The second of Knight's conditions was "the members of the society act with complete 'rationality.'... They are supposed to know absolutely the consequences of their acts when they are performed, and to perform them in the light of the consequences."

In the words of Stigler (1957, p. 11, footnote omitted), "The concept of perfect competition received its complete formulation in Frank Knight's *Risk, Uncertainty and Profit* (1921). It was the meticulous discussion in this work that did most to drive home to economists generally the austere nature of the rigorously defined concept and so prepared the way for the widespread reaction against it in the 1930's."

2.3 Competition with Unbounded Rationality[18]

Competition in Cournot's sense excludes competition in Smith's sense. If all economic agents are price takers, no economic agent is a rival of any other economic agent. All transactions are mediated through prices (Knight, 1946, p. 107):[19]

> The economic man neither competes nor co-operates; his transactions with others are "impersonal," hence are not truly social, or human, relations. The perfect market would be one worked out through coin-in-the-slot machines, without human contact.

With perfectly competitive markets for all goods,[20] we obtain the First and Second Theorems of Welfare Economics: the equilibrium allocation is Pareto optimal, and with a suitable set of lump-sum transfers, any allocation can be supported as a competitive outcome.

Such an equilibrium implies a considerable economy of information processing. Economic agents need know nothing about the way the economy works. They simply make purchase and sales decisions, based on relative prices.

[18] For a survey, see Backhouse (1990).

[19] See also Hayek (1948), McNulty (1967, p. 397; 1968, pp. 641-642).

[20] And subject to other conditions; see, for example, Koopmans (1957, Essay 1).

Since (by assumption), the prices are equilibrium prices, individual decisions are consistent in the aggregate.[21]

The model of perfect competition is not descriptive of real world markets, nor is it intended to be. Scitovsky (1971, p. 25) writes that it is "an admittedly artificial and unrealistic model of economic behavior and economic organization, whose merit and justification are its simplicity and the fact that it is in many (though not all) respects a standard of perfection. Kaldor's view is (1972, p. 1237, emphasis added)[22]

> *[The theory] is not put forward as an explanation of how the actual prices of commodities are determined in particular economies or in the world economy as a whole.* By the term "explanation" Debreu means a set of theorems that are *logically* deducible from precisely formulated assumptions; and the purpose of the exercise is to find the minimum "basic assumptions" necessary for establishing the existence of an "equilibrium" set of prices (and output/input matrixes) that is (a) unique, (b) stable, (c) satisfies the conditions of Pareto optimality.

In his Nobel lecture, Arrow observes that in practice (1974b, p. 268) the "complete markets" assumption of general equilibrium theory fails, in particular with regard to contingent commodity markets, markets for goods that may or may not be realized, depending on the state of the world.[23] He continues "In my own thinking, the model of general equilibrium under uncertainty is as much a normative ideal as an empirical description."

2.4 Qualifications

Arrow (1974a, p. 2) emphasizes that the general equilibrium model is an *equilibrium* model: "In its most formal statement, we simply use for analysis the equilibrium conditions of the individual agent and of the market, without inquiry as to how they come to hold." We have no theory of how the economy reaches equilibrium (Arrow, 1986a, p. S387; Kirman, 2011, pp. 14-15).[24]

[21] Hayek (1945) highlights the information advantages of a competitive system, but he writes of competition as a process rather than as a state.

[22] See in the same vein Sen (1977, p. 322).

[23] Newbery (1989) discusses the welfare implications of incomplete markets.

[24] There is of course the Walrasian auctioneer, but that is invisible-hand-waving, not a model of the conduct of economic agents.

The universal price-taking that characterizes the equilibrium of complete competitive markets is incompatible with the assumption that if the economy is not in equilibrium, prices are set by identifiable economic agents (Arrow, 1959, p. 41).

At least three considerations suggest that the information-economizing properties of the complete competitive general equilibrium model do not carry over to real-world markets. First, out of equilibrium, on the supply side, firms need to know demand functions as well as rivals' prices and outputs, in order to evaluate their own most profitable price. On the demand side, the law of one price need not hold out of equilibrium, and buyers will need to know the prices of goods offered by all suppliers to decide where they should take their custom. In practice, neither set of conditions is likely to be met.

Second, the information and information-processing abilities imputed to payoff-maximizing firms is orders of magnitude greater if competition is imperfect than if it is not (Johansen, 1982, p. 431):

> Instead of saying that players who behave according to the Nash equilibrium concept are naive or myopic, I think it is more correct to say that they are very sophisticated players. They use all relevant information, they perceive correctly the interrelationships between the players, they make correct predictions of the decisions of all players involved, and in doing so they realize that the decisions made by other players are influenced by the data characterizing one's own situation.

Not only must all firms have complete information about all aspects of the market, and the ability to analyze it, but these facts must be common knowledge (Winter, 1986, p. S431): "Above all, the superoptimizer has unlimited access to free information-processing capacity. Were it not so deeply ingrained in the intellectual routines of the discipline, this characterization of human capability would be recognized as being totally inappropriate in a science concerned with the social implications of resource scarcity."

Third, information will not in general be uniformly distributed throughout an economy. This raises the possibility of adverse selection and consequent market failure (Arrow, 1974b).

2.5 It Doesn't Matter

2.5.1 As-if

Milton Friedman (1953) took the "as-if" position that considerations of the kind raised above are beside the point.[25] The economic hypothesis is not that firms maximize expected returns with full information and unlimited calculating ability, but rather (1953, pp. 21-22)[26]

> that under a wide range of circumstances individual firms behave *as if* they were seeking rationally to maximize their expected returns ... and had full knowledge of the data needed to succeed in this attempt; as if, that is, they knew the relevant cost and demand functions, calculated marginal cost and marginal revenue from all actions open to them, and pushed each line of action to the point at which the relevant marginal cost and marginal revenue were equal.

As restated by Samuelson (1963, p. 232), "[T]he 'F-Twist' ... is the following: A theory is vindicable if (some of) its consequences are empirically valid to a useful degree of approximation; the (empirical) unrealism of the theory 'itself,' or of its 'assumptions,' is quite irrelevant to its validity and worth."[27]

Blaug (1982, p. 92) classifies Friedman's methodology as "*instrumentalism*: theories are *only* instruments for making predictions...." His comment is that instrumentalism's (1982, p. 99) "weakness is that of all black-box theorizing that makes predictions without being able to explain why the predictions work: the moment the predictions fail, the theory has to be discarded

[25] See earlier Friedman and Savage (1948), who make the same argument with respect to utility maximization. Wong (1973), Blaug (1982), and Boland (2008) give references to the follow-on literature. Nagel (1963) and Musgrave (1981) discuss the alternative meanings given to the word "assumption" in connection with Friedman's argument. Thaler's discussion (2016, p. 1582) is devastating.

[26] See McFadden's (1997, p. 75) characterization of what he calls "the standard model in economics."

[27] Samuelson continued (1963, p. 233) "The motivation for the F-Twist, critics say, is to help the case for (1) the perfectly competitive laissez faire model of economics, which has been under continuous attack from outside the profession for a century and from within since the monopolistic competition revolution of thirty years past; and (2), but of lesser moment, the "maximization-of-profit" hypothesis...." See similarly Rotwein (1959).

in toto because it lacks an underlying structure of assumptions, an *explanans* that can be adjusted and improved to make better predictions in the future. It is for this reason that scientists usually do worry when the assumptions of their theories are blatantly unrealistic."

2.5.2 Economic Natural Selection[28]

In support of the as-if position, Friedman cites the Darwinian argument of Alchian (1950) (Friedman, 1953, p. 22):

> The process of "natural selection" thus helps to validate the hypothesis—or, rather, given natural selection, acceptance of the hypothesis can be based largely on the judgment that it summarizes appropriately the conditions for survival.

Others have pointed out that natural selection, in the economic world as in the biological world, does not guarantee optimality.[29] Archibald (1959, p. 63) quotes Darwin on this point:[30]

> Natural selection tends only to make each organic being as perfect as, or slightly more perfect than, the other inhabitants of the same country with which it comes into competition . . . *Natural selection will not produce absolute perfection*, nor do we always meet, so far as we can judge, with this high standard under nature.

[28] Apologies to Winter (1964).

[29] Archibald (1959), Blaug (1982, p. 102). Shubik (1954, p. 43) writes of "simplified interpretations or misinterpretations of Darwinism in attempts to draw social and political analogies from the work in the biological sciences." Blume and Easley (2002, p. 125) summarize their findings as: "To sensibly ask questions about evolution, the market structure must be incomplete. Thus what we are really asking is whether natural selection can compensate for the lack of complete markets. Of course, the incomplete markets equilibrium will not be a complete markets equilibrium from the start. But the natural selection conjecture is that from some interesting set of initial conditions (describing firms' capital or heterogeneous investors' wealths), the incomplete markets equilibrium converges to a complete markets equilibrium. Given how little structure incomplete markets equilibria have, the conjecture seems incredible and we show that it is false." They also (2002, p. 126) question the aptness of the analogy between biological and economic dynamics (as does Penrose, 1952). Schaffer (1989) presents a model in which Friedman's argument is valid if a market is perfectly competitive, otherwise not.

[30] The italics are due to Archibald. The citation is "*The Origin of the Species*, Everyman edition, p. 187."

Blaug (1982, p. 102) points out that the Darwinian justification grafts a dynamic adjustment process on the static framework of neoclassical economics. Winter (1986, p. S432) adds that "Since the [natural selection argument] by itself provides no indication as to how long it takes for adaptive processes to reach something like steady-state conditions, it provides no guidance regarding the quality of the predictions that standard economic models may be expected to provide in particular cases."[31]

Koopmans (1957, pp. 140-141) suggests that if economists believe it is economic natural selection that drives profit maximization, then economists should model the process and derive the result (1957, pp. 140-141):[32]

> But if this is the basis for our belief in profit maximization, then we should postulate that basis itself and not the profit maximization which it implies in certain circumstances. We should then postulate that entrepreneurial policies unsuitable for economic survival are applied by only a minority of enterprises which exhibit a high rate of economic mortality.

2.5.3 Learning

The issues raised by Friedman remain salient for economic theory (Mailath, 1998, p. 1347):

> Noncooperative game theory, like neoclassical economics, is built on two heroic assumptions: Maximization—every economic agent

[31] The long run may be very long indeed. The population geneticist persona of Selten (1991) says "It is dubious whether any mutations have changed human economic behavior in the relatively short time since the beginning of the dispersion of agriculture about 10,000 years ago. This means that biologically man may still be a hunter and gatherer not very well adapted to the necessity of long run planning. This may be the reason why some Ph.D. dissertations take much longer than planned."

[32] His subsequent comments are consistent with modern industrial economics, and echo critiques of the unbounded rationality model (Koopmans, 1957, p. 142): "Such a change in the basis of economic analysis would seem to represent a gain in realism attributable to a concern with the directly perceived descriptive accuracy of the postulates. It would lead us to expect profit maximization to be most clearly exhibited in industries where entry is easiest and where the struggle for survival is keenest, and would present us with the further challenge to analyze what circumstances give to an industry that character. It would also prevent us, for purposes of explanatory theory, from getting bogged down in those refinements of profit maximization theory which endow the decision makers with analytical and computational abilities and assume them to have information-gathering opportunities such as are unlikely to exist or be applied in current practice."

> is a rational decision maker with a clear understanding of the world; and consistency—the agent's understanding, in particular, expectations, of other agents' behavior, is correct (i.e., the overall pattern of individual optimizing behavior forms a Nash equilibrium). These assumptions are no less controversial in the context of noncooperative game theory than they are in neoclassical economics. ...

Mailath suggests that with repeated interactions, economic agents may learn to play equilibrium outcomes (Mailath, 1998, p. 1353):[33]

> In order to learn to play an equilibrium, players must be playing the same game repeatedly, or at least, similar games that can provide valuable experience. Once all players have learned how their opponents are playing, and if all players are maximizing, then we must be at a Nash equilibrium.

Winter (1986, p. S433) similarly argues that the natural selection argument "offers no support when the decision under consideration is unique ...or irreversible."

Many cases of interest for antitrust economics — entry, merger, predation, tacit collusion — are one-off events. Theory suggests that learning does not justify the use of superrationality assumptions for the analysis of the conduct of real-world economic agents in such situations. Nor does evidence from laboratory experiments (Rabin, 1998, p. 31):

> More generally, the research leads to mixed conclusions about when and how learning takes place, but very much does not support the strong versions of the experts-get-things-right and in-the-real-world-people-learn hypotheses.

2.6 Summary

Arrow (1986a, p. S387) points out that the rational economic man model is a package good:[34]

[33] He also mentions preplay communication, consistent predictions, and focal points as mechanisms that may lead to equilibrium outcomes. But Selten (1979, pp. 150-152) presents a three-level model of decision making in which, he argues, players cannot learn to be fully rational.

[34] See similarly Simon (1986).

> Its useful and powerful implications derive from the conjunction of individual rationality and the other basic concepts of neoclassical theory—equilibrium, competition, and completeness of markets.

Economists are loathe to quarrel with the elemental notion of economic rationality — "preferring more to less," more profit for firms, more "utility" for individuals. But the rational economic man model is a bundle: its implications depend not only on the assumption that all agents prefer more to less, but also that there are complete competitive markets, that all economic agents are fully informed about those markets, capable of analyzing that information, and that those markets are in equilibrium.

Beginning in the last quarter of the twentieth century, there emerged a flood of experimental evidence inconsistent with the assumptions of the unbounded rationality model.

3 Bounded Rationality

Boundedly rational economic man entered economics with the work of Herbert Simon, who originated and elaborated (1957, p. 198) "the principle of bounded rationality":

> The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world—or even for a reasonable approximation to such objective rationality.

Simon was at pains to distinguish boundedly rational behavior from irrational behavior (1957, p. 199):[35]

> [T]he first consequence of the principle of bounded rationality is that the intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model, and such behavior is not even approximately optimal with respect to the real world.

[35] See similarly Simon (1955, p. 101), (1997, p. 118), Chapter 6 ("Cognitive Limits on Rationality") of March and Simon (1958), and Selten (1979, p. 153).

Some of the evidence that emerged from the mid-1970s onward is consistent with a view of bounded rationality as optimization subject to constraints, some is not.[36]

3.1 Heuristics

Tversky and Kahneman (1974) describe the results of simple choice experiments (Kahneman, 2003b, p. 1460):

> "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors" .... The article introduced three heuristics—representativeness, availability, and anchoring—that were used to explain a dozen systematic biases in judgment under uncertainty, including nonregressive prediction, neglect of base-rate information, overconfidence, and overestimates of the frequency of events that are easy to recall.

3.2 Loss aversion

Kahneman and Tversky (1979) model utility as determined by changes from a reference level, not levels after the change (Kahneman, 2003a, p. 726):

> The shift from wealth to changes of wealth as carriers of utility is significant because of a property of preferences that we later labeled loss aversion: The response to losses is consistently much more intense than the response to corresponding gains, with a

[36] For surveys, see among others Sugden (1991), Rabin (1998, 2002), Rubinstein (1998), McFadden (1999), Starmer (2000), Kahneman (2003a, 2003b), Camerer and Loewenstein (2004), Camerer (2006), DellaVigna (2009), Mullainathan and Thaler (2015), and Thaler (2016). Thaler (1992) collects anomalies essays (anomalies, that is, from the point of view of the neoclassical model) from the *Journal of Economic Perspectives*. Diamond and Vartiainen (2007) present applications of the behavioral approach. Much seminal work (along with some original contributions) is collected in Camerer *et al.* (2004), which is the subject of two review essays (Fudenberg, 2006 and Pesendorfer, 2006). Sent (2004), Anger and Loewenstein (2012), and Nagatsu (2015) take history of thought approaches, as does Ellison (2006, Sections 2, 3), making connections with industrial organization.

> sharp kink in the value function at the reference point. ... The concept of loss aversion was, I believe, our most useful contribution to the study of decision making.

Thaler (1980)[37] draws on prospect theory to explain consumer behavior that cannot be explained by the unbounded rationality model, among which the endowment effect (giving less than full weight to opportunity costs), sunk cost fallacies, and self-control problems.[38]

3.3 Framing

Kahneman and Tversky (1984) and Tversky and Kahneman (1986) report on framing effects, which are also inconsistent with unbounded rationality (Kahneman 2003a, p. 727):

> A framing effect is demonstrated by constructing two transparently equivalent versions of a given problem, which nevertheless yield predictably different choices. The standard example of a framing problem, which was developed quite early, is the "lives saved, lives lost" question...

Thaler (1985) and Read *et al.* (1999) describe an aspect of decision-making (mental accounting or narrow choice bracketing), with origin in limited computational ability (Kahneman, 2003a, p. 728):

> The concept of mental accounting describes how people violate rationality by failing to maintain a comprehensive view of outcomes and by failing to treat money as fungible. [Thaler] showed how people segregate their decisions into separate accounts, then struggle to keep each of these accounts in the black.

[37] Camerer (2006, p. 184) writes that "Many people regard Thaler's 1980 paper as the starting point of behavioral economics per se, since it drew on psychology but was clearly focused on the economics of consumer choice ...."

[38] Self-control problems are also modelled by allowing agents to have a higher discount rate for the immediate than for the distant future; see Laibson (1997), Kirby (1997).

3.4 Ultimata and Voluntary Contributions to Public Goods[39]

One among the assumptions of the unbounded rationality model is that economic agents act strictly to maximize their own individual payoffs, and devil take the hindmost. Experimental tests of the ultimatum game and of voluntary contributions to public goods reject both unbounded rationality and exclusively selfish behavior.

In the Ultimatum Game (Rand *et al.*, 2013, p. 2581):[40]

> [O]ne player proposes a division of a sum of money between herself and a second player, who either accepts or rejects. Based on rational self-interest, responders should accept any nonzero offer and proposers should offer the smallest possible amount.

In contrast to this position, (Güth and Kocher, 2014, p. 398, footnote omitted):

> [T]he modal equal split offer is an extremely robust phenomenon. On average, players in the game tend to offer around 40–50% of the pie in the standard version of the game. Such offers are almost always accepted. Responders' acceptance rates decrease with smaller offers, and they approach zero quite quickly for offers below 20%.

As Thaler (1988, p. 197) notes (a) a responder that refuses a positive offer demonstrates concern for non-monetary aspects of the game, while (b) an offerer that does not offer the smallest possible amount may anticipate that offers perceived as being unfair will be rejected or may themselves have fairness concerns. Murnighan (2008) suggests that fear of rejection is the more important of the two motivations.

[39] The ultimatum game is due to Güth *et al.* (1982). For surveys, see Thaler (1988), Camerer (2003, Chapter 2), Murnighan (2008), and Güth and Kocher (2014). On voluntary contribution games, see Dawes and Thaler (1988), Ostrom (2000, pp. 139-141), and Holt and Laury (2008) (among other chapters in the *Handbook of Experimental Economics Results*).

[40] The ultimatum game is a simple game. In the words of Camerer (2003, p. 7) "Simple games are particularly useful because only one or two basic principles are needed to make a prediction. If the prediction is wrong, we know which principles are at fault, and the results usually suggest an alternative principle that predicts better."

Voluntary contributions experiments test for free riding in provision of a public good. Each subject in a group receives an endowment that can either be kept for own consumption or used to fund a public good. After individual contribution decisions are made, each subject receives (in addition to the part of the endowment that the subject has reserved for own consumption) a proportional share of a multiple of the total invested in the public good. The individually-optimal decision is to keep all the endowment for oneself, free-riding on other group members' contributions to the public good. In Nash equilibrium, there are no contributions to the public good. Marwell and Ames (1981) call this the "strong free riding hypothesis." The social (group) payoff is maximized if all individuals contribute their entire endowment to the public good. The "weak free riding hypothesis" is that there will be some contributions to the public good, but not enough to maximize the group payoff.

Describing the results of 12 variations of this basic framework, Marwell and Ames (1981, pp. 307-308) write

> [O]ver and over again, in replication after replication, regardless of changes in a score of situational variables or subject characteristics, the strong version of the free rider hypothesis is contradicted by the evidence. People voluntarily contribute substantial portions of their resources — usually an average of between 40 and 60 percent — to the provision of a public good. This despite the fact that the conditions of the experiment are expressly designed to maximize the probability of individualized, self-interested behavior. Free riding does exist — subjects do not provide the optimum amount of the public good, and tend to reserve a meaningful fraction of their resources. The 'weak' free rider hypothesis is supported. Nevertheless, the amount of contribution to the public good is not easily understood in terms of current theory.

3.5 Implications for Market Outcomes

The rational firm maximizes its profit by picking an output that makes (residual) marginal revenue equal to marginal cost. Faced with the resulting price, a fully rational consumer buys, if at all, a quantity that makes marginal utility equal to price. Yet the prevalence of price-gouging laws, which make it a crime to set a rational profit-maximizing price in the wake of a natural

disaster or other shock to a market, suggests that the perception of fairness is also a factor that can influence price-setting. Kahneman *et al.* (1986) report survey evidence consistent with this view, and conclude that "Several market anomalies are explained by assuming that these standards of fairness influence the behavior of firms."[41]

By the dawn of the current century, behavioral economics had moved into what Rabin (2002, p. 658) calls its "second wave," exploring applications to financial economics, labor economics, macroeconomics, and organizational economics.[42] We turn our attention to the implications of behavioral economics for industrial economics and antitrust policy.

4 Behavioral Industrial Organization: Implications for Antitrust Policy[43]

The early bounded rationality literature focused on documenting and explaining individual decisionmaking that appeared anomalous from the unbounded rationality perspective.[44] Applications of this work in industrial organization shed light on business strategy vis-à-vis consumers (Ellison, 2006, p. 147):[45] "In the recent psychology and economics-motivated lit-

[41] See later Rabin (1993, Section IV of which presents a model of the impact of concern for fairness on monopoly pricing), Fehr and Schmidt (1999). See Thompson (1971) for a historical example: he argues the eighteenth-century English food riots (p. 79) "operated within a popular consensus as to what were legitimate and what were illegitimate practices in marketing, milling, baking, etc."

[42] For references, see Sunstein (2000), Camerer *et al.* (2004), Thaler (2005), and Diamond and Vartiainen (2007).

[43] For surveys, see Ellison (2006), Armstrong (2008), Armstrong and Huck (2010), Spiegler (2011), Mehta (2013), and Bailey (2015). Bailey's Section 4 gives references to antitrust decision that turned on behavioral considerations.

[44] See, for example, Russell and Thaler (1985).

[45] See similarly Glaeser (2004, p. 409) and Bailey (2015, p. 360). Discussing (for example, Hall and Hitch, 1939), Ellison writes (2006, p. 145):"One aspect of this [early] literature that is striking in contrast to the current literature is that the focus is almost exclusively on firms' deviations from profit-maximization rather than on consumer irrationality." The literature referred to describes boundedly rational firm behavior, but not strategic behavior by one firm that is premised on bounded rationality of another firm. Akerlof and Yellen (1985, p. 709) give references to more recent papers that model deviations from non-maximizing firm behavior, as does in particular their Sections III-A and IV.

erature, the rational firm-irrational consumer assumption has become the norm, and the question of what firms do to exploit irrationality is often the primary focus."[46] Topics include consumer nonswitching, under circumstances in which it would appear rational for consumers to switch suppliers (Arbatskaya, 2000; Giuletti *et al.*, 2005), strategic obfuscation (Gabaix and Laibson, 2006; Spiegler, 2006; Ellison and Ellison, 2009; Huck, 2010; Richards *et al.*, 2017), pricing if consumers have time-inconsistent preferences or display overconfidence (DellaVigna and Malmendier, 2004, 2006), and pricing if consumer perception that prices are unfair impacts demand (Kahneman *et al.*, 1986; Spiegler, 2012).

As much as these analyses improve our understanding of the determinants of market performance in imperfectly competitive markets, they do not directly inform antitrust policy,[47] which in broad outline is concerned with collusion and strategic anticompetitive behavior.[48]

This leads us — after a discussion of the merits of applying behavioral insights to firm conduct — to consideration of the closely related topics of the economics of predation, collusion, and entry when firms are susceptible to behavioral impulses, and the implications for antitrust policy.

4.1 Bounded Rationality of Firms in Markets

Principal-agent models start from the premise that a firm's managers are hired by the firm's owners. This is a pleasant fiction (Arrow, 1994, p. 114):[49]

> Legally, incorporated firms are defined by the legal control and residual claims of stockholders. ... But even at an elementary level, there are questions in this definition, especially for large limited liability public companies. It has been noted for a long while that management is frequently only weakly responsive to

[46] In retrospect, Scitovsky (1950) appears prescient.

[47] The same may be said of the behavioral analysis of boundedly-rational but non-strategic firm behavior toward the adoption of new technologies (Ellison and Fudenberg, 1993, 1995) and of equilibrium behavior when when firms imitate rivals' behavior (see Armstrong and Huck, 2010, pp. 15-17 for discussion).

[48] These are of course the subjects of Section 1 and Section 2 of the Sherman Act, respectively. The Section 2 prohibition of monopolization is less expansive than Article 102 of the Treaty on the Functioning of the European Union, which prohibits abuse of a dominant position.

[49] See also Arrow (1986b, pp. 184-1185), and earlier Berle and Means (1932).

> stockholders. In fact, the management is more nearly the essential definition of the firm. The stockholders are investors who trade their holdings with considerable frequency and have no close relation to the firm.

If, as this statement suggests, managers have discretion to deviate from the maximization of shareholder value, then the bounded rationality of managers will affect firms' decisions — and firms' strategic interactions.

Managerial discretion may be limited by the presence of large institutional shareholders.[50] But the interest of large shareholders is to incentivize management to adopt policies that maximize value for large shareholders, not for all shareholders. Becht *et al.* (2005, footnotes omitted) note that there is a tradeoff between managerial discretion and protecting the interests of small shareholders: "In an attempt to boost stock market liquidity and limit the potential abuse of minority shareholders some countries' corporate law drastically curbs the power of large shareholders. These countries rely on the board of directors as the main mechanism for co-ordinating shareholder actions. But boards of directors are widely perceived to be ineffective. Thus, while minority shareholders get better protection in these countries, managers may also have greater discretion."

Investment by large shareholders in competing firms may promote tacit collusion, raising policy concerns that are independent of managerial bounded rationality (Azar *et al.*, 2017; Posner *et al.*, 2017). Proposals to limit cross-competitor shareholdings of institutional investors, or to limit such investors to passive roles, would also promote managerial discretion.

The argument has been made that managerial discretion can be checked by the use of incentive contracts that align managerial and owner interests. Shleifer and Vishny (1997, p. 745) point out that in practice incentive contracts are themselves subject to managerial discretion: "Managers may negotiate for themselves such contracts when they know that earnings or stock price are likely to rise, or even manipulate accounting numbers and investment policy to increase their pay."

A further argument has been that efficient capital markets — the market for management — will limit managerial discretion. In this view, managements that deviate from shareholder value maximization expose their firm to the possibility of takeover and themselves to the possibility of replacement.

[50] A 1940 article in *Fortune* magazine described the concentration of shareholding in the hands of a few "highly articulate owners" as "the greatest problem before executives."

This begs the question just how fine-tuned the efficient financial market is. In his presidential address to the American Finance Association, Fischer Black estimated (1986, p. 533) that in an efficient market, "the price is more than half of value and less than twice value" at least 90 per cent of the time. This leaves ample margin for management to wander from value maximization.[51]

Managers are individuals, and when they act as managers, subject to the same boundedness of rationality as when they act on other capacities. The administrative framework within which managers operate will compensate for bounded rationality in some dimensions, and magnify it in others (Engel, 2010, p. 463).

Excessive optimism seems characteristic of managerial decisionmaking, with implications for participation in collusive arrangements, entry, investment, and mergers (Roll, 1986; Zajec and Bazerman, 1991, Malmendier and Tate, 2005, 2008). List (2003, 2004) emphasizes the role of experience in taming anomalous behavior. Camerer and Fehr (2006) point to the interaction of players who do and do not think strategically in determining outcomes. Al-Najjar *et al.* (2008) find that an influence of sunk cost on pricing may survive adaptive pricing.

Writing specifically of managerial decisions regarding corporate finance, Camerer and Malmendier (2007, p. 258) suggest that managers are most likely to make "mistakes" when (i) decisions are not frequent and do not deliver clear feedback; (ii) the manager does not specialize in making those decisions; and (iii) managers are protected from market pressure and competition. It can be expected that these conditions will allow bounded managerial rationality to manifest itself for other types of managerial decisions as well, and some of those decisions may evoke antitrust concern.

4.2 Predation

4.2.1 Theory

The modern economic literature on predation begins with Selten (1978). In Selten's model (van Damme *et al.*, 2009, p. 139):

> [T]here is an incumbent (a chain store) who is a monopolist in several (finitely many) markets where it is operating the same

[51] Smiley (1976, p. 31) estimates that the threat of an outside offer to shareholders that would displace incumbent management gives "no assurance that firms will be valued at more than 86% of their true potential market value."

> technology and producing the same products. In each market, it faces potential entry. More precisely, in the first market, first the entrant decides about entry. Then, if entry occurs, the incumbent decides whether to fight or to accommodate. The outcome of this interaction becomes publicly known before in the second market the same stage game is played between the incumbent and a new entrant, etc.

If there is no entry, the incumbent gets the monopoly payoff and the potential entrant gets a normal rate of return from its outside option. If entry occurs and the incumbent accommodates, both firms earn positive economic profit (which together are less than monopoly profit). If entry occurs and the incumbent fights, both firms suffer economic losses.[52] Payoffs are known, and each potential entrant's entry decision and the incumbent's response to that decision become known to subsequent potential entrants.

The unbounded rationality equilibrium outcome calls for entry and accommodation in each market. By a backward induction argument that has become familiar because of Selten's work, the only reason for the incumbent to fight entry would be to create a reputation for fighting that might deter future entry. But the unboundedly rational potential entrant into the final market — the 20th market, in Selten's example — would understand that by fighting, the incumbent would reduce its own payoff, without the possibility of future gain, and would not be deterred if the incumbent were to fight entry in the next-to-last market. The incumbent cannot deter entry into the final market. But if the incumbent cannot deter entry into the final market, it has no incentive to fight in the next-to-last market, and the unboundedly rational potential entrant into that market would understand this. Thus the incumbent cannot deter entry into the next-to-last market. But the same logic applies, working backward, to each market, back to the first. The unboundedly rational first potential entrant is able to look forward to the final market and apply the backward induction argument. In the same way, each potential entrant will enter and be accommodated by the incumbent. Selten acknowledges that this *induction theory* yields the game-theoretically correct solution, but rejects it as an indication of actual behavior.

[52] This payoff structure can be seen as a black-box reflection of price decisions that are not explicitly modelled: no entry, monopoly price; entry and accommodation, noncooperative equilibrium duopoly prices; entry and fight, price below unit cost.

He takes a bounded-rationality view of human decision-making, supposing that decisions may be made on one of three levels, routine, imagination, and reasoning (Selten, 1990, p. 652):

> On the routine level a decision is reached very quickly without any thinking like in a difficult traffic situation which does not leave any time for conscious deliberation. On the level of imagination the decision maker tries to visualize how various initial actions may influence future events. The comparison of the scenarios constructed in this way is the basis of the selection of a decision alternative. On the level of reasoning an analysis of a model of the situation is performed.

He continues

> A *predecision* either activates only the routine level or the routine level and the level of imagination or all three levels. There are no other possibilities since higher levels need the help of lower ones. Routine decisions determine which scenarios are constructed on the level of imagination. The plausibility of model assumptions on the level of reasoning is checked by the level of imagination.
>
> If more than one level has been activated and different decisions are suggested by different levels, a final decision determines which of the level decisions is taken. This is not necessarily the decision suggested by the highest activated level. Reasoning is fallible and cannot be trusted absolutely. The level of imagination does not always produce a better decision than the routine level. To what extent the three levels of decision making can be trusted to yield adequate decisions is a matter of experience.

In this light, Selten puts forward a *deterrence theory* of incumbent behavior, according to which the incumbent fights entry, if it occurs, until the final few markets. Potential entrants near the end of the sequence of markets would be able to follow the induction argument; earlier potential entrants would not (Selten, 1978, p. 153):[53]

[53] For a striking echo of Selten's position, see Posner (1979, pp. 939-940):

> Obviously the induction argument is a result of abstract thinking which is done on the level of reasoning. On the level of imagination a clear and detailed visualization of a sequence of two, three or four periods is possible — the exact number is not important. A similarly clear and detailed visualization of a sequence of 20 periods is not possible. For a small number of periods the conclusions of the induction argument can be obtained by the visualization of scenarios. For a large number of periods the scenarios will either be restricted to several periods, e.g. at the end of the game or the visualization will be vague in the sense that the individual periods are not seen in detail. A player may imagine that 'in the beginning' something else will happen than 'towards the end' without having any clear view of the extension of these vaguely defined parts of the game.
>
> On the level of imagination, one cannot find anything wrong with the deterrence theory ...

For Selten, (1978, p. 133) "The fact that the logical inescapability of the induction theory fails to destroy the plausibility of the deterrence theory is a serious phenomenon which merits the name of a paradox," and Selten resolves the paradox by appealing to bounded rationality.

Kreps and Wilson (1982) resolve the chain store paradox by relaxing a different assumption of the unbounded rationality model, that of complete

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> Even without having a well-developed theory of strategic behavior, one can easily imagine circumstances in which predatory pricing, at least in the absence of legal prohibition, would be a plausible policy for a profit-maximizing seller to follow. Suppose that he sells in many markets, and his rivals sell in only one or a few markets each. If he sells below cost in one market, his losses there are an investment that will be recouped with interest in his other markets in the form of more timid competition from the rivals in those markets. Knowing that the multimarket seller can obtain substantial gains from a demonstrated willingness to sell below cost for an extended period of time in one market, the local victim may not think it worthwhile to try to outlast him.
>
> To be sure, the administrative and error costs of trying to prevent this sort of thing may outweigh its dangers to the competitive process. That, however, is a different point. My point is that predatory pricing is not irrational.

and perfect information.[54,55] In their variation of the chain store game, an incumbent may be either weak or strong. A weak incumbent is like the incumbent of Selten's game. A strong incumbent, however, earns a greater payoff by fighting than by accommodating. A fully-informed potential entrant would enter if the incumbent is weak, and stay out if the incumbent is strong. But at the start of the game, entrants do not know the incumbent's type. Entrants begin the game with an initial probability that the incumbent is strong, and update this probability as new information — the incumbent's response to entry, if entry occurs — arrives. Sequential equilibrium behavior for a weak incumbent is to fight entry, if it occurs, early in the game. Early in the game, the weak incumbent acts as if it were strong. This prevents entrants from acquiring information about the incumbent's type. Early entrants, knowing that the incumbent will fight (whatever its type), stay out. Approaching the end the game, some entrants make the attempt, and the incumbent fights, with a probability that is part of the solution, or accommodates, with the complementary probability. If the weak incumbent accommodates, it reveals itself to be weak, and all subsequent entrants come into their markets. If the weak incumbent fights, the game moves forward one period. A weak incumbent accommodates entry in the final period. This result shows that predatory pricing is not irrational, in theory, in markets where firms' managers are boundedly rational.

4.2.2 Experimental Markets

There are a large number of experimental tests of bounded-rationality models of predation.[56] One lesson of this literature, which it has in common with all experimental tests of models of imperfectly competitive markets, is that the details of experimental institutions matter for experimental results. Gomez *et al.* conclude their survey by writing that it (2008, p. 184) "is clear is that predatory prices can be generated reliably, both in stylized signaling games

[54]For detailed discussion of an example of the Kreps and Wilson model, see Martin (2002, pp. 249-254).

[55]Selten (1990, p. 651) comments that "In the past many economists followed the ingenious attempt of two excellent game theorists to run away from the problem by looking at a different game with slightly incomplete information (Kreps and Wilson (1982)). Such attempts to save the behavioral relevance of full rationality miss the point. The chain store paradox arises in the chain store game; it is irrelevant that it does not arise somewhere else."

[56]For surveys, see Gomez *et al.* (2008), Van Damme *et al.* (2009).

and in rich market settings." In discussion of Jung *et al.* (1994), van Damme *et al.* (2009, p. 139) write that

> [They] implement markets in which a monopolist plays a sequence of eight periods against different entrants. They implement both a version of the Selten set-up, as well as a version of the Kreps and Wilson model. Using the Kreps and Wilson definition of predatory pricing, they report that, for experienced subjects, predatory pricing occurred in 100 % of the cases in the Kreps and Wilson model and in 85% of the games in the Selten model.

Jung *et al.*'s results depart in some respects from the predictions of both models, but confirm that predatory pricing can occur in laboratory markets.

4.2.3 Natural Markets

The annals of business history contain numerous examples of predatory business conduct. These include the predatory pricing complained of in *Mogul Steamship*,[57] in *Standard Oil* (on which, see Dalton and Esposito, 2007, Leslie, 2012), in *Corn Products Refining Co.*,[58] and by the American Sugar Refining Company (Genesove and Mullin, 2006), as well as the use of fighting brands by the National Cash Register Company in the 1880s (Friedman, 1998), by the Tobacco Trust (Burns, 1989), and by the Canadian match monopoly (Yamey, 1972, fn. 18). One EU case is *AKZO* (*AKZO Chemie BV v. Commission* 1991 ECR I-3359 1993 5 CMLR 215).[59]

[57] *Mogul Steamship Company, Ltd. v. McGregor, Gow, & Co., et al.* ([Court of Appeal] (1884) 23 Q.B.D. 598 1889 July 13). For discussion, see Yamey (1972). Scott Morton (1997, p. 684) (which we discuss below) writes "I examine shipping cartels at the turn of the century because ever since their inception these cartels have generated enormous controversy over their alleged anticompetitive behavior, particularly predatory pricing. Numerous dramatic accounts of price wars to drive out entrants are described in publications of the period."

[58] *U.S. v. Corn Products Refining Co. et al.* 234 F. 964 (1916).

[59] Van Damme *et al.* (2009) and Fumagalli and Motta (2013, pp. 600-605) discuss other EU cases.

4.3 Collusion

4.3.1 Theory

Stigler (1964) considered the question of cartel stability. He discussed methods of collusion,[60] market characteristics that would or would not favor cartel stability, and pointed to the difficulty of maintaining agreements "whose violation would be profitable to the violator." Friedman (1971) looked at the cartel stability question in the context of a repeated game, and derived an easily interpretable condition — that the discount factor be sufficiently close to 1, which is to say that future income flows be valued almost as much, dollar for dollar, as current income flows — for a grim trigger strategy to support cartel stability. With a grim trigger strategy, any episode of defection from collusive output restriction is met with permanent reversion to one-shot game noncooperative equilibrium values. For rates of time preference that satisfy the indicated condition, the present discounted value of economic profit lost upon reversion outweighs the short-run gain in economic profit from defection, and it is not in any cartel member's interest to defect.

Antitrust policy concerns itself with collusion,[61] not tacit collusion.[62] If in Friedman's model the stability condition is satisfied, each firm independently decides, in its own self-interest, to restrict output. Such an equilibrium, therefore, describes tacit collusion, not collusion. Much of the economics literature glosses over the distinction.[63] Posner regards tacit collusion as unlikely to be important in practice (1969, p. 1574) : "[I]t seems improbable that prices could long be maintained above cost in a market, even a

[60] Such as use of a joint sales agency, fixing market shares, allocating customers or geographic areas to cartel members.

[61] Stigler (1964, p. 45): "collusion takes the form of joint determination of outputs and prices by ostensibly independent firms . . . "'

[62] *Brooke Group*, 509 U.S. 209, 227: "Tacit collusion, sometimes called oligopolistic price coordination or conscious parallelism, describes the process, not in itself unlawful, by which firms in a concentrated market might in effect share monopoly power, setting their prices at a profit-maximizing, supracompetitive level by recognizing their shared economic interests and their interdependence with respect to price and output decisions."

[63] Mason regarded the distinction between collusion and tacit collusion as posing an intractable policy dilemma (1949, p. 1277): "Now independence of action is, by definition, the opposite of collusion. But it may be impossible to determine from market behavior alone whether the firms are acting independently or together." Page (2009, p. 15) writes "[T]he law has never clarified the definition of a Sherman Act agreement sufficiently to distinguish concerted action from lawful conscious parallelism.

highly oligopolistic one, without some explicit acts of communication and implementation." This is consistent with the emphasis current antitrust and competition policy place on information exchange as a facilitator of collusion (Kühn, 2001; Potters, 2009). If, in this sense, we step outside the model, then Friedman's repeated-game approach can be taken as demonstrating that collusion is not inherently unstable.

Friedman derives his result in a full information environment. Green and Porter (1984) introduce uncertainty to the model, adding a random element to market demand.[64] Their modified trigger strategy ensures cartel stability in this generalized environment. The modification provides that if demand is sufficiently low in some period, firms revert to one-shot equilibrium behavior for a certain number of periods, after which they return to output restriction. Reversion periods have the flavor of a price war — output is not restricted — but in equilibrium, no firm actually defects; the role of the "price war" is to ensure that it is not in firms' interest to defect. Friedman and Green-Porter both retain the unbounded rationality model assumption that agents have unlimited information-processing ability: firms are able to identify the equilibrium strategy.

Kreps *et al.* (1982) analyze cooperation in a finitely-repeated Prisoners' Dilemma game, a context that presents strategic issues that have much in common with those raised by noncooperative collusion. They show that although the equilibrium choice in a full-information game is to defect, it can be an optimal choice for a fully-rational player to cooperate, early in the game, if there is some probability that the other player will cooperate (Dawes and Thaler, 1988, p. 191):[65]

> What Kreps *et al.* show is that if you are playing against an opponent whom you think may be irrational (i.e., might play TIT-FOR-TAT even in a game with finite trials), then it may be rational to cooperate early in the game (to induce your irrational opponent to cooperate too).

This result requires giving up one of the package of assumptions that make up the unbounded rationality model.

[64] See also Porter (1983) and Rotemberg and Saloner (1986).

[65] In a duopoly game, in each period after the first a player following the tit-for-tat strategy makes the choice that the other player made in the previous period. See Section 4.3.3.

4.3.2 Natural Markets

Confrontation with the data suggests that the trigger-strategy approach does not, by itself, adequately explain observations of collusion in imperfectly competitive markets. Other types of explanatory factors, with a bounded rationality flavor, emerge from empirical work.

Levenstein and Suslow (2006)[66] use cross-section and case-study data to explore the question of cartel stability. A first finding is that some but not all cartels are ephemeral. For cross-section samples used in 9 different studies, average cartel duration ranged from 3.7 to 10 years. For 42 private international cartels from the 1990s, cartel duration ranged from 1 to 23 years, with average duration 5.4 years. For the 50 cartels in 19 industries that made up the case studies, average cartel duration was 14 years. The longest-lived cartels in different industries lasted 30, 40 (two), 50, and 100 years. It cannot be taken for granted that cartels will collapse of their own weight.

They identify coordination, cheating, and entry as the three key problems faced by a cartel (2006, p. 45). Coordination is something the successful cartel learns, and this helps address the two other problems as well (2006, p. 67):[67]

> When cartels "learn," what are they learning? They learn how to monitor output and prices of individual cartel members in order to detect cheating. They learn how to structure incentives so that collusion is more profitable in the long run than cheating. Successful cartels fashion self-imposed penalties or other compensation schemes for firms that exceed cartel quotas. They learn how to structure cartel-imposed punishments and other disciplinary actions in response to cartel violations. They develop and implement exclusionary practices to prevent entry or expansion by nonmembers. Finally, they develop an elaborate internal hierarchy that allows communication on various levels (executive and middle-management) not only to provide flexibility in the details of the agreement, but to build trust as well. Hierarchy and communication are important to cartel success because the world

[66] See also Zimmerman and Connor (2005), Levenstein and Suslow (2011).

[67] They cite the Genesove and Mullin (1999) study of information exchange by the Sugar Institute as an example of learning to collude.

> is dynamic and contracts are inherently incomplete. Firms' expectations about their competitors' propensity to cooperate can have a significant impact on the success of collusion.

Their views on cartel breakdown direct attention away from low prices as a strategy that induces loyalty to the cartel (2006, p. 79):[68]

> Our overview of the empirical literature suggests that, first, the outbreak of a price war—as opposed to the threat of a price war—is rarely a sign of cartel success, second, that the most successful cartels are able to develop alternative punishments and punishment threats that enhance stability at lower cost, and third, that cartels break down in some cases because of cheating, but more frequently because of entry, exogenous shocks, and dynamic changes within the industry.

4.3.3 Experimental Markets

Nor does experimental evidence comfort the punishment approach to analyzing cartel stability.[69] Feinberg and Snyder (2002) report the results of duopoly repeated-game experiments, of random length, in which subjects could set a collusive price, an undercutting (defection) price, or a punishment price. Treatments included negative demand shocks in some periods; sometimes these demand shocks were revealed to the subjects, sometimes they were not. Parameters of the model were set so that one period of reversion (to undercutting or to punishment prices) would be sufficient to make the collusive price the privately optimal choice. Evaluating their results, Feinberg and Snyder conclude that one-period punishment did not sustain collusion in the presence of demand uncertainty and secret price cuts (2002, p. 5):

[68] In the same vein, see Slade (1987) and Levenstein (1997). Podolny and Scott Morton similarly make internal disagreements the main cause of price wars (1999, p. 53): "It is hard to overstate how difficult [it] was for these shipping lines to agree upon the division of the market. Examination of correspondence from the period illustrates how long and vigorously the member firms negotiated over each change (see Appendix). As a result, while these cartels would rarely fall apart due to cheating, price wars did disrupt cartels."

[69] For surveys, see Engel (2007), Davis and Holt (2008), Haan *et al.* (2009), Potter (2008).

> What was surprising from our experiments was the extent to which the combination of secret demand shocks and secret price cuts impaired players' ability to collude. Despite parameters allowing collusion to be sustainable with trigger strategies requiring only one period of punishment, our results suggest that the combination of secret demand shocks and imperfect information about rival pricing may prevent players from sustaining collusion at all.

Wright's (2013) experiment generates data from 100 duopoly markets of random duration. In most periods, subjects set own price in response to the rival's price in the previous period. Occasionally the rival's previous-period price was not made available, and subjects were asked to supply a response function for use in this contingency. Wright classified the chosen responses as

- *Disproportionate* punishment: a grim response (à la Friedman (1971) or Abreu (1986, 1988));
- *Tit-for-tat*: responding with the rival's previous-period price (Axelrod and Hamilton, 1981);
- *Best-response*: setting the single-period best-response price to the rival's previous-period price;
- *Non-cooperative*: setting a price at or below the one-shot game noncooperative equilibrium price;
- *Lenient*: responding with the collusive price.

As he describes his results (2013, p. 92, footnotes omitted):

> The evidence from the experiment suggests very few subjects adopt disproportionate punishment strategies. Only about 5% of subjects have elicited strategies that are consistent with them cooperating using these types of strategies. Instead, subjects tend to use graduated punishments like tit-for-tat, with prices that vary with the other subject's previous price, if they indeed intend to use any immediate punishment at all. Between 90% and 95% of subjects have elicited strategies that are less harsh in their

> immediate response to a negative deviation from the cooperative price than implied by Grim, with more than 20% of subjects having elicited strategies that are lenient (they do not involve any immediate response to such undercutting).

4.3.4 The Market as a Common-Pool Resource

It may be that a framework for organizing the findings about real-world cartels can be found in Elinor Ostrom's work on the endogenous development of institutions to manage common-pool resources (Ostrom, 2001, p. 18, internal citation omitted):

> Common-pool resources generate finite quantities of resource units, and one person's use subtracts from the quantity of resource units available to others. Most common-pool resources are sufficiently large that multiple actors can simultaneously use the resource system, and efforts to exclude potential beneficiaries are costly.

Ostrom gives as examples (2001, p. 18) "natural and human-made systems including groundwater basins, irrigation systems, forests, grazing lands, mainframe computers, government and corporate treasuries, and the Internet." Certainly from the point of view of active firms, a market can be thought of as a common-pool resource: it generates a finite quantity of profit, one firm's sales reduce the profit available to others, most markets can support more than one firm, and efforts to exclude potential entrants are likely to be costly.

Particularly in the United States, such a viewpoint is not, or, is no longer, usual.[70] The U.S. experience under the National Recovery Administration (as well as, among other evidence, the work of Symeonidis (2002) on U.K.

[70]Even in the United States, the National Industrial Recovery Act (1933-35) had an element of this way of looking at performance in imperfectly competitive markets. In European countries, it was the norm until the creation of the European Coal and Steel Community and its American-style competition policy. Much before that, there was a view (by no means universal) that firms in an industry might reasonably cooperate. In upholding a cartel contract as legal and enforceable in the 1888 *Bavarian Bricklayers* decision, the Bavarian appeals court wrote that "When the prices of the products of an industry fall to an unreasonably low level, and the successful operation of the industry is thereby endangered or made impossible, the resulting crisis is detrimental not only to the individuals affected but to society at large. Therefore, it is to the interest of society that prices in any given industry should not remain long at a level that is below the cost

cartel policy) strongly argues that current cartel policy has it about right. But the analogy between a cartel and self-organized institutions to manage a common-pool resource may yield insights that are useful for cartel policy.

Ostrom identifies seven design principles[71] for enduring self-organized resource regimes (see the accompanying box).[72] Several of the design principles are reminiscent of the U.S. railroad cartels that operated legally in the late-19^{th} century United States before passage of the Sherman Act.[73]

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of production. ...it cannot be simply and generally contrary to the public welfare that producers interested in a given branch of industry should unite in order to prevent or to moderate price-cutting and the consequent general decline in the prices of their products. ...when prices are for a long time so low that financial ruin threatens the producers, their combination appears to be not merely a legitimate means of self-preservation, but also a measure serving the interests of society." In 1930, the Interparliamentary Union adopted a resolution to the effect that cartels were natural economic institutions that could not be effectively prohibited. Instead, governments should require cartels to register and take action against a cartel if, but only if, it engaged in abusive conduct (Boserup and Schlichtkrull, 1962).

[71] She writes (2000, p. 149): "These design principles are extensively discussed in Ostrom (1990) and have been subjected to extensive empirical testing."

[72] There is an eighth principle (2000, p. 152): "When common pool resources are somewhat larger, an eighth design principle tends to characterize successful systems—the presence of governance activities organized in multiple layers of nested enterprises."

[73] On the Joint Executive Committee, see the references in footnote 64, and the follow-on literature. On the Omaha Pool and the Southern Railway & Steamship Association, see Martin (2010, pp. 197-199), and the references cited therein. The discussion of the early operations of the U.S. Steel Corporation in Page (2009) is also to the point.

Design Principles of Long-Surviving, Self-Organized Resource Regimes

1. The presence of clear boundary rules ... enables participants to know who is in and who is out of a defined set of relationships and thus with whom to cooperate.
2. Local rules-in-use restrict the amount, timing, and technology of harvesting the resource; allocate benefits proportional to required inputs; and are crafted to take local conditions into account.
3. Most of the individuals affected by a resource regime can participate in making and modifying their rules.
4. Most long-surviving resource regimes select their own monitors, who are accountable to the users or are users themselves and who keep an eye on resource conditions as well as on user behavior.
5. These resource regimes use graduated sanctions that depend on the seriousness and context of the offense.
6. The importance of access to rapid, low-cost, local arenas to resolve conflict among users or between users and officials.
7. The capability of local users to develop an ever-more effective regime over time is affected by whether they have minimal recognition of the right to organize by a national or local government.
Source: Ostrom (2000, pp. 149-152).

The first design principle defines who is in the cartel, and who is out.[74] The second design principles deals with allocation of sales among cartel members, and this might follow techniques discussed by Stigler (1964). The third design principle refers to governance — legal cartels had assemblies of some kind; illegal cartels have meetings in hotel rooms.[75] The fourth and fifth design principles, monitors and graduated punishments, are (as mentioned above) noted by Levenstein and Suslow (2006). The sixth design principle covers arbitration, for which there might be a formal structure if collusion is legal, or informal. Under contemporary legal regimes, of course, it is the seventh design principle that distinguishes cartels from self-organized resource regimes — in markets subject to antitrust and competition policy, cartels are illegal.

[74] Out of the cartel and, for potential entrants, out of the market.
[75] See, generally, Connor (2006), Harrington (2006).

Discussing collective action, Ostrom writes (2000, p. 138) "A substantial gap exists between the theoretical prediction that self-interested individuals will have extreme difficulty in coordinating collective action and the reality that such cooperative behavior is widespread, although far from inevitable." She explains self-organized management of common-pool resources by giving up the rational egoist assumption of the unbounded rationality model. She envisages three types of economic agents, rational egoists, conditional cooperators, and willing punishers (2000, p. 142):

- Conditional cooperators are individuals who are willing to initiate cooperative action when they estimate others will reciprocate and to repeat these actions as long as a sufficient proportion of the others involved reciprocate.[76]
- [Willing punishers are] willing, if given an opportunity, to punish presumed free riders through verbal rebukes or to use costly material payoffs when available.

Ostrom argues that (2000, p. 142) "[a]ssuming the existence of two types of 'norm-using' players—'conditional cooperators' and 'willing punishers"—in addition to rational egoists, enables one to start making more coherent sense out of the findings of the laboratory experiments on contributions to public goods." Giving up the rational egoist assumption of the unbounded rationality model may enable us to start making more coherent sense of the empirical findings about collusion.

4.4 Entry

Levenstein and Suslow (2006) identify entry as one of the major causes of cartel breakdown — perhaps the major cause. Ostrom (2000, p. 153) writes that "Major migration (out of or into an area) is always a threat" to collective action, and if one views a cartel as an institution to manage a common-pool resource, entry can be expected to threaten cartel stability. We turn our attention, then, to the economics of entry.

[76] Wright writes (2013, p. 101) "It could be that some subjects are just more cooperative and trusting than others, and are willing to give others the benefit of the doubt in case of a one-time deviation."

As we have seen, the function of own-payoff maximization in the classical framework is to equalize rates of return in different activities. Equalization of expected, risk-adjusted rates of return[77] on investment is brought about by entry and exit — firms enter industries where the rate of return is above the long-run equilibrium value, exit industries where it is below, until through higgling and jiggling of the quantities supplied, general equilibrium is reached. This vision fits poorly in an economy populated by unboundedly rational economic agents. If all firms operate with complete and perfect information and unlimited analytical ability, why aren't rates of return continuously in equilibrium?[78]

There is an empirical literature on the determinants of entry,[79] but the very existence of this literature is a concession to fact that bounded rationality must be taken into account to understand the determinants of performance of real-world markets. The findings of this literature do not support the vision of entry and exit as a mechanism that equilibrates rates of return to different activities.

If entry and exit are equilibrating mechanisms that equalize rates of return to different activities, we should observe entry when industry profit is above average, exit when industry profit is below average. In practice, we observe simultaneous entry and exit (see, for example, Dunne *et al.*, 1988). Part of the explanation for simultaneous entry and exit is that most entrants, especially *de novo* entrants, are unsuccessful: they enter, dither about in the fringe of the industry, and leave after a few years.[80]

Nor is entry easy for diversifying entrants. Mueller (1991, p. 12) summarizes findings of Biggadike (1976):

> He examined the histories of 40 market entries by a sample of large diversified firms. Despite their size (all but one was in the Fortune 500), the average entrant suffered substantial losses during the first few years of operation and required 8 years to just

[77] In what follows, "rate of return" should be read as "expected risk-adjusted rate of return," unless otherwise noted.

[78] If economic agents are unboundedly rational, there cannot be any $10 bills on the sidewalk.

[79] For surveys, see Mueller (1991), Geroski, 1991, 1995), and Caves (1998).

[80] For a sample of small U.S. firms, Phillips and Kirchhoff (1989) find that 10 per cent of new firms grow in their first four years, that "two out of five new firms survive at least six years and over half of the survivors grow."

> break even. Presumably, new or small firm entrants would fare even worse.

However, diversifying entry is more successful than *de novo* entry, particularly diversifying entry by foreign suppliers (Mueller, 1991, p. 13).

Entry responds weakly to high industry profits and, not surprisingly in view of evidence that it takes some time for the few entrants that survive to carve out a place for themselves, has slight impact on incumbents' profits.

Rather than acting as an equilibrating mechanism, entry and exit appear much more as a selection mechanism that operates in an environment of bounded rationality.[81] Partial equilibrium unbounded rationality models assume that active and potential firms know all the market demand surface and that all firms know all firms' cost functions. In practice, boundedly-rational real-world incumbents will have some idea of the nature of market demand, and their own cost functions, in the neighborhood of their current output levels. They will have limited information about the cost functions of active rivals. An entrant, even one that invests in a preliminary market study, will need time in the industry to learn even this much. Often, apparently, what most entrants learn is that there is limited demand for them to profitably supply, and they leave the market in short order.

Entry may induce cartel breakdown.[82] However, (Levenstein and Suslow, 2006, p. 74) "the most successful cartels do not simply treat barriers to entry as exogenous; they actively try to create them."

Scott Morton (1997) examines the determinants of 47 price wars in response to entry by British shipping cartels between 1879 and 1929. She finds that price wars were more likely against young, inexperienced entrants that were likely to have limited financial resources, results that she sees as consistent with "long-purse" theories of predation (Telser, 1966; Bolton and Scharfstein, 1990).

Podolny and Scott Morton (1999) add to the analysis entrant social status as a factor affecting the likelihood of a price war. If it were known that an entrant had high social status, first, that would signal a likely high level of financial resources, meaning that a price war would be long, costly, and less likely to expel the entrant, all else equal. Second, and this has a behaviorist

[81] Jovanovic (1982); Ericson and Pakes (1995), Pakes and Ericson (1998). For discussion, see Doraszelski and Pakes (2007).

[82] See Harrington (1989) for an analysis of cartel stability in a market that faces the possibility of entry.

aspect, a high-status entrant would be more likely to cooperate in cartel operations — to be a conditional cooperator, in Ostrom's terminology.[83] Podolny and Scott Morton find that (1999, p. 62) "An entrant-owner with high social status was approximately 40% less likely to trigger a price war than an entrant of ordinary status."

4.5 *Matsushita* and *Brooke Group* from a Bounded Rationality Perspective

4.5.1 *Matsushita*

Three major fault lines of received U.S. antitrust policy — predation, collusion, and entry — converge in the Supreme Court's 1986 *Matsushita* decision.[84] All are implicated by the findings of behavioral economics (as, indeed, by the findings of mainstream economics).

Matsushita concerned legal actions by two U.S. producers of television sets, begun separately in 1970 and 1974 and consolidated in 1979. The basis of the antitrust complaint was the claim that a large number of Japanese manufacturers of television sets, and associated firms, had conspired to engage in predatory pricing on the U.S. market, for at least 20 years, in violation (among others) of Sections 1 and 2 of the Sherman Act, with the aim of driving the American firms out of business. A 1981 District Court decision[85] granted the Japanese firms' request for summary judgement. The American firms appealed the District Court outcome to the Third Circuit Court of Appeals, which thought that the American firms had produced enough evidence to justify a trial on the merits on some of their complaints.[86] The Japanese

[83] Or, more likely to be a member of the cartel's "moral community," a term Podolny and Scott Morton adopt from Granovetter (1995).

[84] *Matsushita Electrical Industrial Co., Ltd, et al. v. Zenith Radio Corp. et al.* 475 U.S. 574 (1986). For discussion, see Ponsoldt and Lewyn (1988), Schwatrzman (1993), Gifford (1994, pp. 455-464), Salinger (2007), Weber (2007), Martin (2010, pp. 720-721).

[85] *Zenith Radio Corp. v. Matsushita Electric Industrial Co., Ltd., et al.* 513 F. Supp. 1100 (E.D. Pa. 1981). At the start of the very long District Court opinion, Judge Becker writes "the touchstone of this decision lies in the fact that our intensive examination of the enormous record in this case has revealed that, despite years of discovery, the plaintiffs have failed to uncover any significant probative evidence that the defendants entered into an agreement or acted in concert with respect to exports to the United States in any manner which could in any way have injured the plaintiffs."

[86] *Zenith Radio Corp et al. v. Matshushita Electical Industrial Co., Ltd, et al.* 723 F. 2d 238 (1983).

firms in turn successfully appealed the Circuit Court decision to the U.S. Supreme Court.

As summarized by the Supreme Court majority (475 U.S. 574, 584)

> The thrust of respondents' argument is that petitioners used their monopoly profits from the Japanese market to fund a concerted campaign to price predatorily and thereby drive respondents and other American manufacturers of [consumer electronic products] out of business. Once successful, according to respondents, petitioners would cartelize the American [consumer electronic products] market, restricting output and raising prices above the level that fair competition would produce. The resulting monopoly profits ... would more than compensate petitioners for the losses they incurred through years of pricing below market level.

The opinion defined predatory pricing as envisaged by Areeda and Turner (1975) (475 U.S. 574, 584, fn. 8; internal citations omitted):[87]

> Throughout this opinion, we refer to the asserted conspiracy as one to price "predatorily." This term has been used chiefly in cases in which a single firm, having a dominant share of the relevant market, cuts its prices in order to force competitors out of the market, or perhaps to deter potential entrants from coming in. In such cases, "predatory pricing" means pricing below some appropriate measure of cost.

The Supreme Court majority reversed the Appeals Court decision on the ground that the alleged conspiracy made no economic sense (475 U.S. 574, 587, emphasis added):

[87] On the next page of the decision, the Court adds an alternative characterization of predatory pricing, writing "For purposes of this case, it is enough to note that respondents have not suffered an antitrust injury unless petitioners conspired to drive respondents out of the relevant markets by (i) pricing below the level necessary to sell their products, or (ii) pricing below some appropriate measure of cost." (ii) is the Areeda-Turner approach. If one thinks of the quantity sold by a predating firm or firms as being determined by a demand curve (demand equations, if products are differentiated), it is not obvious how to interpret (i).

> *[I]f the factual context renders respondents' claim implausible – if the claim is one that simply makes no economic sense* – respondents must come forward with more persuasive evidence to support their claim than would otherwise be necessary.

The Court found predatory pricing by a single firm to be implausible (475 U.S. 574, 596-597): losses would definitely be sustained while prices were below unit cost, while any post-predation attempt to set price above unit cost could induce entry. Thus (475 U.S. 574, 596-597, 589):

> [T]here is a consensus among commentators that predatory pricing schemes are rarely tried, and even more rarely successful.

It found *conspiracy* to engage in predatory pricing equally implausible (475 U.S. 574, 590-592, 594-595). During the price-cutting phase, each conspirator would have an incentive to defect, setting high prices and free-riding on the low prices set by the others to injure the target firms. In the post-predation period, each conspirator would again have an incentive to defect, by setting low prices. Entry would be an issue for conspiring predators as for the predatory dominant firm, and by conspiring to raise price in the post-predation period, conspirators would expose themselves to antitrust prosecution.

4.5.2 *Brooke Group*

The antitrust principles laid out in *Matsushita* are brought into sharp relief when applied to the facts of *Brooke Group*,[88] a decision that settled the antitrust consequences of below-cost pricing in the American cigarette market.[89]

[88] *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.* 509 U.S. 209 (1993). For discussion, see Burdett (1999).

[89] The cigarette industry has an antitrust history that includes the 1911 breakup of the Tobacco Trust (221 U.S. 106), hard on the heels of the *Standard Oil* decision that gave antitrust the rule of reason (221 U.S. 1), and the 1946 *American Tobacco II* decision (328 U.S. 781), which inferred conspiracy to monopolize from parallel behavior in input (tobacco leaf) and output markets.

In the 1980s, health concerns turned the highly-concentrated[90] U.S. cigarette market into a declining industry. Liggett & Myers,[91] once a major supplier but with a market share fallen to 2.3 per cent, introduced a line of non-advertised and low-price generic cigarettes. The generic product met with immediate success in the market, gaining sales at the expense of branded cigarettes, in particular those of Brown & Williamson. Brown & Williamson, the third-largest firm in the industry, had a market share a little more than 10 per cent. The two largest firms in the industry had market shares above 30 per cent.

Faced with the loss of sales and profit on its advertised brands, Brown & Williamson introduced its own generic cigarettes, with the intent, as Liggett saw it, that[92]

- Brown & Williamson would enter the generic segment with list prices matching Liggett's but with massive, discriminatory volume rebates directed at Liggett's biggest wholesalers;
- as a result, the net price of Brown & Williamson's generics would be below its costs;
- Liggett would suffer losses trying to defend its market share and wholesale customer base by matching Brown & Williamson's rebates;
- to avoid further losses, Liggett would raise its list prices on generics or acquiesce in price leadership by Brown & Williamson;
- higher list prices to consumers would shrink the percentage gap in retail price between generic and branded cigarettes; and
- this narrowing of the gap would make generics less appealing to the consumer,
- thus slowing the growth of the economy segment and reducing cannibalization of branded sales and their associated supracompetitive profits.

[90] See Burdett (1999, Table 10-1). In 1980, the Herfindahl index was 0.2421, about the value for an industry supplied by four equally-sized firms.

[91] Liggett & Myers was acquired by Brooke Group, Ltd. during the course of the litigation.

[92] 509 U.S. 209, 231, not set off as a list in the original.

Under the Areeda-Turner standard, Liggett needed to show that Brown & Williamson had set a price below unit cost. On this point, the Supreme Court majority wrote that[93] "There is ... sufficient evidence in the record from which a reasonable jury could conclude that for a period of approximately 18 months, Brown & Williamson's prices on its generic cigarettes were below its costs, and that this below-cost pricing imposed losses on Liggett that Liggett was unwilling to sustain...."

Another requirement for Liggett to succeed in its complaint, also present in *Matsushita*, was that Brown & Williamson had a reasonable prospect of recouping its predatory losses, if it should induce Liggett to raise the price of its generics. Despite laying out Liggett's theory of antitrust injury, that below-cost pricing had occurred in the generic segment of the market and recoupment would occur in the branded segment, the Court wrote that[94]

> Recoupment through supracompetitive pricing in the economy segment of the cigarette market is an indispensable aspect of Liggett's own proffered theory, because a slowing of growth in the economy segment, even if it results from an increase in generic prices, is not itself anticompetitive. Only if those higher prices are a product of nonmarket forces has competition suffered. If prices rise in response to an excess of demand over supply, or segment growth slows as patterns of consumer preference become stable, the market is functioning in a competitive manner.

Liggett, however, did not work out its claim of antitrust injury by pointing to changing patterns of consumer preference, but because of nonmarket forces — below cost pricing by Brown & Williamson. Rather than put that matter before a jury, the Supreme Court required not only that Liggett demonstrate Brown & Williamson's reasonable possibility of recoupment, but also that recoupment occur in market segment in which the predatory losses had been incurred.[95]

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[93] 509 U.S. 209, 231, internal citations omitted.

[94] 509 U.S. 209, 232.

[95] The requirement that losses on sales of generic cigarettes be recouped in the generic segment may be regarded as a form of judicial bracketing; see Section 3.3.

4.5.3 "Realities of the market"

In *Matsushita*, the Supreme Court asked if the factual context of an antitrust complaint rendered the claim implausible. In *Brooke Group*, it held that[96] "The record in this case demonstrates that the anticompetitive scheme Liggett alleged, when judged against the realities of the market, does not provide an adequate basis for a finding of liability." But facts alone, to quote Coase, are just (1984, p. 230) "a mass of descriptive material waiting for a theory, or a fire." The implications of a factual context for market performance can be understood only in terms of a model. The question is, what model is implied by the Supreme Court's reasoning in *Matsushita* and *Brooke Group*?[97] It appears much more like the "good approximation," perfect competition model of the Second Chicago School than either the neoclassical rational economic man model or models that allow for bounded rationality.

Matsushita points to the inherent instability of collusion to conclude that collusive predation is (475 U.S. 574, 590) "incalculably more difficult to execute than an analogous plan undertaken by a single predator." Game-theoretic models teach that the maintenance of stable tacit collusion is not beyond the reach of unboundedly rational economic agents.[98] Models of boundedly-rational behavior yield the same conclusion. They give up the assumption of that economic agents are exclusively self-seeking and view them — to paraphrase Coase's (1976) comment on Adam Smith[99] — "as they actually are—dominated, it is true, by self-love but not without some concern for others, able to reason but not necessarily in such a way as to reach the right conclusion, seeing the outcomes of their actions but through a veil of self-delusion." Such a combination of motivations can contribute to maintenance of a group identity that promotes cartel stability — and, evidence is, has promoted the stability of documented long-lived cartels. Some such cartels engaged in collusive predation.

The *Matshushita* Court's implicit model is one in which entry is easy:[100]

[96] 509 U.S. 209, 230.

[97] Salinger (2007, p. 476) writes that "One reading of *Matsushita* is that it requires an antitrust case to be supported by a formal economic model." But not all models are formal, or even explicit.

[98] Klevorick (1993) finds no influence of this class of model on antitrust jurisprudence, and there is no indication that this has changed.

[99] See footnote 14.

[100] As regards entry conditions, the Court cites Easterbrook (1984, p. 27); part of the material quoted is (the court omits a footnote, as do I): "If the defendants should try to

"[Zenith *et al.*] offer no reason to suppose that entry into the relevant market is especially difficult, yet without barriers to entry it would presumably be impossible to maintain supracompetitive prices for an extended time." In the absence of evidence, the Court assumes the possibility of rapid entry, the kind of entry that exists in the classroom model of perfect competition but not in real-world markets.

If, as all evidence suggests, economic agents are boundedly rational and this bounded rationality affects the way strategic behavior impacts market performance, it is difficult to reconcile *Brooke Group*'s recoupment requirement by reference to "the realities of the market." Brown & Williamson engaged in below-cost pricing for 18 months. If it was acting to maximize its own value, it must have expected — versed in the craft as no court could be[101]—to be able to recoup the losses incurred while it was pricing below unit cost.[102] The Court again pointed to cartel instability[103] to conclude that "The evidence in this case is insufficient to demonstrate the danger of Brown & Williamson's alleged scheme." But neither unbounded rationality models nor boundedly rational models would justify a conclusion that firms in (509 U.S. 209, 213) "one of America's most concentrated industries" would be unable to come to a stable collusive understanding.[104] Successful collusion in high-concentration markets is by no means a forgone conclusion, but it is not as fragile as the model implicit in the *Matsushita* and *Brooke Group* decisions suggests.

Salinger writes (2007, p. 479) "A deeper problem with determining whether an allegation makes economic sense is that a firm gauges the profitability of an action by how it expects its rivals to respond. The economic approach to understanding expectations would be to assume that each firm expects other firms to behave in their own economic interest. But the be-

raise prices to such a level, they would attract new competition. There are no barriers to entry into electronics, as the proliferation of computer and audio firms shows. The competition would come from resurgent United States firms, from other foreign firms (Korea and many other nations make TV sets), and from defendants themselves."

[101] To paraphrase *Alcoa* (148 F.2d 416 at 427).

[102] If, that is, one assumes that Brown & Williamson sought to maximize its own value.

[103] 509 U.S. 209, 232: "Thus, the linchpin of the predatory scheme alleged by Liggett is Brown & Williamson's ability, with the other oligopolists, to raise prices above a competitive level in the generic segment of the market."

[104] Levenstein (1997) and Podolny and Scott Morton (1999) both point to price wars as a device that may resolve internal cartel differences. Such an analysis could explain the events of *Brooke Group*.

havior of other firms in turn depends on their own expectations." Predation may be a credible strategy with unboundedly rational economic agents, if there is less than complete and perfect information. It may appear to be a credible strategy with boundedly rational economic agents — and if firms are boundedly rational, the realities of the boundedly rational marketplace mean predation will be credible.

5 Conclusion

At least since its 1925 *Maple Flooring* decision,[105] and as recently as 2010,[106] the Supreme Court has declared that decisions under the Sherman Act must be based on the reality of competition in the marketplace. Onto this sensible foundation it has layered the veneer of a litmus test that facts must make economic sense in the context of an economic framework that is inconsistent both with post-1980s mainstream economics and with the "New Learning" of behavioral economics. The result has been, particularly as far as dominant-firm strategic behavior is concerned, and in the words of Henry Simons (1936, p. 72) "open season on consumers."

There is increasing recognition that U.S. antitrust policy has retreated

[105] 28 U.S. 563, 579 (emphasis added): "It should be said at the outset, that in considering the application of the rule of decision in these cases to the situation presented by this record, it should be remembered that this Court has often announced that *each case arising under the Sherman Act must be determined upon the particular facts disclosed by the record*, and that the opinions in those cases must be read in the light of their facts and of a clear recognition of the essential differences in the facts of those cases, and in the facts of any new case to which the rule of earlier decisions is to be applied."

[106] *American Needle, Inc.* v. *National Football League et al.* 560 U. S. 183 (2010), 191 (emphasis added): "We have long held that concerted action under § 1 does not turn simply on whether the parties involved are legally distinct entities. Instead, we have eschewed such formalistic distinctions *in favor of a functional consideration of how the parties involved in the alleged anticompetitive conduct actually operate*." See also (all emphasis added) *White Motor* 372 U.S. 253, 263 ("We need to know more than we do about *the actual impact of these arrangements on competition...*"), *GTE Sylvania*, 433 U.S. 36, 58-59 ("[D]eparture from the rule-of-reason standard must be based upon *demonstrable economic effect* rather than — as in *Schwinn* — upon formalistic line drawing."), *Monsanto v. Spray-Rite* 465 U.S. 752, 762 ("In *Sylvania* we emphasized that *the legality of arguably anticompetitive conduct should be judged primarily by its 'market impact.'*"), *Business Electronics* v. *Sharp* 485 U.S. 717, 726 ("[D]eparture from [the rule-of-reason] standard must be justified by *demonstrable economic effect...*").

too far for the good of a free-market economy.[107] In the interest of maintaining public faith in the legitimacy of a market system of resource allocation, as well as promoting good market performance, antitrust should strip away the veneer of a litmus test that invokes unboundedly rational economic agents to analyze the impact of strategic behavior on the performance of markets populated with boundedly rational economic agents. In the words of Hirshleifer (1985, p. 59, footnote omitted), "[W]e must be ready to abandon the rationality paradigm to the extent that it fails to fit the evidence about human behavior."

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