Chapter 5. Market Power: How Does It Arise? How Is It Measured?

Lawrence J. White*
Stern School of Business
New York University
Lwhite@stern.nyu.edu

To appear in
The Oxford Handbook in Managerial Economics
edited by Christopher R. Thomas and William F. Shughart II

Abstract

Market power – how it arises, and how it is measured – is an important topic for the economics field of "industrial organization" (IO). It is also an important topic for managers and for managerial economics, since it can be related to sustainable advantage for a company and it is usually at the center of antitrust cases in which a company may be involved. This chapter defines market power, discusses how it arises, and describes the various methods that have been used for empirically detecting and measuring it. Attention is also given to the role and measurement of market power in important antitrust contexts.

Keywords: market power; monopoly; oligopoly; competition; Lerner index; S-C-P paradigm; antitrust; merger guidelines

JEL codes: D41; D42; D43; L12; L13; L41; M21

* The author thanks Christopher Thomas and William Shughart for helpful comments on an earlier draft of this chapter.

I. Introduction

The nature, causes and measurement of market power have always been central issues to economists working in the field of industrial organization (IO). Traditional IO approaches market power primarily from a public policy perspective, which supplies the analytical foundation for antitrust policy and enforcement efforts. Indeed, the fundamental concern of antitrust policy – also known outside of the United States as competition policy – is precisely the creation, existence, and exercise of *market power*, as well as possible remedies when market power has been exercised unlawfully or may eventually be exercised unlawfully (e.g., as a consequence of a proposed merger).[1]

Since at least 1980 (e.g., in Porter 1980), IO economists have recognized a second perspective for industrial organization methodology: examining IO issues through the lens of senior managers of a firm wishing to find ways to achieve a sustainable competitive advantage vis-à-vis rival firms, as well as potential new entrants, and thereby maximize the value of the firm and its shareholders' wealth. Attaining and sustaining market power – legally, of course – is a fundamental route to creating that sustained advantage.[2] Furthermore, if senior managers are considering entry into an industry, either through a "fresh start" or "greenfield" effort or through the acquisition of a company that is already established in that industry, they should want to know if market power is being exercised in that industry and whether and how it can be sustained. Accordingly, senior managers must understand the nature and sources of market power, as well as some practical methods for measuring the degree of market power possessed by their own firms and their rival firms.

[1] Some forms of regulation – e.g., "public utility regulation" – also have as their goal the limiting of companies' ability to exercise market power. Market power, per se, is not unlawful. The antitrust laws come into play only when such power is acquired illegally or existing power is abused.

[2] It is noteworthy, however, that the term "market power" does not appear in the index of Porter (1980).

Another important reason for managers to understand market power arises when companies inevitably become embroiled in antitrust issues that perforce focus senior managers' attention on market power issues. For example:

- Company A may want to acquire or merge with Company B, but there may be claims by government law enforcement agencies that the merger should be prevented because it will create or enhance market power and is thereby anticompetitive;
- Company A may be accused of being involved in a price-fixing conspiracy, which has the goal of allowing the conspirators jointly to exercise market power;
- Company A may be accused of unilaterally exercising market power, such as charging excessively high prices; or
- Company A may be accused of taking actions that unduly disadvantage rivals and that thereby strengthen its already existing market power: e.g., charging prices that are "below costs" and thereby acting in a predatory manner vis-à-vis rivals; or insisting that its distributors/dealers handle only its products and not those of rivals, thereby making it harder for the rivals to find distribution for their products.

Accordingly, issues of market power are not for public policy wonks only. Although it is certainly true that the pioneering work on the nature and measurement of market power has been driven by the demands of public policy and antitrust doctrine, so-called "modern" managerial economics now firmly includes strategic and tactical decision making that is designed to create and protect a high degree of distinctiveness for the company and its products – which, as will be discussed below, implies market power – as the primary path to maximizing the present value of the stream of future economic profits. Nevertheless, there is no escaping the 75 or so years of IO

history[3] that has largely placed public policy at the center of concerns about market power, and that tradition will unavoidably flavor the discussion in this chapter.[4]

This chapter proceeds as follows: Section II formally defines market power and discusses current understanding about the sources of market power. Section III then address the major theme of this chapter: critically analyzing current methodologies for measuring market power and suggesting the directions for improvements. Section IV discusses the measurement of market power in three special antitrust contexts: mergers; monopolization; and collusion. Section V offers concluding remarks and identifies areas for future research.

II. What Is Market Power? How Does It Arise?

A. Defining market power[5]

The concept of market power applies to an individual enterprise or to a group of enterprises acting collectively. For the individual firm, it expresses the extent to which the firm has discretion over the price that it charges. The baseline of zero market power is set by the individual firm that produces and sells a homogeneous product[6] alongside many other similar firms that all sell the same product. Since all of the firms sell the identical product (and there are no issues of reliability or other quality differences), the individual sellers are not distinctive. Buyers care solely about finding the seller with the lowest price.

In this context of "perfect competition", all firms sell at an identical price that is equal to their marginal costs, and no individual firm possesses any market power: If any firm were to

[3] Industrial organization appears to have developed as a separate, recognizable field in economics in the late 1930s; see White (2010a, 2010b) for a discussion of the origins and development of the IO field.
[4] In that sense, this chapter will be complementary to the chapters in Part 9 ("Public Policy for Managers") of this volume.
[5] Unless otherwise indicated, this chapter will focus on issues of market power as they apply to sellers. Roughly comparable issues of the exercise (and measurement) of market power can also apply to buyers ("monopsony"); but, although they are not wholly absent, these issues arise less often in policy concerns.
[6] This is frequently described as a "commodity".

raise its price slightly above the market-determined price, it would lose all of its customers (since they would quickly switch to the other firms that continue to sell at the market price); if a firm were to reduce its price slightly below the market price, it would be swamped with customers who switch from the other firms (but it would find selling to these new customers unprofitable, since its price would now be below its marginal costs).

Accordingly, the standard definition for market power is to define it as the divergence between price and marginal cost, expressed relative to price.[7] In mathematical terms,

$$L = (P - MC)/P \,, \qquad (5.1)$$

where L (the "Lerner Index")is the indicator of market power,[8] P is the price at which the firm sells its output, and MC is the marginal cost of the firm for the volume of output that the firm is selling. When P = MC, as is the case for the outcome when a perfectly competitive firm is selling a homogeneous product, then L = 0. If P > MC, then L > 0.

For the expression of market power (i.e., L > 0), many economists think instinctively of the opposite of competition: monopoly, which is a single seller of a distinct product that is without close substitutes. The monopoly outcome, and the comparison with the perfectly competitive outcome, is best represented geometrically, as in Figure 5.1.[9]

[Figure 5.1 near here]

In Figure 5.1, we portray a simple downward-sloping linear market demand curve for a standardized item and a simple horizontal linear unit cost (average cost, or AC) curve for

[7] See, for example, Motta (2004, p. 41), Carlton and Perloff (2005), Perloff et al. (2007), and Tremblay and Tremblay (2012).

[8] Since Lerner (1934) was the first to popularize this formulation of market power, this is often called the Lerner index; for some historical perspective, see Elzinga and Mills (2011). Lerner also popularized the relationship by showing that $L = (P - MC)/P = -1/\varepsilon$, where ε is the own-price elasticity of demand for the firm's product. This last relationship can be derived from the first-order condition for a firm to maximize its profits. It is worth noting that it appears that Lerner's derivation was apparently preceded by a similar derivation of this relationship by Amoroso (1930); see Keppler (1994) and Giocoli (2011).

[9] This geometric portrayal is a standard demonstration that can be found in most microeconomics textbooks.

producing that item.[10] If a large number of sellers of this item have these same costs,[11] then the competitive outcome will be P_C = MC (= AVC = AC) with an aggregate market quantity of Q_C. If instead a single firm (monopoly) faced the same demand curve and cost conditions (and entry were blockaded), then the monopolist's price[12] would be higher, at P_M (and the monopolist's quantity would be lower, at Q_M). In the terms of equation 5.1, $L_M = (P_M - MC)/P_m > 0$, while $L_C = (P_C - MC/)P_C = 0$. Thus, this index would indicate real market power.

As a related matter, this index would also indicate the presence of above-normal profits for the monopolist, and their absence for (perfect) competitors. This is an important point, to which we will return below.

The problem with this rigid use of the Lerner index as an indicator of market power arises as soon as we move away from the simple world of multiple sellers of identical homogeneous products – which, at best characterizes only the sellers for primary agricultural and mineral commodities. With non-homogeneous products, the seller is distinctive: In deciding from whom to buy, buyers care about more than just which seller has the lowest price. They care about the attributes of the product and of the seller. The direct implication is that the demand curve that faces each distinctive seller has a negative slope (rather than being horizontal from the perspective of the seller of the homogeneous product, where only price matters to buyers). In turn, this will mean that the profit-maximizing output for the firm will be at an output where the

[10] If the long-run AC cost is horizontal, then long-run AC, average variable cost (AVC), and MC are all identical. Also, AC is defined to include a normal profit on invested capital.
[11] As standard texts demonstrate, the linear horizontal line of long-run AVC = AC = MC could arise from a large number of identical sellers that each have a U-shaped AC curve, the bottom of which is at the level of the AC = AVC = MC line in Figure 5.1, combined with easy entry and exit.
[12] This assumes that the monopolist is not able to practice price discrimination and thus can charge only a simple uniform price to all of its customers.

firm equates marginal revenue (MR) with MC and P > MR = MC, which of course implies P > MC and therefore L > 0.[13]

This result was first recognized by Robinson (1933) and Chamberlin (1933). Robinson termed this market structure "imperfect competition"; Chamberlin termed it "monopolistic competition". In either case, as Chamberlin's geometry – the essence of which is reproduced as Figure 5.2 – showed, the equilibrium outcome when entry (of distinctive but reasonably close competitors) is sufficiently easy, the typical seller will earn only normal profits,[14] but the equilibrium price will be P = AC > MC.[15] Thus the Lerner index for this firm would register "market power".

[Figure 5.2 near here]

However, the landscapes of most market economies are dominated by myriad distinctive firms that produce and sell distinctive products – whether as manufacturers or as service providers or as retailers. Although there may be some definitional rigor in attaching the concept of "market power" to such firms, it makes little intuitive sense to identify the corner delicatessen or the neighborhood kitchen remodeler or a small machine shop with the term "market power". To do so risks either trivializing the concept or – in the context of public policy – greatly overstating the realistic domain of public policy concerns.[16]

Consequently, unless otherwise noted, the remainder of this chapter will describe "market power" as applying to instances where the size of the enterprise (or group of enterprises, in the

[13] The perfectly competitive firm also chooses an output at which MR = MC; but in that case P = MR, and hence P = MC.
[14] Recall that a normal profit on invested capital is embodied in the AC curve.
[15] If entry is not sufficiently easy – if the seller is sufficiently distinctive – then the seller may be able to earn above-normal profits, as a return on its distinctiveness; this would imply an equilibrium outcome in Figure 5.2 where the DD demand curve is displaced up and to the right and isn't tangent to the AC curve. Also, the AC curve need not be U-shaped but could instead embody economies of scale (i.e., lower unit costs at higher volume) over the entire range of output.
[16] See Pepall et al. (2008, pp. 53-54) for similar concerns over the use of the Lerner index as a mis-representation of "market power".

event of the collective exercise of market power) is large enough to warrant special attention (e.g., from the perspective of public policy) – i.e., "significant" market power.[17] We will thus be returning to the traditional notion of "monopoly" that is associated with Figure 5.1 (or with a small-numbers oligopoly over the same domain).

B. How does market power arise?

What are the sources of market power? If we were to remain consistent with the strict definition of market power as simply any firm that has a positive Lerner index, the answer is easy: distinctiveness of product and/or seller. But for our notion of significant market power, a market of significant size is clearly also necessary; and, beyond size, a more complete and nuanced answer is needed.

1. The single seller. For a single seller – for the monopolist of Figure 5.1 – distinctiveness is certainly not just a starting point; it is a necessary condition. A contradiction in terms would arise if a monopolist were described as one among other firms that are all selling the same product and that are seen as undifferentiated ("homogeneous") by buyers. But more than just distinctiveness is needed.

That "more" – as Bain (1956) recognized – are barriers to entry. Without barriers to entry, the above-normal profits of the monopolist could not persist. Potential sellers of the same or closely similar product would be attracted by the prospects of earning above-normal profits and would continue to enter the industry, so long as those above-normal profits remained as a lure. Only when there are a sufficient number of sellers supplying the quantity buyers are

[17] This recognition that there must be some relative size threshold for realistic considerations of "market power" can also be found in Fisher (2008) and Baker (2008). It is possible, however, that even with a size threshold, a large firm with a positive Lerner index might be just a large-scale version of the Chamberlin-Robinson firm of Figure 5.2. Areeda and Hovenkamp (2002, p. 133) state that "Market power need not trouble the antitrust authorities unless it is both substantial in magnitude and durable." However, their subsequent discussion indicates that "magnitude" refers to the deviation between price and marginal cost, and not the size of the enterprise.

willing and able to purchase, so that prices (and profits) are at the competitive equilibrium of Figure 5.1 (or the Chamberlin-Robinson outcome of Figure 5.2 is reached with an absence of above-normal profits), would entry cease.

There are fundamentally three categories of barriers:

a. Ownership of a unique resource. The ownership of a (sizable) unique resource constitutes one potential barrier to entry. Examples would include: a) a unique mineral deposit; b) a unique government franchise (e.g., the right to be the sole provider of taxicab services within a city; or c) an especially distinctive patent.[18]

b. Economies of scale. If the technology of an industry is such that economies of scale prevail over the entire range of possible production volumes, then a single firm – a "natural monopoly" – that supplies the market would be able to do so most efficiently. Even if there is some production volume at which diseconomies of scale prevail, if the relevant market is smaller than that volume, then a monopoly would still be the most efficient framework. The extent to which the monopolist could exploit its market power (i.e., the size of the Lerner index) would be restricted by the extent of the cost disadvantage that smaller entrants would face (which determines the so-called limit-entry price; see Modigliani 1958 and Sylos-Labini 1962), as well as by conjectures by entrants as to how the incumbent would react to their entry.

c. The size and "sunkenness" of needed investments. If entry into a market requires a relatively large expenditure and that expenditure has few alternative uses (i.e., the costs are "sunk"), then potential entrants would consider such entry to be quite risky. Examples of such

[18] With respect to patents: There is a long and unfortunate legal history of describing all patents (and other forms of "intellectual property", such as copyrights and trademarks) as "monopolies". Since the U.S. alone currently issues almost 200,000 patents each year (and has issued over 7 million patents since the beginning of the U.S. patent system in 1789), "monopoly" cannot be a useful descriptor for all patents. Instead, recognizing them as distinctive pieces of property – some (probably only a relative few) of which each year are sufficiently distinctive that "monopoly" may be a useful descriptor for those patents – is a superior framework. Patents define a product, but not necessarily a market; the class of cholesterol-lowering statin drugs provides an apt example.

sunk investments include a large investment in specialized machinery that has no alternative use; substantial research and development (R&D) expenditures that may not yield useful results; large advertising and other promotional expenditures that are lost if unsuccessful. Such required expenditures would constitute barriers to entry. By contrast, if the necessary expenditure is modest and, if spent on a tangible item, that item has a viable secondary market, the barriers to entry would be low. Monopoly would be more likely to arise in the former circumstance than in the latter.

2. A group of sellers. Market power can arise also in the context of a group of firms that act, either explicitly or implicitly, in a joint fashion. The interesting questions arise in the context of "oligopoly", a market structure with a relatively small number of sellers of either a homogeneous product or a differentiated set of products. The crucial feature of oligopoly is that the firms are sufficiently few that they recognize their mutual interdependence: Each firm recognizes that what it does affects the others and is in turn affected by what they do.[19]

As authors for almost two centuries have realized, an oligopoly market structure can, in principle, have outcomes that could range from the equivalent of a monopoly to a competitive equivalent and thus would be expected to have an index of market power that could be L_M, or L_C, or anything in between. It all depends on the assumptions that one makes about how the (few) firms in the industry would behave vis-à-vis each other.[20]

At one extreme, if the oligopolists were to collude and coordinate their behavior in a way that maximizes their joint profits, then their Lerner index should approximate L_M; in essence, the oligopolists collectively are able to exercise the same degree of market power as could a pure monopolist. This calculation assumes that each oligopolist has the same constant marginal costs

[19] For an overview, see, e.g., Shapiro (1989).
[20] In slightly more formal terms, the outcome depends on the "conjecture" that each firm holds as to how the other firms will react to the first firm's actions.

as does the monopolist. But if the oligopolists have different costs and/or sell distinctive (differentiated) products, then the calculation of the Lerner index for the group becomes ambiguous: If the product is homogeneous, the price would be uniform and clear-cut; but what should represent "marginal cost" is less clear. The calculations become yet murkier if each seller's product is distinctive. One could, of course, calculate a Lerner index for each member of the oligopoly; but then the group's Lerner index could be represented only by some kind of average of the individual Lerner indexes.

At the other extreme, in a homogeneous good context, if each firm (with identical constant marginal costs) behaves aggressively and prices myopically (i.e., believing that none of the other firms will adjust its price in response to whatever price the first firm selects[21]), then even just two competing oligopolists would drive the equilibrium price down to the level of marginal costs, so that the Lerner index for this two-firm aggressive oligopoly would be L_C; in essence, even the two-firm oligopoly would be incapable of exercising market power. If, however, the two firms have differing marginal costs, then the logic of this aggressive pricing would lead to an outcome in which the lower-cost firm sets its price at a level that is just below the marginal costs of the higher-cost firm (and the lower-cost firm sells to all of the buyers in the market), and the Lerner index thus would be positive; in essence, the lower-cost firm enjoys a monopoly, which is limited at the price that is equal to the rival firm's (higher) marginal cost.[22]

Between these two extremes are the possibilities that elements of market structure could influence the extent of the joint exercise of market power. One approach would be to keep the

[21] This is usually labeled "Bertrand competition", since it was first suggested by Bertrand (1883).
[22] This "limit pricing" outcome assumes that the higher-cost firm, even if it isn't selling anything, remains a constant threat to re-enter the market, or there are equally situated firms that could enter. If, instead, the higher-cost firm could be driven permanently from the market, never to return, and there were no other firms that could enter, then an initial period of limit pricing could allow the lower-cost firm subsequently to achieve a monopoly, with the appropriate Lerner index.

"Bertrand" assumption that each firm myopically sets its price while assuming that the other firms keep their prices unchanged but also to assume that the firms sell differentiated products: The product is not homogeneous, and buyers have preferences among the sellers and their products as well as favoring lower prices.

In this case, the equilibrium price for each firm will exceed its marginal costs. This outcome arises because of the following: With differentiated products, as each firm contemplates (myopically) what would happen if it changes its price, either up or down, the upward change would no longer mean a loss of all customers, and a downward change would no longer attract the entirety of the rival's customers. In essence, differentiating the product "softens" the competition between firms, even for Bertrand competitors. Unless the two firms are symmetric with respect to the buyers' preferences, their equilibrium prices would not be identical; consequently, even if their marginal costs were the same (which they need not be in the case of non-homogeneous products), the Lerner index for the "industry" would be ambiguous. Again, a Lerner index could be calculated for each firm, but the Lerner index for the industry would have to be some kind of average.

As another possibility: Assume that each firm again behaves myopically but this time chooses its output (rather than its price) while assuming that none of the other firms will adjust their outputs in response to its choice.[23] In this case (with a homogeneous product and identical constant marginal costs for all firms) the outcome will be a price that will be between the monopoly price and the purely competitive price, but that will be lower when there are more firms and will asymptotically approach the competitive price as the number of sellers gets very large. Formally, if the market demand curve can be represented as the linear relationship $Q = a - bP$, and each of the n oligopolists has identical constant unit costs of $c < a$, then:

[23] This is usually labeled "Cournot competition", since it was first suggested by Cournot (1838).

$$P = (a + nc)/(n + 1). \quad (5.2)$$

And the Lerner index for the n-firm oligopoly would be:

$$L_n = (a - c)/(a + nc). \quad (5.3)$$

Further, if the firms have different marginal costs, then those with lower marginal costs will have higher Lerner indexes and larger market shares.[24] Again, the Lerner index for the industry will have to be some average of the individual firms' Lerner indexes. If market shares are used as the weights, however, an interesting result arises: The weighted Lerner index can be shown to be equal to the ratio of a) the sum of the squared market shares of all of the sellers in the market – which is often described as the Herfindahl-Hirschman index[25] (HHI) of seller concentration – divided by b) the own-price elasticity of market demand.[26] Finally, if the firms sell differentiated products, the outcome will be an amalgam of the cost differences and the buyers' preferences over the differentiated products.

More generally for an oligopoly, if the analysis moves away from the mechanistic/myopic approaches modeled by Bertrand and Cournot, then one really is in an "it all depends" world with respect to the joint exercise of market power. However, systematic thinking about the structural determinants of the joint exercise of market power can uncover useful insights. The formal name for this systematic thinking is "the structure-conduct-performance" (S-C-P) paradigm:[27] The structure of an industry influences its conduct (or behavior), which in turn influences its performance.[28] In this context, the Lerner index –

[24] Even with a homogeneous product, the lowest-cost firm does not drive out the others, because of the "choose output" Cournot assumption.
[25] See Herfindahl (1950) and Hirschman (1945, 1964).
[26] It appears that Cowling and Waterson (1976) were the first to discover this relationship between the sales-share-weighted Lerner index and the HHI. We will return to the use of the HHI in Section III.
[27] Pieces of the discussion that follow can be found in Fellner (1949), Chamberlin (1956, app. B), and Stigler (1964). The paradigm is usually summarized in IO textbooks; see, for example, Scherer and Ross (1990); Carlton and Perloff (2005); and Pepall et al. (2008). See also Jacquemin and Slade (1989).
[28] Critiques of the S-C-P paradigm will be delayed until Section III.

representing the percentage elevation of price over cost -- is primarily a major indicator of an industry's conduct; but since the Lerner index is also an indicator of profits (at least relative to marginal costs), and above-normal profits are associated with allocative inefficiency (consumers are being charged prices that are in excess of the seller's marginal costs), resulting in income transfers (from consumers to the seller), the Lerner index is also an indicator of performance.[29]

One way to motivate the analysis is to begin with the assumption that each firm wants to maximize its own profits. But in an oligopolistic structure the firm's profits will depend not only on its own actions but also identifiably on the actions of its rivals. In that context, each firm faces the following tension:

On the one hand, each firm would recognize that jointly the highest profits that the group could achieve would be the monopoly profits of Figure 5.1 (which would be divided somehow among the group). On the other hand, if all of the others were maintaining that monopoly price, any firm could do even better than its share of the joint monopoly profits by undercutting its rivals' price slightly and stealing their customers and expanding its market share.[30] The longer that it would take the other firms to realize what was happening and to respond, the greater the gain for the first firm would be; conversely, a quick response by the others would mean little gain for the initial price cutter – and hence a weaker incentive to engage in price-cutting in the first place. But, as yet another consideration, each firm may fear that some other firm within the group may cut its price first, so that each firm would be the victim rather than the beneficiary of

[29] In the geometry of Figure 5.1, the triangle yxz represents the allocative inefficiency (deadweight loss) of market power: the accumulated difference between the seller's marginal costs and buyers' willingnesses to pay that are above marginal costs but below the price that the monopolist charges; the rectangle $P_M yz P_C$ represents the transfer from buyers to the monopolist: the excess (over the competitive price) that buyers pay times the quantity that is bought by the buyers at the monopoly price.

[30] This temptation for expansion, of course, assumes that the firm can readily increase output and doesn't quickly confront bottlenecks or other impediments to expansion.

any price cutting, which would argue for each firm engaging in price cutting in any event.[31] But if all firms reason in this way, the joint monopoly outcome will quickly unravel, and the Bertrand competitive outcome will prevail.[32]

In this context, then, what are the structural conditions that would tend to make the industry more conducive to the coordination that yields the collusive outcome, and thus the joint exercise of significant market power? Conversely, what are the conditions that would make coordination more difficult, thus being more conducive to a largely competitive outcome?

The tension between the opportunity to share in the joint monopoly profits of the collusive arrangement and the temptation to cut price surreptitiously -- to "cheat" on any understanding – but with the likely consequences of an eventual competitive outcome, leads to the consideration of the following structural features as contributing to the likelihood that one or the other of these outcomes, or something in between, eventually will prevail:

- Can the firms communicate? Although explicit price fixing – i.e., explicit communication and coordination among sellers with respect to prices (or outputs, or market shares) has generally become illegal in most countries – it is nevertheless worthwhile to raise the issue: Explicit communication among sellers should make coordination on a joint monopoly outcome easier to achieve.[33] Without explicit

[31] In the language of game theory, in these circumstances cutting the price below the joint monopoly level is the dominant strategy for each firm: Regardless of what the other firms do, it is always in each one's interest (at least in the short run) to cut its price. This is the essential lesson of the classic game theory problem of the "prisoner's dilemma".

[32] Or, if one thinks that the "undercutting" occurs through a Cournot-oriented expansion of output, then the Cournot equilibrium would be the "non-cooperative" result.

[33] And, indeed, despite its illegality, explicit communication to achieve price fixing and market allocation continues to occur, as the U.S. Department of Justice's (DOJ) videotapes of the lysine conspiracy of the 1990s vividly illustrate; see, for example, http://www.youtube.com/watch?v=ytNI56yzbQg. For a longer description of the lysine conspiracy, see Eichenwald (2000); for a wider discussion of price fixing conspiracies more generally, see Connor (2008). Because prosecutors must prove that an agreement to fix prices has been negotiated, but do not need to show that the agreement actually was implemented or caused prices to rise, Posner (1976, pp. 25-26), for one, argues that law-enforcement resources have been misallocated toward conspiracies that are easy to uncover but result in little or no economic harm.

communication, the firms instead will have to rely on indirect and implicit understandings, which will make coordination more difficult. The probabilities of being apprehended and convicted for price fixing, as well as the penalties that are attached to conviction, would be important as well.[34]

- Conditions of mutual monitoring. If the group of sellers can easily and quickly monitor each others' behavior – e.g., observing each others' sales and prices, through industry reports or media stories – they will be able to respond sooner to any firm's "cheating" on an understanding, which will thereby discourage any firm from breaking ranks in the first place. The longer is the lag in monitoring, the stronger will be the temptation for a firm to break ranks.
- The number of sellers. When the number of sellers is relatively small, it is likely to be easier for the group to monitor each other and to reassure themselves that little or no "cheating" is occurring. Accordingly, fewness of sellers would be more conducive to the collusive outcome.
- The relative sizes of the sellers. When the sellers are more similar in size, their outlooks (and beliefs about what price level and output quantity would achieve the monopoly outcome) are likely to be more similar, which should make agreement on the collusive outcome easier. However, it is also the case that one firm might dominate the market (because of a superior technology or a superior brand, say), but there are some smaller

[34] Also, so-called "leniency programs" by antitrust enforcers – the willingness of an antitrust agency to waive penalties for the first member of a price-fixing conspiracy to step forward and confess and provide useful evidence against the other members – surely help enforcers detect already-in-place price fixing conspiracies and probably deter their formation, since potential conspirators might thereby fear that the conspiracy would be more likely to be detected. See Polo and Motta (2008) and Spagnolo (2008) for overviews.

firms that can survive – albeit with limited capabilities for expansion.[35] In this case, the disparity in sizes need not undermine the exercise of market power, because the superiority of the dominant firm's technology, brand, or both, combines with the limits of the smaller firms to prevent the latter from wholly eroding the former's market power. This "dominant firm" model can be expanded to encompass a few relatively large firms that are dominant (and can coordinate among themselves) in competition with a group of (limited) reactive fringe firms (see Landes and Posner 1981).

- Conditions of entry. Analogous to the discussion of simple monopoly, higher barriers to entry would make it easier for a group of firms to reach and maintain an understanding with respect to the joint maintenance of market power. Conversely, easy entry will doom any efforts at the joint exercise of such power, since the above-normal profits that these efforts would hope to achieve would quickly be eroded by the larger quantities and lower prices that entry would bring.
- Ease of expansion by smaller firms. Smaller "fringe" firms may not be part of any oligopolistic understanding, or may believe that they can expand more readily without attracting the attention and response of the larger firms. If they can expand readily – if they are not constrained by production limitations or by the importance of branding – then oligopolistic coordination will be more difficult. Conversely, as was discussed above for the dominant firm or firms, limits on the ability of smaller firms to expand will make the dominance of the larger firms easier to maintain.
- The cost structures of the sellers. If the group of sellers all have roughly the same costs, they are more likely to envision the same jointly maximizing industry price; substantial

[35] This model is generally attributed to Stigler (1940), with revivals by Saving (1970) and Landes and Posner (1981). However, it appears that Amaroso (1938) preceded even Stigler; see Giocoli (2011).

cost differences among industry members may make an understanding harder to reach and maintain, especially with respect to the low-cost producer(s). Further, if the industry is characterized by high fixed costs and low marginal costs, the temptations for an industry member surreptitiously to cut its price would be greater, since the margins (over marginal costs) will be comparatively large. Railroads represent one example of this kind of cost structure, which, in extreme cases, may rule out the existence of a competitive market equilibrium.

- The buyers' side of the market. If the buyers of an industry's output are relatively few and knowledgeable and can readily "shop around" among the sellers, their bargaining strength – "My order is sizable and important to you: Give me a special (low) price, or I will take all of my purchases to one of your rivals." – will encourage the unraveling of any oligopolistic understanding among the sellers.[36] By contrast, if the buyers are many and small, they are less likely to shop around as effectively; and in any event, the threat will be far less potent.[37]
- Industry conditions. If the industry is relatively stable – e.g., in terms of demand and underlying product and production technologies – the maintenance of an understanding among a group of sellers will be easier. Sharp swings in demand, radical changes in production technologies, or sharp changes in product design or features would make the maintenance of an understanding more difficult.

[36] This buyer-side bargaining should not be confused with "monopsony", which is the exercise of market power by a single buyer (vis-à-vis a group of competitive sellers that collectively have a rising supply curve). The monopsonist can drive down its purchase price by buying less than would a competitive group of buyers (just as the monopolist in Figure 5.1 is able to sell at a higher price by supplying less than would the group of competitive sellers).

[37] A straightforward example of the effect of the buyers' side of the market can be found in the automobile industry: Large fleet buyers (e.g., auto rental agencies and large corporations and governments that buy fleets of vehicles for one-the-job use by their employees) pay far less than do individual buyers; see White (1971, pp. 133-135; 1977; 1982). For a discussion of a similar phenomenon in pharmaceuticals (large hospitals versus prescription-based individual purchasers), see Elzinga and Mills (2004).

- The nature of the product. If a product is homogeneous, mutual monitoring should be easier; product differentiation should make monitoring more difficult, especially when new products are introduced ("Is the lower price on my rival's new product a reflection of its lower quality? Or is the lower price really a price cut in disguise?"). However, as was discussed above, product differentiation itself tends to "soften" competition among oligopolists. Also, if the demand elasticity with respect to price for the industry's product is relatively low (so that a relatively large price increase will result in only a small decrease in the amount that is purchased), the gains from a coordinated understanding will be greater, which should thereby increase the likelihood that an understanding will develop and be maintained.
- Industry history and sociology. An industry in which the senior executives of the various companies have come to know and respect and trust each other would likely find the development and maintenance of an oligopolistic understanding easier. Rapid turnover of firms and/or senior executives would make maintenance more difficult.

These structural characteristics of an industry should not be seen as individually "make or break" conditions – except, arguably, for conditions of entry, since it is hard to envision that market power could persist when entry is easy – but instead as contributory (so-called "plus") factors to whether a group of oligopolists will be able to maintain an understanding among themselves and thereby jointly to exercise market power.

III. Methodologies for the Measurement of Market Power.

There are a number of methodologies that have been used to estimate and measure market power. This section will discuss their strengths and weaknesses.

A. Cross-section regressions to explain industry profit rates.

A direct implication of the monopoly/competition model of Figure 5.1 is the following: Not only will the price that is charged by the monopoly exceed the price that is charged by the otherwise comparable competitive industry (as measured by L_M and L_C), but also the profits that are earned by the monopoly will be greater than the profits that are earned by the competitive industry (and, again, the two Lerner indexes will represent the comparative profit rates as well).

For comparisons across two different industries, some additional explanation is needed: The prices across two different industries are not comparable.[38] And information on marginal costs may be difficult to ascertain. But the Lerner index – viewed as a profitability index – avoids both of these problems, since the profit margin (P – MC) is expressed relative to P.[39] Accordingly, if one knew that Industry A was a monopoly and Industry B was competitive, the expectation would be that the Lerner index for the former would be larger than the Lerner index for the latter. Further, one could turn this relationship around and argue that (other things being equal, of course) a higher Lerner index for Industry C as compared with Industry D would provide an inference that the former would more likely be a monopoly than would the latter.

So far we have avoided any discussion of what to do about oligopoly. But the S-C-P paradigm offers some insights, including the argument that the numbers of sellers and their relative sizes (as expressed by market shares) ought to matter; the Cournot model offers a similar insight with respect to numbers and relative sizes, although the Bertrand model for homogeneous products does not.[40] Consequently, there would appear to be a presumption that the relationship between the Lerner index and industry structure should be such that the Lerner index should

[38] This, of course, is the traditional problem of "comparing apples with oranges".
[39] Because marginal costs are usually difficult to measure, average variable costs are usually used as a stand-in.
[40] However, versions of the Bertrand model with differentiated products can yield the inference that the number of sellers and their relative sizes matter.

show higher values – that greater levels of market power would be indicated – when the number of firms in an industry is relatively small or when a few large firms dominate an industry with or without some other, smaller fringe firms. In short, market power should be positively related to seller concentration – although that relationship may well be erratic and non-linear – with the monopoly outcome as the limiting case.

This, in essence, is the proposition that economists – starting in the 1950s and extending through the 1970s – tested through least-squares regressions on industry-level cross-section data.[41] In these regressions, industry profit rates – as an indicator of market power – were explained by a measure of industry seller concentration.[42] The measure of seller concentration that was used was usually the four-firm concentration ratio (CR4), the fraction of industry sales that are accounted for by the largest four firms. These studies generally found a positive relationship between profits and CR4, implying that companies in more concentrated industries were more likely to be exercising market power.

Because of the limitations of the CR4 (it ignores all firms beyond the fourth-largest, and it ignores the relative distribution among the first four), the HHI began to replace it when sales shares data for individual firms became available to researchers.[43] In addition to encompassing all firms' shares of sales and thus being more comprehensive, the HHI has the advantage (as was

[41] The first such study appears to have been by Bain (1951). Dozens of studies followed, for the U.S. and then for other countries. Summaries can be found in Weiss (1971; 1974; 1989), Bresnahan (1989), Schmalensee (1989), Scherer and Ross (1990, ch. 11), Waldman and Jensen (2001, ch. 16), Martin (2002, ch. 7), Newmark (2006), Carlton and Perloff (2005, ch. 8), and White (2008b).

[42] The sources of the data were usually the U.S. Internal Revenue Service's annual Statistics of Income for industry profits and the U.S. Census Bureau's periodic Census of Manufactures and annual Survey of Manufactures for seller concentration. Sometimes the profit variable in the regressions would be the Lerner index or a variant of it, and sometimes the dependent variable would be the ratio of profits to owners' equity. This latter variable could be argued to be what the owners of companies would want to maximize, and it also would be the basis for calculating the opportunity cost of equity capital and measuring the allocative distortion that above-normal profitability from the exercise of market power would yield.

[43] It probably also helped that the 1982 DOJ Merger Guidelines used HHIs in discussing the seller concentration levels that would trigger antitrust concerns.

discussed above) of being an indicator of market power in the Cournot model and also in Stigler's (1964) model of the ability of oligopolistic firms to be able to monitor each other.

Also, these studies became more sophisticated over time. In addition to using a measure of seller concentration as an explanation for profit rates, these studies gradually included as explanatory variables more of the measures that the S-C-P paradigm indicate should matter for profitability: e.g., barriers to entry (as proxied by advertising rates and measures of economies of scale), competition from imports, measures of risk, and non-linearities between seller concentration and profit rates. In addition, more sophisticated econometric techniques were employed.

Starting in the late 1960s, however, these studies came under increasing attack. Initially the concern was that the S-C-P paradigm was too simplistic. First, entrants predictably would be attracted to industries with high profit rates, which would affect subsequent observed seller concentration; thus there was an important reverse causality and endogeneity that was being ignored.[44] Next, industries that were concentrated might have higher profits because there were important economies of scale that were being ignored by the S-C-P paradigm.[45] Also, the national industry demarcations that were specified in the IRS and Census data might not be the appropriate ones for the measurement of the exercise of market power. The appropriate markets might be narrower or broader; also, they might be more local or might be international.

The next wave of criticism argued that the accounting profit rates that were being used were inappropriate for the measurement of "economic profits" and hence for the indication that

[44] These criticisms can be found, for example, in Brozen (1971, 1974), Demsetz (1973; 1974) and Mancke (1974). The issue of the endogeneity of seller concentration was subsequently re-emphasized by Sutton (1991; 1998).
[45] The profit regressions implicitly assumed – following Bain (1956) and Kaysen and Turner (1959) – that economies of scale were not important for most industries and thus were not salient in explaining observed concentration levels.

above-normal profits and the concomitant market power were actually present.[46] Finally, studies in the 1980s indicated that the profit-concentration relationships that appeared to hold for the data for the 1940s through the 1960s were far weaker or non-existent for the 1970s and early 1980s.[47]

Because of these criticisms – especially with regard to the weaknesses of the accounting data that underlay the profit measurements – these cross-section profit-concentration studies have largely gone out of style as a way of measuring market power and its effects.

B. Price-Concentration Studies.

An alternative way of measuring market power is to test directly the relationship between prices and seller concentration. These tests require data on the prices of the same good or service that is sold in different markets where there are differing levels of seller concentration. Almost always this means that the sample involves a good or service that is sold in different geographic areas – such as Metropolitan Statistical Areas (MSAs) for retail goods, or city-pairs for air passenger transportation – where the separate geographic areas are likely to constitute separate markets.[48]

Such studies usually involve regressions of price on seller concentration and other variables that try to control for the other characteristics of the local market on the demand side (e.g., local population size or local average household income) and on the costs of supply (e.g., local wage rates). In essence, the price regressions represent a reduced-form approach to the underlying demand and supply relationships that yield the observed price.[49]

---

[46] See Fisher et al. (1983); Fisher and McGowan (1983); Benston (1985); and Fisher (1987). Carlton and Perloff (2005) and Perloff et al. (2007, ch. 2) offer eight reasons why accounting data are inappropriate and misleading for these kinds of studies.

[47] See Domowitz et al. (1986a; 1986b; 1987; 1988).

[48] The data often arise as a consequence of antitrust cases or regulatory proceedings.

[49] See Rubinfeld (2008) for a discussion.

These kinds of studies have been done for railroads, airlines, banking, various categories of retailing, and livestock procurement.[50] The results support the conclusions of the earlier profits-concentration studies (but without relying on accounting data or suffering other drawbacks):[51] Higher levels of seller concentration are (controlling for other influences) positively associated with higher prices and thus with greater market power.

C. Auction data.

Auctions can be considered to be markets, and the number of bidders that show up at an auction is an indicator of the extent of competition (and an inverse indicator of the potential for jointly exercised market power) for the item at auction. For example, consider procurement auctions, where a buyer (e.g., a state government) solicits bids for a specified task (e.g., a specific road construction project): The bidders are, in essence, suppliers that are competing on the price (the low bid wins) at which they will supply the item that is desired (the completed road). The number of bidders at the auction are the approximate equivalent of the number of sellers in a market.

Auction theory (building on oligopoly theory) predicts that prices in procurement auctions will be higher (i.e., that market power will be exercised) when fewer bidders are present. Similarly, for an auction where bidders are competing to buy an item, prices will be lower when fewer bidders are present at the auction (which would be an expression of market power on the buying side).[52]

[50] See, for example, Weiss (1989) and Audretsch and Siegfried (1992) for some of the studies and summaries of others. See also Dalkir and Warren-Boulton (2009), Ashenfelter et al. (2006), Baker (1999), and Busse and Rysman (2005).
[51] For a critique, however, see Newmark (2006).
[52] Surveys of auction theory can be found in McAfee and McMillan (1987), Klemperer (2004), Milgrom (2004), and Hendricks and Porter (2007).

To test this method of measuring market power, one needs to find samples of auctions where different numbers of participants showed up[53] to bid on comparable items or items that are made comparable through the use of suitable control variables. As an example, road construction auctions can be made roughly comparable by including the state highway department's engineers' estimates of the costs of building the road, which should account for the complexity of the project and local cost conditions.[54]

Empirical studies of auction prices and numbers of bidders do indeed find the predicted relationships: Fewer bidders at auctions are associated with higher prices in procurement auctions and lower prices at auctions where an item is being sold.[55] Also, instances of collusion at auctions – the joint exercise of market power through price fixing – have been detected empirically.[56]

D. Studies Involving Tobin's q.

For a publicly traded company, the market value of the company's equity shares represents the stock market's estimate of the present discounted value of the company's stream of future net earnings. The total market value of the company would be equal to its equity market value plus the aggregate of its debt (e.g., bonds issued, bank loans, and credit from suppliers). Suppose that the total market value of a company exceeds the replacement costs of its assets. One potential explanation for this situation would be that the firm is earning above-normal profits – i.e., is exercising market power.

[53] The number of bidders showing up may be endogenous, and thus this potential endogeneity may need to be taken into account in any empirical testing.
[54] See, for example, De Silva et al. (2009). Similarly, when the auction involves bidders that are bidding for an item that is being sold – e.g., when the U.S. Government auctions the rights to harvest lumber or to drill for oil on federal lands – the government's estimates of the likely resources on the land provide the basis for rough comparability.
[55] See, for example, Brannman et al. (1987), Brannman and Klein (1992), Athey and Levin (2001), and Hendricks and Porter (2007).
[56] See Hendricks and Porter (2007) for an overview; see also Porter and Zona (2009). For a criticism of the latter approach, see McChesney and Shughart (2007),

The ratio of a firm's market value to its replacement costs has come to be known as "Tobin's q" (Tobin 1969). The logic of the previous paragraph indicates that q > 1.0 for a firm should lead to expansion by existing firms, entry by new firms, or both, since either category of firms should be able to sell shares to the public for more than the cost of assembling the assets to replicate the activities (and profits) of that firm. But if there are barriers to entry, then q > 1.0 for the firm may persist.

A crucial element in testing any hypotheses that involve q is the ability by researchers accurately to estimate the replacement cost of the firm's assets. To the extent that the assets are intangible – such as the good will toward a product that is created by advertising or the value that is created by intellectual property, such as patents, copyrights, or trademarks – there may be difficulties in valuation. If these intangible assets are ignored, there will be a tendency for q to be greater than 1.0, even if market power is not present.

The initial study to relate Tobin's q to market power issues (Lindenberg and Ross 1981) used a large sample of publicly traded companies and found a positive relationship between q and the Lerner index for those companies; but the study did not find a relationship between q and the CR4 for these companies. Although there have been a few additional studies in this area,[57] not many efforts to relate Tobin's Q to market power have been published – probably because of the measurement problems just discussed.

E. The Panzar-Rosse Approach.

A direct implication of profit maximization for a monopoly is that the price-quantity maximization combination will always be in the elastic portion of the monopoly's demand

[57] See, for example, Salinger (1984) and Smirlock et al. (1984).

curve.[58] In turn, if the monopolist's costs increase – say, because the price of an input increases – then (holding other things constant) the monopolist's price will increase, but its revenue will fall. Panzar and Rosse (1987) (P&R) expand on this insight to show that the sum of the input price elasticities with respect to the monopolist's revenue must be negative. By contrast, if a firm is operating in a perfectly competitive industry, cost increases will be fully passed through to consumers in the form of higher prices; consequently, for any perfectly competitive firm that can be observed before and after a cost increase, the sum of the input price elasticities with respect to the firm's revenue should be equal to 1.0. Finally, for the Chamberlin-Robinson competitor of Section II, P&R determine that these same elasticities should be equal to or less than 1.0.

Tests of the P&R approach have been done for firms in a few industries, especially in banking[59] and other regulated industries, where data for individual firms usually are readily available and production functions can be expressed with only a few inputs. The studies typically show that only a few firms appear to fall into the category of monopoly or perfect competition, and that most firms appear to be in the category of the Chamberlin-Robinson competitor. However, there are no clear tests for the presence of oligopoly in the P&R approach. More importantly, the approach relies on regressions of firms' revenues against a set of input price variables and other control variables. Unless the input prices are reasonably well measured (which they often are not) and there are good controls for the other influences on a firm's revenues (which there often are not), the tests are not likely to yield useful inferences.

F. The New Empirical Industrial Organization (NEIO) Approach.

[58] Recall from Section II that the first-order condition for maximizing profits yields the result that $L = (P - MC)/P = -1/\varepsilon$. If $MC > 0$, then $|\varepsilon| > 1.0$ for $L > 0$.

[59] As well as adding to those studies, Bikker et al. (2012) review 32 applications of the P&R approach to banking alone.

The "new empirical industrial organization" (NEIO) approach (Bresnahan 1989) arose in the 1980s from a confluence of factors: a) a dissatisfaction with the cross-industry profit-concentration regressions, as discussed above; b) a greater availability of detailed "micro" data on individual products and even on individual transactions, arising from data sources such as the scanner data that are collected from check-out transactions at supermarkets and other large retailers; c) a renewed emphasis on structural rather than reduced-form econometric estimations; and d) improved econometric theory and modeling with respect to structural multi-equation estimation. The NEIO approach has tended to focus on the data within one industry, or sometimes even within one company. Although the NEIO approach can be used to address other IO issues, market power inferences have often emerged from these studies.[60]

The NEIO approach can be illustrated with the following simple example: The demand for a product (for an industry or for an individual firm) can be represented (in inverse form) by:

$$P = f(Q, Z), \tag{5.4}$$

where Z represents other variables that are likely to influence demand (e.g., income and the prices of substitutes and complements). The marginal revenue for the firm is:

$$MR = d(PQ)/dQ = P + Q*dP/dQ = P*(1 + 1/\varepsilon). \tag{5.5}$$

The cost structure for the firm or industry can be represented by:

$$MC = g(Q, W), \tag{5.6}$$

where W represents variables that are likely to influence costs (such as input prices). The condition for a firm to maximize profits therefore is:

$$MR = MC; \tag{5.7}$$

or

[60] Summaries of NEIO studies that provide estimates of market power, including Lerner indexes, can be found in Bresnahan (1989), Perloff et al. (2007, ch. 3), Einav and Levin (2010), and Tremblay and Tremblay (2012, ch. 12).

$$P^*(1 + 1/\varepsilon) = g(Q, W). \quad (5.8)$$

Instead of solving equations 5.4 and 5.8 for P (while eliminating Q) and then estimating a reduced-form regression – which is the general approach of the price-concentration regressions discussed above – the NEIO approach keeps equations 5.4 and 5.8 intact and estimates these two equations jointly (using appropriate econometric techniques). In so doing, not only can the effects of mergers be ascertained,[61] but any influence on the relationships that indicates a change or difference in the price-elasticity of demand can be used to make inferences about market power. Since the prices of a firm with market power should be expected to respond to differences in the elasticity of demand, whereas the perfectly competitive firm's prices are driven solely by costs, this approach provides a means of estimating market power.

It appears likely that the NEIO approach is the wave of the future for estimating market power.[62]

IV. Market Power Estimation in Antitrust Contexts.

Market power estimations are especially important in three antitrust contexts: mergers; allegations of monopolization; and the calculation of damages from price fixing. All three will be discussed.[63]

A. Mergers.[64]

[61] See Whinston (2007) for an overview.
[62] Kumbhakar et al. (2012) offers an alternative that is similar in spirit to the NEIO approach but instead uses a production function approach and does not require the information on input prices that is often needed for NEIO studies. The Kumbhakar et al. approach is relatively new, and its widespread practicability has yet to be shown.
[63] For general overviews, see Baker and Bresnahan (2008) and Rubinfeld (2008).
[64] Overviews of the effects of mergers can be found in Whinston (2007), Werden and Froeb (2008a; 2008b), Kuhn (2008), Ordover (2008), Werden (2008), and Leonard and Zona (2008); see also the Review of Industrial Organization, 39 (August-September 2011) for a special issue that is devoted to the 2010 U.S. DOJ-FTC Horizontal Merger Guidelines. It is worth noting that most competition policy agencies worldwide have adopted approaches that are similar to the U.S.-oriented approaches that are described in the text below.

The goal of modern antitrust policy with respect to mergers is to prevent mergers (or to require sufficient divestitures, spinoffs or other ameliorations) that would otherwise create or enhance market power. The updated (2010) U.S. DOJ-FTC Horizontal Merger Guidelines (HMG) recognize that a merger might create or enhance market power in either of two ways:

- Coordinated effects. By reducing the number of sellers in an industry and increasing the market share of the merged entity, a merger may create or enhance the oligopolistic conditions that are conducive to the joint exercise of market power, as was discussed in Section II.
- Unilateral effects. When two firms that previously sold somewhat similar but differentiated and competing products consummate a merger, the presence of each firm as a check on the other firm's ability to raise prices is eliminated. If appreciable numbers of one firm's customers see the other firm as their next best alternative (and other firms' products are a sufficiently distant third), then the merged firm will possess enhanced market power and be able to increase the price of one or both products accordingly.

Each potential route for a merger to create or enhance market power will be addressed.

1. Coordinated effects. If the fear is that a merger will create or enhance an oligopolistic joint exercise of market power, then a "market" must be defined (delineated); otherwise, there is no basis for the determination of "market shares".[65] The HMG adopt the following paradigm: A market is a collection of sellers that are selling a specific product that, if they coordinated their behavior so as to act like a monopoly, could profitably (and sustainably) raise the price above the

[65] For a dissenting view, which argues that market delineation is wholly unnecessary, see Kaplow (2011).

current prevailing price. In essence, a market is a collection of firms that can exercise market power; equivalently, a market is something that can be monopolized.[66]

The specific question that is asked is whether a group of firms, if they acted as a monopoly (the "hypothetical monopolist test") with respect to a specific product, could sustain a "small but significant and non-transitory increase in price" (the "SSNIP test"). If the answer is "yes" (because only a sufficiently small percentage of sales would be lost), then that group of firms that are selling that product constitutes a relevant market;[67] if the answer is "no", then the market must be expanded to include more firms (either in geographic space or in product space) until the answer becomes "yes". Generally, the smallest group of sellers that satisfy the SSNIP test will constitute the relevant market; the SSNIP is usually 5%.

The crucial information for ascertaining the answer to the SSNIP test is the price-elasticity of demand (ε) for the product in question and the price-cost margin (PCM) on the product. The critical question in the SSNIP test is whether the percentage reduction in sales (PRS) will be sufficiently small, so that the proposed price increase for the hypothetical monopolist is profitable. This "critical loss" in sales can be shown to be:

$$|PRS\hat{}| < SSNIP/(PCM + SSNIP). \qquad (5.9)$$

Since the price-elasticity of demand (ε) is the percentage change in quantity that is brought about by (i.e., divided by) a percentage change in price, if both sides of inequality 5.8 are divided by SSNIP, the result is:

$$|\varepsilon\hat{}| = |PRS\hat{}|/SSNIP < 1/(PCM + SSNIP) \ . \qquad (5.10)$$

[66] Although this paradigm was first used in the DOJ 1982 Merger Guidelines, the concept appears to have first been developed by Adelman (1959); see Werden (2003).

[67] Although the HMG focus on sellers in the delineation of a relevant market, if a group of sellers can practice price discrimination (market segmentation) toward a group of customers that are located in a specific geographic area or that are in a specific line of trade, then the sales by those sellers to those customers would also constitute a relevant market.

$\varepsilon^{\wedge}$ is often termed the "critical elasticity".

Data for these calculations can come from company information on PCMs and on NEIO-type data and econometric estimations to ascertain elasticities.[68]

Once the relevant market has been delineated, the HMG then turn to the oligopoly and market structure considerations that were discussed in Section II to try to ascertain whether the proposed merger likely would create or enhance market power. Because market shares are the most readily quantifiable, the post-merger HHI and the change in the HHI brought about by the merger tend to receive prominent attention.[69] However, the conditions of entry, the buyers' side of the market, whether the merged firm would likely become more aggressive or less aggressive vis-à-vis the other firms in the market, etc., also are considered. Finally, the potential efficiencies – i.e., reductions in costs – that may accompany the merger are also considered as a potential offset; however, because cost reductions are easy to promise but may be difficult to deliver, prospective cost-reduction claims usually require considerable substantiation.[70]

2. Unilateral effects. If the prospective merger partners each sell a differentiated product, then the merger eliminates the presence of both to act as a check on the other's ability to raise its price, and the merged firm may be able to raise prices unilaterally.

Consider each firm's behavior prior to the merger: Each firm has set its price on its product so as to maximize its profits, in accordance with eq. 5.8. It doesn't want to set a higher price, because (at that profit-maximizing price) the prospective loss of customers (and the margins that are being earned on them) more than offsets the higher profit margins on the

[68] See, for example, Rubinfeld (2008).
[69] The HMG assume, on a "pro forma" basis, that the post-merger market share of the merged firm will be the sum of the two merger partners' pre-merger shares. It is then readily shown that the change between the pre- and post-merger HHIs must be equal to twice the product of the two pre-merger market shares.
[70] If the promised cost efficiencies fail to occur after the merger has been consummated, it may be difficult to undo the merger: The merged firm is likely to integrate personnel and systems, eliminate brands and offices, etc., and thus an effort to undo the merger would require "unscrambling the egg".

customers that would remain with the firm at the higher price. If, however, any of those lost customers would have switched to the prospective merger partner, then the merged firm would recapture some profit margins on those diverted customers. Hence, the merged firm would find a higher price to be profitable for this product than did the pre-merger firm; in essence, the merged firm can exercise more market power. And this effect can operate for both firms' products.

The strength of the "upward pricing pressure" (UPP)[71] would depend on the extent to which the merged firm is able to recapture the diverted customers that were otherwise lost to the pre-merger firm (the "diversion ratio") and the profit margins on the "companion" product to which the customers are diverted. The more that the customers of the one firm see the product of the other as their next-best alternative, and the wider are the margins on that next-best product, the greater will be the post-merger price increase. An offset to this UPP would be any efficiencies – specifically, reductions in marginal costs of the first product – that might occur as a consequence of the merger. Consequently, if the diversion ratio from Firm A's product to Firm B's product is labeled D_{AB} and the merger-connected reduction in Firm A's marginal costs is ΔMC_A, the net UPP_A will be positive – i.e., the merged firm will be able to exercise greater market power with respect to product A – if:

$$\text{net } UPP_A = D_{AB}*PCM_B - \Delta MC_A > 0. \qquad (5.11)$$

It is worth noting that this determination of UPP does not require a process of market delineation. Instead, it only requires the finding that one or the other (or both) of the two firms' products have significant numbers of customers that find the other firm's product to be their next best alternative (and, of course, the finding that the magnitudes are non-trivial from a policy perspective). Or, if it were felt that there must be a delineation of a market in order for there to

[71] This is the phrase that Farrell and Shapiro (2010) have popularized.

be a finding that the post-merger firm has been able to exercise greater market power, then (tautologically) the finding of a positive net UPP (if it exceeds some threshold) must mean that the two prospective merger partners comprise a relevant market for that product.

The analysis thus far has ignored the possible responses by other firms. If entry would occur in response to the net UPP, or if other firms would reposition their products, so that the diversion ratio decreases, the net UPP would decrease.

The data that are needed for a net UPP calculation are the relevant PCMs, measures of own-price elasticity and cross-price-elasticity of the products, and the post-merger reductions in MCs, as well as information on the possibilities of entry and of product repositioning. As usual, the PCMs are the easiest to gather, since they may be available from accounting data (if AVC is considered to be a tolerable stand-in for MC). The demand elasticities will require NEIO-type data and econometric estimation. Indeed, since the introduction of unilateral effects into merger analysis in the early 1990s, there has come into existence a "cottage industry" of "merger simulation" efforts.[72] And, finally, as is true for a "coordinated effects" analysis, the prospective cost reductions are often the hardest to evaluate, since they are easy to promise but may be difficult to deliver.

Although modern merger analysis has been pioneered by the U.S. antitrust enforcement agencies, the approaches that have been discussed above are now generally employed by comparable enforcement agencies around the world.

B. Monopolization.[73]

In a monopolization case, the plaintiff often alleges that the defendant undertook specific actions that disadvantaged the plaintiff and reduced competition; the plaintiff is usually an actual

[72] Summaries can be found in Werden (2008), Leonard and Zona (2008), Froeb and Werden (2008a; 2008b), and Rubinfeld (2008).
[73] A more complete discussion can be found in White (2008a).

or potential (or former) rival. Or the customer-plaintiff may allege that the defendant charged above-competitive prices, which harmed the plaintiff. Or the U.S. Government sues the defendant on behalf of the general public.

As a preliminary matter, the plaintiff will need to establish that the defendant has substantial market power; and the defendant will want to try to deny that this is so. Accordingly, the plaintiff will want to try to establish that the relevant market is relatively narrow, and the defendant has a large or dominant market share and thus can exercise substantial market power; and the defendant will want to claim that the relevant market is broad, and the defendant has only a small market share of that broad market and hence cannot exercise substantial market power.

A famous example of this type of issue arose in the DOJ's antitrust suit against duPont in the 1950s, alleging the monopolization of cellophane.[74] The DOJ alleged that the relevant market was narrow: only cellophane; DuPont argued that the relevant market was much broader and encompassed all flexible wrapping materials. More recently, in the DOJ's monopolization suit against Microsoft in the late 1990s,[75] the DOJ argued that the relevant market was operating systems for Intel-compatible personal computers; Microsoft argued for a wider definition that would have encompassed software on all platforms for computing (including applications running on servers). Yet more recently, in the DOJ's antitrust suit against Visa and MasterCard in the early 2000s alleging monopolization of credit card issuance,[76] the DOJ argued for a narrow market of credit and charge cards; Visa and MasterCharge argued for a broader payments market that also encompassed debit cards, checks, and cash.

[74] See U.S. v. E.I. DuPont de Nemours & Co., 351 U.S. 377 (1956); for discussion, Stocking and Mueller (1955) is apt.
[75] See U.S. v. Microsoft Corp., 253 F.3d 34 (2001); for discussion, see, e.g., Rubinfeld (2009).
[76] See U.S. v. Visa U.S.A., Inc. Visa International Corp., and MasterCard International Inc., 344 F.3d 229 (2003); for discussion, see Pindyck (2009).

If the plaintiffs' views of the relevant markets were valid, the defendants clearly possessed market power, and the trials would then turn to the allegations of monopolization and whether they were valid; if the defendant's views of the relevant markets were valid, the defendants had little or no relevant market power, and the cases should be dismissed. Which views were valid?

Unfortunately, the market definition paradigm that works well for the HMG approach to "coordinated effects" merger cases generally does not apply to such monopolization cases. Recall that the HMG's market definition paradigm is used to assess a prospective merger and the possibility that this merger might create or enhance market power in the future. The paradigm can thus ask, for market definition purposes, "Could a hypothetical monopolist raise the price significantly above where it is currently?"

By contrast, in the context of a monopolization case, the goal is to try to determine whether the defendant currently has market power. The use of a SSNIP test – i.e., asking "Could the defendant profitably raise its price by 5% from current levels?" – ought to be useless, because the answer should always be "no", regardless of whether the defendant does or does not possess market power.[77] If the defendant is maximizing profits in accordance with eq. 5.8, its current price should be its profit-maximizing price, and any increase above the current level would be unprofitable, even for a monopolist, because the firm would lose too many sales.[78]

[77] Unfortunately, as White (2008a) documents, this has not stopped judges in monopolization cases – and even some expert economists – from asking a SSNIP-type of question in these cases. In the duPont cellophane case, the U.S. Supreme Court asked it, and the majority concluded that du Pont did not have market power because the company could not increase its price of cellophane profitably from current levels – that duPont was too constrained by competition from other flexible wrapping materials. This inappropriate use of a SSNIP-type of question has since come to be known in antitrust discussions as the "cellophane fallacy".

[78] As Werden (2000) has pointed out, a SSNIP test would be appropriate if the issue that was under litigation was a prospective action (e.g., an exclusionary act) by the defendant against which the plaintiff was seeking an anticipatory injunction; but few monopolization cases involve prospective actions.

If profits were considered to be a reliable indicator of the exercise of market power, they might help address the market power issue. Recall that the monopolist of Figure 5.1 can be expected to earn above-normal profits, whereas the perfect competitors of Figure 5.1 and the Chamberlin-Robinson competitors of Figure 5.2 can be expected to earn only normal profits. But, as was discussed in Section IV, since the early 1980s, economists have generally looked with disfavor on the use of profit rates as evidence that can help measure the presence of market power; and the use of Lerner indexes alone won't help, since both the Chamberlin-Robinson competitors of Figure 5.2 and the monopolist of Figure 5.1 have Lerner indexes that exceed 1.0.

Unfortunately, there have been no generally accepted market definition paradigms for monopolization cases that would solve this conundrum.[79] The development of an appropriate paradigm remains as a serious need for antitrust policy and jurisprudence. And, again, this need is not confined to just the U.S. experience but applies to enforcement regimes worldwide.

C. Collusion (price-fixing).

When competing firms formally collude in a "horizontal" price-fixing arrangement,[80] the firms' collective goal is to elevate their prices above what competition would otherwise generate. In essence, the goal is the joint exercise of market power.

As was noted above, in the United States price fixing among competitors is a "per se" offense: The plaintiff or prosecutor must simply prove that the effort to fix prices occurred in order to win the case; there is no need to show the extent of the effect, or even that there was any

[79] White (2008a) offers some suggestions.

[80] The term "horizontal" is important, so as to distinguish price fixing among competitors from a "vertical" agreement between, say, a manufacturer and a distributor as to what the latter's resale price of the manufacturer's product should be. These latter types of arrangements do not carry the automatic presumption of socially detrimental behavior. See, for example, Elzinga and Mills (2008).

effect. In essence, there is no need to demonstrate or measure the exercise of market power in order to win the case – only that there was an explicit effort jointly to exercise market power.[81]

However, if the plaintiff hopes to win damages from the price fixers, then the plaintiff must demonstrate that the price-fixing did have some effect: that market power was exercised. This demonstration usually involves the following: a) determining the period of time during which the price fixing occurred; b) determining the actual prices that were charged during this period; c) determining the "but for" prices – the prices that would have otherwise been charged in the absence of the price-fixing conspiracy – during this period; d) determining the volume of transactions that occurred during the period; and e) multiplying the volume of transactions times the "overcharge" (the difference between the actual price charged and the "but for" price) so as to determine the aggregate damages.[82]

The interesting issue with respect to the damages calculation is almost always the determination of the "but for" price, and to a lesser extent the determination of the time period during which the conspiracy occurred.[83] The "but for" price is another instance where NEIO modeling and data can prove useful.[84]

V. Conclusion

Market power – how it arises, and how it is measured – is an interesting and important topic for managerial economics as well as for the field of industrial organization (IO). The topic is surely worthy of further study by managers and by those who instruct and advise them.

---

[81] This "per se" approach reflects the belief that such behavior is almost always adverse to the public interest, so that just the evidence that the effort was undertaken is sufficient for conviction.
[82] In the U.S. private parties are entitled to treble damages from the defendant: a tripling of the actual economic damages that are proved at trial.
[83] For example, for varying views on the lysine price-fixing conspiracy of the 1990s, see Connor (2001) and White (2001).
[84] See, for example, Rubinfeld (2008).

Much of this future study will surely have a strong empirical flavor, with detailed micro-level data on products, prices, consumers, and firms being analyzed through the use of sophisticated econometrics and careful modeling. This is all to the good.

As scholars – in managerial economics as well as in traditional IO – undertake research that touches on issues of market power, there are a few areas that are especially worthy of attention. First, as was indicated in the discussion of antitrust policy, there is still no paradigm for the delineation of markets in monopolization cases that is comparable to the paradigm that has been quite successful in the analysis of mergers. This void is important, because judicial decisions in monopolization cases as to whether defendants possessed and exercised market power are consequently likely to be erratic, which is not an encouraging prospect for the long-run efficiency of the U.S. economy (or for other economies where similar judicial issues arise).

Next, developing incentive-compatible methods for merger proponents to describe the prospective efficiencies that would flow from proposed mergers would surely have high social value. Enforcement officials usually adopt skeptical attitudes toward claimed prospective efficiencies, because the efficiencies are so easy to promise beforehand but may be difficult to deliver afterward. This may well mean that prospective mergers that may increase market power but that would also have more-than-offsetting efficiencies are rejected. Again, this is not an encouraging prospect for long-run efficiency.

Finally, the concept of market power itself needs a nuanced reassessment, especially from the IO side. Although the "price equals marginal cost" standard for allocative efficiency is surely a useful place to start, the ready identification of "market power" with <u>any</u> positive deviation of price from marginal cost carries real dangers, especially since "market power" too often carries a pejorative connotation because it is readily associated with "monopoly" and the

allocative (and possibly distributional) drawbacks of the latter. Yet the development of distinctiveness by a seller for its product is a well-recognized path toward greater competition and innovation and better satisfaction of buyer demands, even if this distinctiveness almost always means that price is likely to exceed marginal costs in equilibrium.

The real issue that accompanies distinctiveness, as Spence (1976) and Dixit and Stiglitz (1977) demonstrated, is the tradeoff between the economies of scale that might be better exploited for surviving products if there were fewer distinctive products that were being sold versus the decreased buyer satisfaction (reduced consumer surplus) that would also accompany fewer distinctive choices. This is the same type of issue that arises in standardization controversies (such as whether an industry should adopt a common technological standard). The issues are real; but they are not helped by the identification of distinctiveness with market power and its pejorative connections.

Given the long use of the Lerner index and its association with "market power", there may be no good remedy for this conundrum. It is nevertheless worth some careful thought, as well as careful usage.

References

Adelman, Morris A. "Economic Aspects of the Bethlehem Opinion." *Virginia Law Review* 45 (1959): 684-96.

Amoroso, Luigi. "La Curva Statica di Offerta." *Giornale degli Economisti* 45 (1930): 1-26; translated as "The Static Supply Curve." In *International Economic Papers*, vol. 4, edited by Alan T. Peacock, Wolfgang F. Stolper, Ralph Turvey, and Elizabeth Henderson, 39-65. London: Macmillan, 1954.

Amoroso, Luigi. *Principii di Economica Corporativa*. Bologna: Zanichelli, 1938.

Areeda, Phillip E. and Herbert Hovenkamp. *Fundamentals of Antitrust Law*, Vol. 1. New York: Aspen Law & Business, 2002.

Ashenfelter, Orley, David Ashmore, Jonathan B. Baker, Suzanne Gleason, and Daniel S. Hosken. "Empirical Methods in Merger Analysis: Econometric Analysis of Pricing in *FTC v. Staples*." *International Journal of the Economics of Business* 13 (2006): 265-79.

Athey, Susan and Jonathan Levin. "Information and Competition in U.S. Forest Service Timber Auctions." *Journal of Political Economy* 109 (2001): 375-417.

Audretsch, David B. and John J. Siegfried, eds. *Empirical Studies in Industrial Organization: Essays in Honor of Leonard W. Weiss*. Dordrecht: Kluwer, 1992.

Bain, Joe S. "Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940." *Quarterly Journal of Economics* 65 (1951): 293-324.

Bain, Joe S. *Barriers to New Competition*. Cambridge, MA: Harvard University Press, 1956.

Baker, Jonathan B. "Econometric Analysis in *FTC v. Staples*." *Journal of Public Policy & Marketing* 18 (1999): 11-21.

Baker, Jonathan B. "Market Definition." In *Issues in Competition Law and Policy*, vol. I, edited by Wayne D. Collins, 315-351. Chicago: American Bar Association, 2008.

Baker, Jonathan B. and Timothy F. Bresnahan. "Economic Evidence in Antitrust: Defining Markets and Measuring Market Power." In *Handbook of Antitrust Economics*, edited by Paolo Buccirossi, 1-42. Cambridge, MA: MIT Press, 2008.

Benston, George J. "Accounting Numbers and Economic Values." *Antitrust Bulletin* 27 (1982): 161-215.

Bertrand, Joseph. Review of "Theorie Mathematique de la Richesse Sociale" and "Recherches sur les Principes Mathematiques de la Theorie des Richesses." *Journal des Savantes* 67 (1883): 499-508.

Bikker, Jacob A., Sherrill Shaffer, and Laura Spierdijk. "Assessing Competition with the Panzar-Rosse Model: The Role of Scale, Costs, and Equilibrium." *Review of Economics and Statistics* 94 (2012): forthcoming.

Brannman, Lance and J. Douglas Klein. "The Effectiveness and Stability of Highway Bid-Rigging." In *Empirical Studies in Industrial Organization: Essays in Honor of Leonard W. Weiss*, edited by David B. Audretsch and John J. Siegfried, 61-75. Dordrecht: Kluwer, 1992.

Brannman, Lance, J. Douglas Klein, and Leonard W. Weiss. "The Price Effects of Increased Competition in Auction Markets." *Review of Economics and Statistics* 69 (1987): 24-32.

Bresnahan, Timothy F. “Empirical Studies of Industries with Market Power.” In *Handbook of Industrial Organization*, vol. 2, edited by Richard Schmalensee and Robert D. Willig, 1011-57. Amsterdam: Elsevier, 1989.

Brozen, Yale. “Concentration and Structural and Market Disequilibria.” *Antitrust Bulletin* 16 (1971): 241-248.

Brozen, Yale. “Concentration and Profits: Does Concentration Matter?” *Antitrust Bulletin* 19 (1974): 381-99.

Busse, Meghan and Mark Rysman. “Competition and Price Discrimination in Yellow Pages Advertising.” *Rand Journal of Economics* 36 (2005): 378-90.

Carlton, Dennis W. and Jeffrey M. Perloff. *Modern Industrial Organization*, 4th edn. Boston: Pearson, 2005.

Chamberlin, Edward H. *The Theory of Monopolistic Competition*. Cambridge, MA: Harvard University Press, 1933.

Chamberlin, Edward H. *The Theory of Monopolistic Competition*, 7th edn. Cambridge, MA: Harvard University Press, 1956.

Connor, John M. “Our Customers Are Our Enemies: The Lysine Cartel of 1992-1995.” *Review of Industrial Organization* 18 (2001): 5-21.

Connor, John M. *Global Price Fixing*, 2nd edn. Berlin: Springer: 2008.

Cournot, Augustin A. *Researches sur les Principes Mathematique de la Theorie des Richesses*. Paris: Hachette, 1838.

Cowling, Keith and Michael Waterson. “Price-Cost Margins and Market Structure.” *Economica* 43 (1976): 267-74.

De Silva, Dakshina G., Thomas D. Jeitschko, and Georgia Kosmopoulou. “Entry and Bidding in Common and Private Values in Auctions with an Unknown Number of Rivals.” *Review of Industrial Organization* 35 (2009): 73-93.

Dalkir, Serdar and Frederick R. Warren-Boulton. “Prices, Market Definition, and the Effects of Merger: Staples-Office Depot (1997).” In *The Antitrust Revolution: Economics, Competition, and Policy*, 5th edn., edited by John E. Kwoka, Jr., and Lawrence J. White, 178-89. New York: Oxford University Press, 2009.

Demsetz, Harold. “Industry Structure, Market Rivalry, and Public Policy.” *Journal of Law & Economics* 16 (1973): 1-9.

Demsetz, Harold. “Two Systems of Belief about Monopoly.” In *Industrial Concentration: The New Learning*, edited by Harvey J. Goldschmid, H. Michael Mann, and J. Fred Weston, 164-83. New York: Columbia University Press, 1974.

Dixit, Avinash K. and Joseph E. Stiglitz. “Monopolistic Competition and Optimum Product Diversity." *American Economic Review* 67 (1977): 797-308.

Domowitz, Ian, Glenn R. Hubbard, and Bruce C. Petersen. “Business Cycles and the Relationship between Concentration and Price-Cost Margins.” *Rand Journal of Economics* 17 (1986a): 1-17.

Domowitz, Ian, Glenn R. Hubbard, and Bruce C. Petersen. “The Intertemporal Stability of the Concentration-Margins Relationship.” *Journal of Industrial Economics* 35 (1986b): 13-34.

Domowitz, Ian, Glenn R. Hubbard, and Bruce C. Petersen. “Oligopoly Supergames: Some Empirical Evidence on Prices and Margins.” *Journal of Industrial Economics* 35 (1987): 379-98.

Domowitz, Ian, Glenn R. Hubbard, and Bruce C. Petersen. “Market Structures and Cyclical Fluctuations in U.S. Manufacturing.” *Review of Economics and Statistics* 70 (1988): 55-66.

Eichenwald, Kurt. *The Informant*. New York: Random House, 2000.

Einav, Liran and Jonathan Levin. “Empirical Industrial Organization: A Progress Report.” *Journal of Economic Perspectives* 24 (2010): 145-62.

Elzinga, Kenneth G. and David E. Mills. “The Brand Name Prescription Drugs Antitrust Litigation.” In *The Antitrust Revolution: Economics, Competition, and Policy*, 4th edn., edited by John E. Kwoka, Jr., and Lawrence J. White, 301-320. New York: Oxford University Press, 2004.

Elzinga, Kenneth G. and David E. Mills. “The Economics of Resale Price Maintenance.” In *Issues in Competition Law and Policy*, vol. III, edited by Wayne D. Collins, 1841-58. Chicago: American Bar Association, 2008

Elzinga, Kenneth G. and David E. Mills. “The Lerner Index of Monopoly Power: Origins and Uses.” *American Economic Review* 101 (2011): 558-64.

Farrell, Joseph and Carl Shapiro. “Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition.” *B.E. Journal of Theoretical Economics: Policies and Perspectives* 10 (2010): issue 1, article 9.

Fellner, William J. *Competition among the Few*. New York: Knopf, 1949.

Fisher, Franklin M. and John J. McGowan. “On the Misuse of Accounting Rates of Return to Infer Monopoly Profits.” *American Economic Review* 73 (1983): 82-97.

Fisher, Franklin M., John J. McGowan, and Joen E. Greenwood. *Folded, Spindled, and Mutilated: Economic Analysis and U.S. v. IBM*. Cambridge, MA: MIT Press, 1983.

Fisher, Franklin M. “On the Mis-Use of the Profits-Sales Ratio to Infer Monopoly Power.” *Rand Journal of Economics* 18 (1987): 384-96.

Fisher, Franklin M. “Detecting Market Power.” In *Issues in Competition Law and Policy*, vol. I, edited by Wayne D. Collins, 353-71. Chicago: American Bar Association, 2008.

Giocoli, Nicola. “Who Invented the Lerner Index? Luigi Amoroso, the Dominant Firm Model, and the Measurement of Market Power.” 2011; available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1966538.

Hendricks, Ken and Robert H. Porter. “An Empirical Perspective on Auctions.” In *Handbook of Industrial Organization*, vol. 3, edited by Mark Armstrong and Robert H. Porter, 2073-2143. Amsterdam: Elsevier, 2007.

Herfindahl, Orris C. *Concentration in the U.S. Steel Industry*. Ph.D. dissertation, Columbia University, 1950.

Hirschman, Albert O. *National Power and the Structure of Foreign Trade*. Berkeley: University of California Press, 1945.

Hirschman, Albert O. “The Paternity of an Index.” *American Economic Review* 54 (1964): 761-2.

Jacquemin, Alexis and Margaret E. Slade. ‘Cartels, Collusion, and Horizontal Merger.” In *Handbook of Industrial Organization*, vol. 1, edited by Richard Schmalensee and Robert D. Willig, 415-73. Amsterdam: Elsevier, 1989.

Kaplow, Louis. “Market Definition and the Merger Guidelines.” *Review of Industrial Organization* 39 (2011): 107-125.

Kaysen, Carl and Donald F. Turner. *Antitrust Policy: An Economic and Legal Analysis*. Cambridge, MA: Harvard University Press, 1959

Keppler, Jan H. “Luigi Amoroso (1886-1965): Mathematical Economist, Italian Corporatist.” *History of Political Economy* 26 (1994): 589:611.

Klemperer, Paul. *Auctions: Theory and Practice*. Princeton: Princeton University Press, 2004.

Kuhn, Kai-Uwe. “The Coordinated Effects of Mergers.” In *Handbook of Antitrust Economics*, edited by Paolo Buccirossi, 105-44. Cambridge, MA: MIT Press, 2008

Kumbhakar, Subal C., Sjur Baardsen, and Gudbrand Lien. “A New Method for Estimating Market Power with an Application to Norwegian Sawmilling.” *Review of Industrial Organization* 40 (2012): 109-129.

Landes, William M. and Richard A. Posner. "Market Power in Antitrust Cases." *Harvard Law Review* 94 (1981): 937-96.

Leonard, Gregory K. and J. Douglas Zona. "Simulation in Competitive Analysis." In *Issues in Competition Law and Policy*, vol. II, edited by Wayne D. Collins, 1405-36. Chicago: American Bar Association, 2008.

Lerner, Abba P. "The Concept of Monopoly and the Measurement of Monopoly." *Review of Economic Studies* 1 (1934): 157-75.

Lindenberg, Eric B. and Stephen A. Ross. "Tobin's Q Ratio and Industrial Organization." *Journal of Business* 54 (1981): 1-32.

Mancke, Richard B. "Causes of Interfirm Profitability Differences: A New Interpretation of the Evidence." *Quarterly Journal of Economics* 88 (1974): 181-93.

Martin, Stephen. *Advanced Industrial Economics*, 2nd edn. Malden, MA: Blackwell, 2002.

McAfee, R. Preston and John McMillan. "Auctions and Bidding." *Journal of Economic Literature* 25 (1987): 699-738.

McChesney, Fred S. and William F. Shughart, "Delivered Pricing in Theory and Policy Practice." *Antitrust Bulletin* 52 (2007): 205-28.

Milgrom, Paul. *Putting Auction Theory to Work*. Cambridge: Cambridge University Press, 2004.

Modigliani, Franco. "New Developments on the Oligopoly front." *Journal of Political Economy* 66 (1958): 215-32.

Motta, Massimo. *Competition Policy: Theory and Practice*. New York: Cambridge University Press, 2004.

Newmark, Craig M. "Price-Concentration Studies: There You Go Again." In *Antitrust Policy Issues*, edited by Patrick Moriati, 9-42. New York: Nova Science, 2006.

Ordover, Janusz A. "Coordinated Effects." In *Issues in Competition Law and Policy*, vol. II, edited by Wayne D. Collins, 1359-83. Chicago: American Bar Association, 2008.

Panzar, John C. and James N, Rosse. "Testing for 'Monopoly' Equilibrium." *Journal of Industrial Economics* 35 (1987): 443-56.

Pepall, Lynne, Dan Richards, and George Norman. *Industrial Organization: Contemporary Theory and Empirical Applications*, 4th edn. Malden, MA: Blackwell, 2008.

Perloff, Jeffrey M., Larry S. Karp, and Amos Golan. *Estimating Market Power and Strategies*. New York: Cambridge University Press, 2007.

Pindyck, Robert S. "Governance, Issuance Restrictions, and Competition in Payment Card Networks: *U.S. v. Visa and MasterCard* (2003." In *The Antitrust Revolution: Economics, Competition, and Policy*, 5th edn., edited by John E. Kwoka, Jr., and Lawrence J. White, 507-29. New York: Oxford University Press, 2009.

Polo, Michelle and Massimo Motta, "Leniency Programs." In *Issues in Competition Law and Policy*, vol. III, edited by Wayne D. Collins, 2219-28. Chicago: American Bar Association, 2008.

Porter, Michael E. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: New York, 1980.

Porter, Robert H. and J. Douglas Zona, "Bidding, Bid Rigging, and School Milk Prices: *Ohio v. Trauth*." In *The Antitrust Revolution: Economics, Competition, and Policy*, 5th edn., edited by John E. Kwoka, Jr., and Lawrence J. White, 329-50. New York: Oxford University Press, 2009.

Posner, Richard A. *Antitrust Law: An Economic Perspective*. Chicago: University of Chicago Press, 1976.

Robinson, Joan. *The Economics of Imperfect Competition*. London: Macmillan, 1933.

Rubinfeld, Daniel L. "Quantitative Methods in Antitrust." In *Issues in Competition Law and Policy*, vol. I, edited by Wayne D. Collins, 723-42. Chicago: American Bar Association, 2008.

Rubinfeld, Daniel L. "Maintenance of Monopoly: *U.S. v. Microsoft* (2001)." In *The Antitrust Revolution: Economics, Competition, and Policy*, 5th edn., edited by John E. Kwoka, Jr., and Lawrence J. White, 530-57. New York: Oxford University Press, 2009.

Salinger, Michael A. "Tobin's q, unionization, and the Concentration-Profits Relationship." *Rand Journal of Economics* 15 (1984): 159-70.

Saving, Thomas R. "Concentration Ratios and the Degree of Monopoly." *International Economic Review* 1 (1970): 139-46.

Scherer, F.M. and David Ross. *Industrial Market Structure and Economic Performance*, 3rd edn. Boston: Houghton-Mifflin, 1990.

Schmalensee, Richard. "Inter-Industry Studies of Structure and Performance." In *Handbook of Industrial Organization*, vol. 2, edited by Richard Schmalensee and Robert D. Willig, 951-1009. Amsterdam: Elsevier, 1989.

Shapiro, Carl. "Theories of Oligopoly Behavior." In *Handbook of Industrial Organization*, vol. 1, edited by Richard Schmalensee and Robert D. Willig, 329-414. Amsterdam: Elsevier, 1989.

Smirlock, Michael, Gilligan, Thomas, and William Marshall. "Tobin's q and the Structure-Performance Relationship." *American Economic Review* 74 (1984): 1051-60.

Spagnolo, Giancarlo. “Leniency and Whistleblowers in Antitrust.” In *Handbook of Antitrust Economics*, edited by Paolo Buccirossi, 259-303. Cambridge, MA: MIT Press, 2008.

Spence, A. Michael. “Product Selection, Fixed Costs, and Monopolistic Competition." *Review of Economic Studies* 43 (1976): 217-35.

Stigler, George J. “Notes on the Theory of Duopoly.” *Journal of Political Economy* 34 (1940): 521-41.

Stigler, George J. “A Theory of Oligopoly.” *Journal of Political Economy* 72 (1964): 55-69.

Stocking, George W. and Willard F. Mueller. “The Cellophane Case and the New Competition.” *American Economic Review* 45 (1955): 29-63.

Sutton, John. *Sunk Costs and Market Structure*. Cambridge, MA: MIT Press, 1991.

Sutton, John. *Technology and Market Structure*. Cambridge MA: MIT Press, 1998.

Sylos-Labini, Paolo. *Oligopoly and Technological Progress*. Cambridge, MA: Harvard University Press, 1962.

Tobin, James. “A General Equilibrium Approach to Monetary Theory.” *Journal of Money, Credit, and Banking* 1 (1969): 15–29.

Tremblay, Victor J. and Carol H. Tremblay. *New Perspectives on Industrial Organization: Contributions from Behavioral Economics and Game Theory*. New York: Springer, 2012.

Waldman, Don E. and Elizabeth J. Jensen. *Industrial Organization: Theory and Practice*, 2nd edn. New York: Addison Wesley Longman, 2001.

Weiss, Leonard W. “Quantitative Studies of Industrial Organization.” In *Frontiers of Quantitative Economics*, edited by Michael D. Intrilligator, 362-403. Amsterdam: North-Holland, 1971.

Weiss, Leonard J., “The Concentration-Profits Relationship and Antitrust.” In *Industrial Concentration: The New Learning*, edited by Harvey J. Goldschmid, H. Michael Mann, and J. Fred Weston, 184-233. New York: Columbia University Press, 1974.

Weiss, Leonard W. *Concentration and Price*. Cambridge, MA: MIT Press, 1989.

Werden, Gregory J. “Market Delineation under the Merger Guidelines: Monopoly Cases and Alternative Approaches.” *Review of Industrial Organization* 16 (2000): 211-8.

Werden, Gregory J. “The 1982 Merger Guidelines and the Ascent of the Hypothetical Monopolist Paradigm.” *Antitrust Law Journal* 71 (2003): 253-76.

Werden, Gregory J. "Unilateral Effects of Horizontal Mergers I: Basic Concepts and Model." In *Issues in Competition Law and Policy*, vol. II, edited by Wayne D. Collins, 1319-41. Chicago: American Bar Association, 2008b.

Werden, Gregory J. and Luke M. Froeb. "Unilateral Competitive Effects of Horizontal Mergers." In *Handbook of Antitrust Economics*, edited by Paolo Buccirossi, 43-104. Cambridge, MA: MIT Press, 2008a.

Werden, Gregory J. and Luke M. Froeb. "Unilateral Effects of Horizontal Mergers II: Auctions and Bargaining." In *Issues in Competition Law and Policy*, vol. II, edited by Wayne D. Collins, 1343-57. Chicago: American Bar Association, 2008.

Whinston, Michael D. "Antitrust Policy Toward Horizontal Mergers." In *Handbook of Industrial Organization*, vol. 3, edited by Mark Armstrong and Robert H. Porter, 2369-440. Amsterdam: Elsevier, 2007.

White, Lawrence J. "The Automobile Industry." In *The Structure of American Industry*, 5th edn., edited by Walter Adams, 165-220. New York: Macmillan, 1977.

White, Lawrence J. "The Automobile Industry." In *The Structure of American Industry*, 6th edn., edited by Walter Adams, 136-90. New York: Macmillan, 1982.

White, Lawrence J. "Lysine and Price Fixing: How Long? How Severe?" *Review of Industrial Organization* 18 (2001): 23-31.

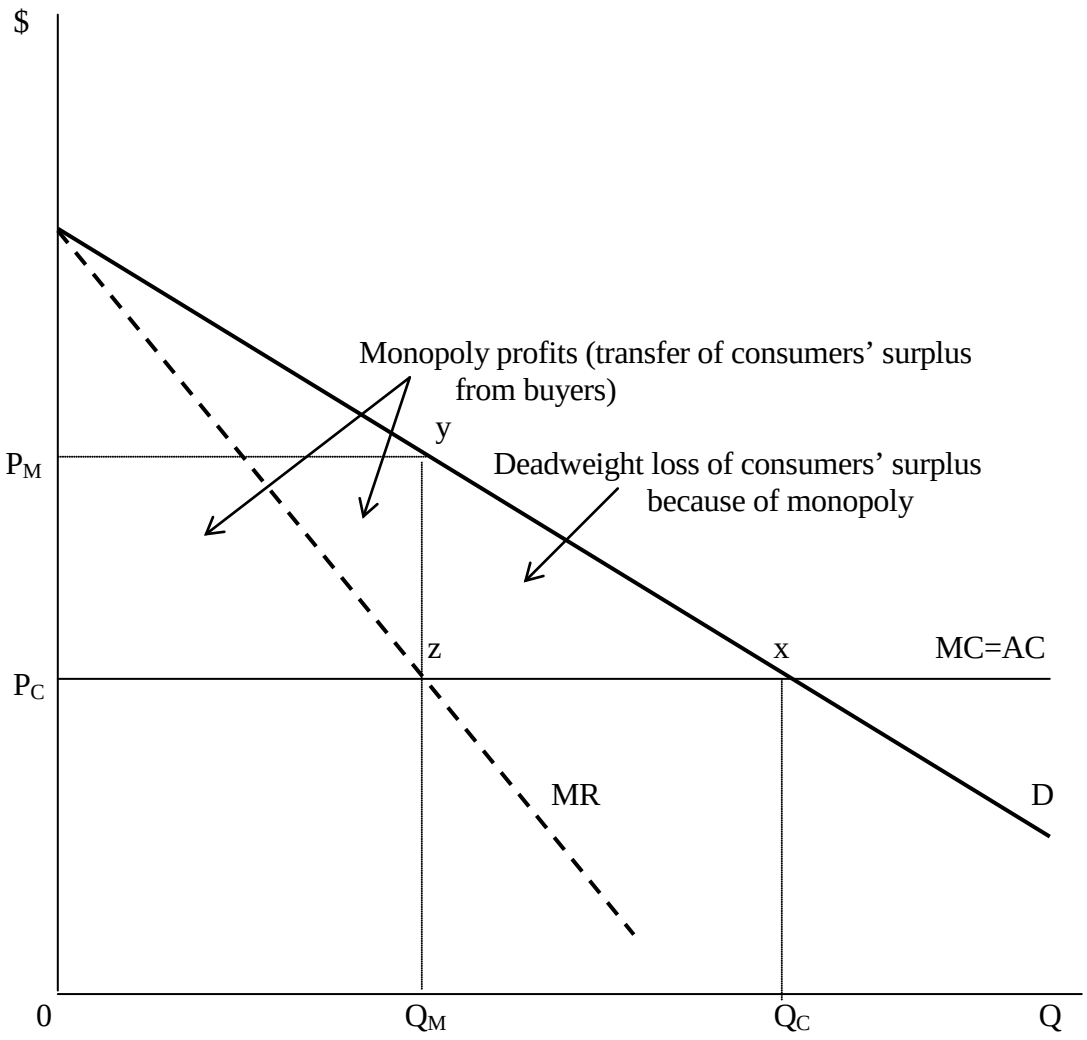
White, Lawrence J. "Market Power and Market Definition in Monopolization Cases." In *Issues in Competition Law and Policy*, vol. II, edited by Wayne D. Collins, 913-24. Chicago: American Bar Association, 2008a.

White, Lawrence J. "Horizontal Merger Antirust Enforcement: Some Historical Perspectives, Some Current Observations." In *Corporate Mergers: Modern Approaches*, edited by P.L. Jayanthi Reddy, 88-99. Hyderabad, India: Icfai University Press, 2008b.

White, Lawrence J. "Economics, Economists, and Antitrust: A Tale of Growing Influence." In *Better Living through Economics*, edited by John J. Siegfried, 226-48. Cambridge, MA: Harvard University Press, 2010a.

White, Lawrence J. "The Growing Influence of Economics and Economists on Antitrust: An Extended Discussion." *Economics, Management, and Financial Markets* 5 (2010b): 26-63.

Figure 5.1: A Comparison of Monopoly and Competition



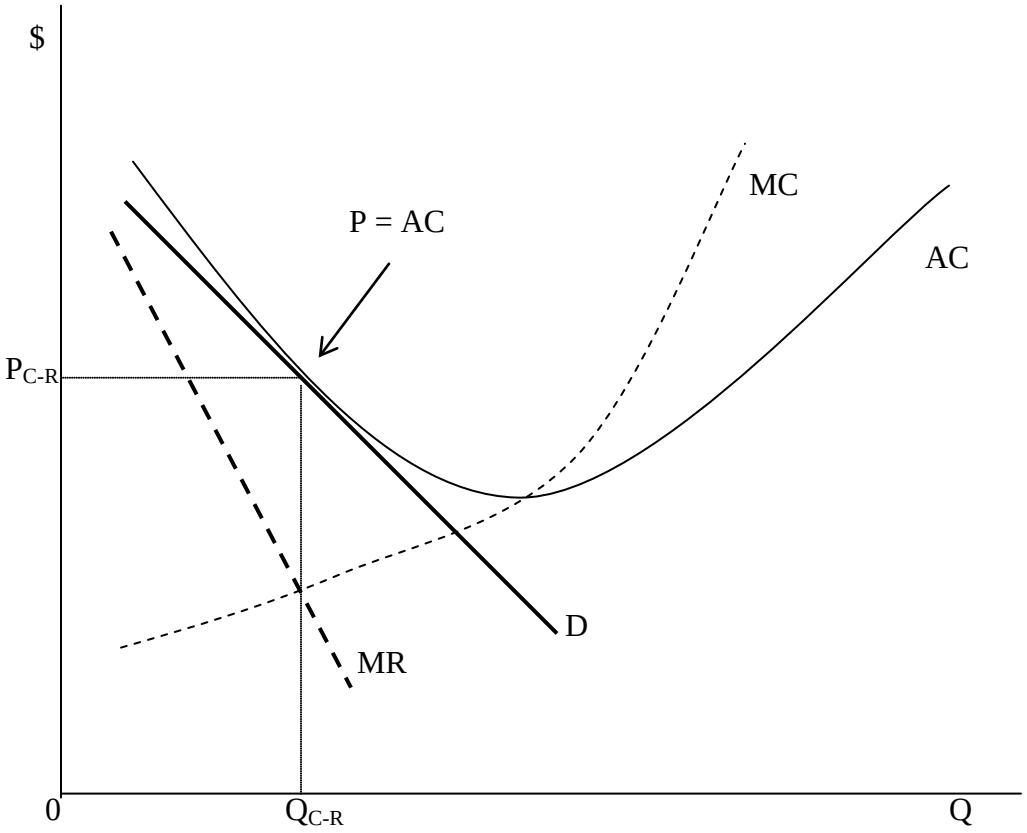
P_C: competitive price

Q_C: competitive quantity that is produced/sold

P_M: monopoly price

Q_M: monopoly quantity that is produced/sold

Figure 5.2: The "Tangency" Equilibrium for a Chamberlin-Robinson Competitor



P_{C-R}: price charged by a Chamberlin- Robinson seller

Q_{C-R}: quantity produced/sold by a Chamberlin-Robinson seller