



VOLUME 3 | NUMBER 1 | SPRING 2007

Competition Policy International

Market Definition: Use and Abuse

Dennis W. Carlton

Market Definition: Use and Abuse

Dennis W. Carlton

Market definition is a crude though sometimes useful tool for identifying market power. The ambiguity in what analysts mean by market power (price above marginal cost, or excess profits) cannot be resolved by market share. When used to analyze a merger or U.S. Sherman Act Section 2 case, it is not just the level of market shares, but also the changes in market shares that are relevant to calculate whether any increase in market power occurs. Despite this, in Section 2 cases courts often use market definition to figure out whether market power exists, a question that can be especially problematic to answer by using market definition. In Section 2 cases, the full antitrust analysis is difficult because any increase in market power typically has to be weighed against any benefits of the alleged bad act. The procedure for defining a market in a merger case or Section 2 case can be rigorously described, but the information required to implement the procedure is typically unavailable. Few analysts (or courts) follow the rigorous procedure in either merger or Section 2 cases. Instead, most markets are defined with some guidance from theory and some qualitative knowledge. Econometric studies using market definition may be helpful both in testing various definitions and in understanding the economic consequences of either the merger or the bad act.

My view is that the definition of a market and the use of market shares and changes in market shares are at best crude first steps to begin an analysis. I would use them to eliminate frivolous antitrust cases when shares are low, but would use them cautiously for anything else. Their usefulness in Section 2 cases is especially weak. Despite their limitations, when they can be used to eliminate frivolous antitrust cases, that use can contribute enormous value to society.

The author is Professor of Economics, University of Chicago, Research Associate at the National Bureau for Economic Research in Cambridge, MA, and Deputy Assistant Attorney General at the U.S. Department of Justice. He thanks Thomas Barnett, David Evans, Kenneth Heyer, James O'Connell, Richard Schmalensee, Hill Wellford, and Gregory Werden for helpful discussions. The views expressed in this paper do not necessarily represent those of the Department of Justice.

I. Introduction

Market definition and the market shares based on it continue to be a central focus of many antitrust cases. This is so despite the well understood limitations of such a methodology in providing an accurate guide to the competitiveness of an industry. The simplicity of the methodology is both its strength and weakness. Its strength is that it is easy to understand and seems intuitively correct—high market shares indicate that competition is weak, while low ones indicate the reverse. The weakness of the methodology is its failure to identify when high market shares may in fact not convey accurate information about an industry’s competitiveness, or conversely when low market shares can mask a lack of competition. Although some may call for the elimination of the methodology as an analytic tool because of its limitations, its great strength is that it may prevent decisionmakers from making egregious errors. I think its best use is to provide safe harbors so that firms in relatively competitive industries are not harassed with senseless antitrust suits and, if they are, such suits can be dispensed with at summary judgment.

A “market” can be rigorously and precisely defined quantitatively, but the information to do so is typically not available. Instead, markets are often defined based on qualitative information, leading to the possibility of errors. I make some practical suggestions to mitigate such errors. When markets are correctly defined, it is the change in market shares that is central to the antitrust analysis, though this is not how courts typically use market definition and shares to analyze cases that are brought under Section 2 of the U.S. Sherman Act (Section 2 cases). Unfortunately, there is only a weak link between change in market share and change in competitive performance, and that is why market definition and the use of market shares are very crude tools of analysis. That is why their best use is as safe harbors to quickly screen out frivolous cases from those where the economic forces governing industry behavior need to be carefully studied. But, I explain why even this use of market definition and market shares can be problematic in Section 2 cases.

Although market definition, together with the calculation of market shares, is a crude methodology, if it is to be used, there are certain logical principles that one should follow. Otherwise, this methodology will become even cruder or, worse yet, misleading. Once one has defined a market, one must understand why market shares are a very imprecise way of characterizing competition and are, at most, the beginning point for an analysis, not the endpoint. The government agencies responsible for antitrust, the U.S. Federal Trade Commission (FTC) and U.S. Department of Justice (DOJ), recognize this limitation—it is explicit in the *Horizontal Merger Guidelines*, for example—but courts often have less experience in antitrust matters and that can create problems with the use of market shares.¹

1 See U.S. Dep’t of Justice & Federal Trade Comm’n, *Horizontal Merger Guidelines* (1992, revised 1997) available at <http://www.ftc.gov/bc/docs/horizmer.htm>.

This paper is organized as follows. Section II explains the purpose of market definition, namely the identification of “market power”, a term whose meaning is often ambiguous. The section explains that it is the change, not the level, of market power that is relevant in most antitrust cases. Despite this, most single-firm conduct (hereinafter Section 2) cases focus on the level of market power, a calculation for which market definition surprisingly turns out to be particularly problematic.² Section III explains how economic theory combined with applicable assumptions tells us precisely what we want to know about the economic effect of mergers, cartels and various types of Section 2 behavior. Using Section III as a framework, Section IV explains the economic principles underlying market definition and market share analysis, emphasizing the sometimes extreme information requirements one must have to define markets, or lacking that information the arbitrariness of market definition. This analysis naturally leads to a discussion of the limitations of market definition and market shares as tools to use to arrive at the correct answer. It pays special attention to feasibility of implementation, and discusses merger and Section 2 cases separately. Section V explains how market definition can be a useful research tool, while Section VI discusses some common mistakes made in applying market definition. Section VII describes how one would apply market definition in two complicated settings: one where research and development (R&D) is central and the other where goods are interrelated as complements, such as in two-sided markets where different market participants exert strong effects on each other. Section VIII concludes with a discussion of how the best use of market definition and market shares is as a safe harbor.

II. What Is the Purpose of Market Definition?

This section makes four points. First, it answers what the goal of market definition is, namely to measure market power. Second, it explains an ambiguity in the definition of market power. Third, it explains why it is the change in market power, not the level of market power, that is relevant to most antitrust analyses. Finally, it explains the limitations of using predicted changes in market shares to estimate the change in market power.

Markets are defined so that when one calculates the share that a firm (or group of firms) comprises, one can assess whether that firm has significant market power. Roughly speaking, “market power” means that the industry’s behavior deviates from perfect competition. One standard definition of market power is the ability to set price profitably above the competitive level, which is usually taken to mean marginal cost. For this definition to make sense there must be a possibility that competition could establish the competitive level. Let’s suppose that is so—for example, consider an industry where there are constant returns to

2 Some of what I label single-firm conduct cases (e.g., tying, vertical restraints) are covered by Section 1 of the Sherman Act. I mean to include those cases when I refer to Section 2 cases.

scale (it costs C to produce each unit) and many firms. We can contrast price in that industry to an industry with only one (or a few firms) and ask whether the price in the latter case is above the competitive price, C . If it is, we can then ask whether the deviation is big enough to be considered a significant enough deviation from the competitive level to justify an antitrust concern that could trigger an antitrust intervention as, for example, when the market power is created by merger or some other action. Of course, any such intervention carries the risk that the decision will be in error and will do more harm than good.

As far as I know, there are no judicial standards to determine how large a deviation of price from C constitutes significant. The consequence of declaring a specific deviation level as “significant” is that antitrust decisions based on market shares will be made and therefore a decision theoretic framework in which one trades off the expected costs of type I and type II errors is the only one capable of answering the question of what constitutes a significant level. I have never seen any quantitative attempt to use such a framework to answer the question of how large a deviation of price from C should be considered significant. Furthermore, there is a time dimension that must also be analyzed. For how long should a price elevated above marginal cost persist before we attach the label significant? Answers to these questions can be specified based not on any such quantitative assessment but based on what seems reasonable. So, for example, Areeda and Turner suggest using a 5 percent threshold in a discussion about what might constitute a significant price increase.³

Before readily accepting this 5 percent threshold, I note that numerous attempts to measure the gap between price and marginal cost estimate gaps in excess of 5 percent for industries that many would consider to be relatively competitive in that there is free entry and several firms. Roughly speaking, a monopolist facing a demand elasticity of 20 would price at about 5 percent above constant marginal cost, but many (most?) firms face much lower elasticities. Perhaps, in light of this, 5 percent may be okay to use to determine whether the change in market power is significant but a higher number may be appropriate to determine whether the level of market power is significant.⁴

3 PHILIP E. AREEDA & DONALD F. TURNER, 2 ANTITRUST LAW 347 (vol. 2, 1978). Notice that if one uses a 5 percent price deviation (or any specified percent) as a criterion for significant deviation, then there can be a logical problem. Consider the following. Firm A and Firm B merge in New York City causing prices to rise there from \$100 to \$105, or a five percent increase. The product is also shipped for \$100 to Chicago and therefore, the Chicago price rises from \$200 to \$205, a two and a half percent price increase. Is it sensible to say that a New York City consumer has suffered a significant loss, but not the Chicago one, if each consumes one unit of the product? The problem arises because a percent criterion does not measure the deadweight loss to society, nor does it measure the harm to consumers.

4 Marginal cost can be difficult to estimate. If one approximates it as average variable cost, then one may erroneously measure that there is a gap between price and marginal cost when there is none as, for example, when price equals marginal and average cost and the marginal cost is upward sloping. In this situation, average variable cost underestimates marginal cost. Similarly, economic profit, which requires the calculation of a competitive rate of return, can be difficult to estimate.

Suppose that unlike the previous example in which a competitive price could be defined, the industry is one in which there cannot be an equilibrium where price equals marginal cost. A good example is an industry in which there is a fixed cost of entry and then Cournot competition. Suppose further that there is free entry. The free entry condition guarantees that (economic) profits are zero (i.e., a competitive rate of return is earned on capital), but price will exceed C , marginal cost. There is often confusion between pricing at marginal cost and earning zero profits. In most industries, there is a deviation from perfect competition in that price exceeds marginal cost, yet free entry can still guarantee zero (expected) economic profit. Suppose profits are zero yet price exceeds marginal cost. Should we attach the label “market power” to describe this circumstance, or should we reserve that label for the case in which price exceeds marginal cost and profits are positive? Alternatively, as my textbook suggests, should we label the first situation as “market power” and the second as “monopoly power”?⁵ Courts and analysts often fail to specify what definition they are using.

The fact that typically it is difficult to calculate either marginal cost or economic profits foreshadows that the direct determination of the level of market

THE FACT THAT TYPICALLY IT IS DIFFICULT TO CALCULATE EITHER MARGINAL COST OR ECONOMIC PROFITS FORESHADOWS THAT THE DIRECT DETERMINATION OF THE LEVEL OF MARKET POWER IS GOING TO BE HARD NO MATTER WHAT DEFINITION IS USED.

power is going to be hard no matter what definition is used. That is one reason why analysts use market share as a proxy for market power, but, as we will soon see, it may be no easier to define markets to calculate market share than it is to measure market power directly.

Although we have been discussing the level of market power, it is the change in market power (which includes any changes in future market power or, alternatively stated, in the durability of market power) that is (or should be) the focal point of most antitrust analysis. (This is not quite right. It is the change in welfare that should be the ultimate focus. But changes in market power can be informative about changes in welfare.) In a merger setting⁶, it is a comparison between the market power in two different industry structures that one must analyze in order to predict whether price will rise post-merger. For example, all else equal, is a market where there are five firms with shares 15, 15, 20, 25, 25 significantly less competitive than a market in which the first two firms merge so that there are only four firms with shares 30, 20, 25 and 25? This strikes me as a well-posed question. Notice that the pre-merger level of market power is irrelevant for answering the question. It is only the change in market power that matters. One can answer a question about the change even though

5 DENNIS W. CARLTON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 93 (4th ed. 2005).

6 Cartels and mergers involve similar considerations. For simplicity, I focus on mergers throughout the paper.

one does not know the initial level. Indeed, one can see why a market power definition based on price (P) in excess of marginal cost is particularly convenient to use here. Let P_2 be the post-merger price and P_1 be the pre-merger price. The change in market power equals $(P_2 - C)$ minus $(P_1 - C)$ or $P_2 - P_1$. As long as C is unchanged as a result of the merger, the change in market power is measured as the change in prices. Notice how this approach focuses on the change in price (in the absence of other changes). To the extent that the merger creates efficiencies, so that the marginal cost of the merging parties will fall, this will make an analysis that focuses only on price in a hypothetical where costs do not change a conservative one in the sense that if a merger does not significantly raise price under the assumption of unchanged costs, one would reach the same conclusion if one took further account of any cost efficiencies.⁷

Consider now a Section 2 case in which the issue is whether some alleged bad act (e.g., exclusive dealing) harmed competition. How should one measure whether there is significant market power? Should one measure it before or after the alleged bad act? Following the same logic as in the merger case, one should focus on the change in market power as a result of the alleged bad act and ask how much market power exists absent the alleged bad act and compare it to the market power that exists with the alleged bad act, keeping all else constant. The conceptual difficulty is that the alleged bad act may have some efficiency justification, but price must typically rise in order to create the incentives to generate the efficiency. Indeed, an increase in market power may be desirable if it enables the firm to provide a higher quality product.⁸

For example, exclusive territories can provide incentives for firms to engage in the provision of services by giving them the ability to raise price as a result of the elimination of competition. Therefore, the product characteristics (including service) are not being held constant when one compares the price with and without the alleged bad act. This means that even if the alleged bad act is desirable in that it creates incentives for the provision of valued services to at least some consumers, and even if there are perfect substitutes to the product both with and without services, the analyst who looks at only price will mistakenly conclude that market power is created even though none is. The analyst concludes this

7 Suppose price rose but quality improved. Although the next section shows how to handle this case precisely, for purposes here one should focus on the quality-adjusted price. Suppose price falls, but not as much as marginal cost. Consumers and society gain, so there should be no antitrust concern even though market power has increased. Suppose price rose, but some costs (e.g., fixed costs) fell. Then one would have to do a more complicated analysis to determine whether total welfare rose if one believes that total welfare, not just consumer surplus, should be the proper objective of antitrust. These examples illustrate that it is the change in welfare, not market power, which is the ultimate focus of analysis. See DENNIS W. CARLTON, DOES ANTITRUST NEED TO BE MODERNIZED? (Economic Analysis Group, Discussion Paper No. 07-3, 2007) and Ken Heyer, *Welfare Standards and Merger Analysis: Why Not the Best?*, 2(2) COMPETITION POL'Y INT'L 29 (2006).

8 I use the term "product quality" broadly to include not just the physical characteristic of the product, but also the way it is sold.

because the analyst observes a lower price in the absence of the alleged bad act and, therefore, incorrectly reasons that the bad act created additional market power. This is why Section 2 cases can be much more complicated than a typical merger case. One expects a price increase as a result of the alleged bad act if the alleged bad act harms competition, but one could also expect a price increase even when the alleged bad act does not harm competition but improves product quality. Therefore, looking only at the behavior of price before and after the alleged bad act does not answer whether the bad act really is harmful. One must dig further and examine, for example, in the case of exclusive distribution, whether some consumers are served better and whether rival manufacturers can still obtain efficient distribution. It is typically hard to trade off the benefit to some consumers from the improved service against the harm to others as a result of the elevated price. Moreover, especially when the services have been provided for many years, it would be wrong to postulate that a reduction in price from elimination of the special services associated with exclusive territories will not harm consumers. For the short term, that may be so, but eventually as the failure to educate consumers mounts over time, the long-run impact on demand could be substantial.

Despite the logic of looking at the change in market power, courts in Section 2 cases often inquire about only the level of market power. In doing so, they are trying to create a safe harbor and shortcut the need to investigate whether market power increased and harmed competition. I discuss this point more fully in Section IV.

Because it is change in market power that is (or should be) the focus of an antitrust analysis, when one is using market shares as a proxy for market power one must focus on the change in shares that results from some particular antitrust decision. But it may be hard to predict the change in share. For example, if Firm A merges with Firm B, the industry will be more concentrated as a result and the analysis measures how that concentration changes as a result of the merger. The concentration measure is based on the pre-merger market shares of the individual firms as in, for example, the Herfindahl-Hirschman Index (HHI) index of concentration, which equals the sum of the squared market shares of firms. So, if there are five firms, each with a market share of 20, and two merge so that the new firm has a share of 40, the HHI rises from 2000 to 2800. We then ask whether that increase warrants concern that price might rise.⁹ Notice that I have assumed that the post-merger share of the merged firm equals the sum of the pre-merger shares. That may be so the day after the merger, but need not remain so in the new equilibrium post-merger. When it is not so, then this method will be inaccurate as a guide to predicting how price will change based on how industry

9 In answering that question, the linkage between a change in HHI and a change in price could also depend on the level of HHI.

concentration (which depends on market shares) will change.¹⁰ And, of course, this analysis presumes that a change in concentration will cause a change in price, a relationship that may not be true. Similarly, in a Section 2 context, one should be interested in answering how the alleged bad act alters the market share of the firm engaged in the action. If there are not observations on market share both before and after the alleged bad act began, this calculation could be a source of difficulty.

III. Getting It Exactly Right

As a theoretical matter, if one knows the structure of demand for a product and all its substitutes, knows the cost curves of firms that currently produce (or could produce) the product, and knows the game that describes the competitive environment (e.g., static Cournot, static Bertrand, dynamic trigger strategies), then one can write down a model whose equilibrium reflects the outcome of all these economic forces. This is of course a tall order, but it is critical to know what one would want to measure before turning to proxies, such as market share.

Consider the case in which a merger is to occur. Suppose that Firm A is a dominant firm facing a competitive fringe with supply curve $S^*(p)$. Firm A wishes to merge with a large segment of the competitive fringe so that after merger the competitive fringe will have supply of only $S^{**}(p)$ where $S^{**} < S^*$ for all p . If industry demand is $D(p)$, then the demand pre-merger facing the dominant firm is $D(p) - S^*(p)$ and the profit maximization yields that the pre-merger price p^* is determined by:

$$\frac{p^* - mc}{p^*} = \frac{-1}{E^*}, \quad (1)$$

where mc = marginal cost of Firm A, E^* = elasticity of demand facing Firm A which equals

$$\frac{1}{s} E^D - E^S \left(\frac{1-s}{s} \right),$$

where E^D = demand elasticity of $D(p)$, E^S = supply elasticity of $S(p)$, and s = share of sales of Firm A.

Landes and Posner use Equation (1) to develop insights about how to define markets in their seminal 1981 paper.¹¹ It is of course easy to see that the deviation of price from marginal cost depends not only on share s (in the way intuition sug-

10 This method can be adapted as long as one can use pre-merger shares to predict post-merger shares. I show how this can be done in the next section.

11 William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937 (1981).

gests: the firm has more market power when s is larger), but also on E^D and E^S , elasticity concepts that depend on how demand or supply changes as price changes. A share will not necessarily reflect either of these elasticities accurately.

If Firm A merges, then the exact calculation of how price changes is the difference between the pre-merger price p^* and the post-merger price p^{**} which is calculated exactly as in Equation (1) but with $S^{**}(p)$ replacing $S^*(p)$. We see that p^{**} will depend on not just how the merger affects the shares of the dominant firm but also on supply and demand elasticities. We could enhance the model and recognize that the merger could lower Firm A's marginal cost, and that could easily be reflected in the calculation of p^{**} .

We can expand the analysis to include market structures other than a homogeneous product with a dominant firm and competitive fringe. Suppose, for example, that each firm i faces demand $d_i(p_1, p_2, \dots, p_n)$ where $i = 1, 2, \dots, n$ is a listing of all products. If we know each firm's costs, and know the competitive game (e.g., Bertrand), we can solve for equilibrium prices pre-merger and post-merger. One does not necessarily need to know the cost curves if one is willing to specify the game. For example, if the game is Bertrand, then one can use profit maximization to derive an equation like (1), and calculate mc from p and the elasticity. This is a now standard type of merger simulation used to estimate so-called "unilateral" effects.

There is no reason to limit these simulations to cases where Bertrand is the competitive game, where the competitive game remains unchanged pre- and post-merger, where product quality is unchanged, or to static situations. If one allows for dynamic (repeated) games, one can address what the *Merger Guidelines* call "coordinated effects". All of these complications are difficult to implement,

THESE MODELS SHOW EXACTLY WHY IN THE CASE OF MERGER, MARKET SHARES OR CHANGES IN THEM, HOWEVER MEASURED, CANNOT POSSIBLY BE ANYTHING BUT A CRUDE GUIDE TO MARKET POWER OR ITS CHANGE, OR TO THE CHANGE IN PRICE RESULTING FROM A MERGER.

but at least theoretically, these models allow the analyst to focus on what are the underlying forces that matter in influencing how the price will change as a result of the merger. These models show exactly why in the case of merger, market shares or changes in them, however measured, cannot possibly be anything but a crude guide to market power or its change, or to the change in price resulting from a merger.

Now consider Section 2 cases. In Section 2 cases, again the theoretically correct model can be described, though it may be difficult to implement in practice. Let a be the alleged bad acts(s) and let a^* be the act(s) that would occur if a were not allowed. Then, the analyst needs to compare $p(a)$ to $p(a^*)$ where p is the vector of all prices of the relevant products and a and a^* are actions that influence demand (e.g., selling effort) and costs. (The acts could also influence the types of competitive game.) A full analysis of the competitive

consequences of act a as compared to act a^* requires an analysis of not just prices, but also how the different acts affect the quality of the product to (some) consumers. For example, if a represents vertical restrictions designed to increase sales information to the consumer, then the demand curve for a firm will be affected by whether a or a^* occurs. Similarly, the supply capabilities of the firm and its rivals could depend on the firm's actions. Taking these effects into account one can then calculate, at least theoretically, whether banning a and replacing it with a^* leads to an increase in welfare.¹²

Let me summarize this section. Although perhaps difficult to implement empirically, theoretical models produce clear results about how to calculate the effect of mergers or alleged bad acts under Section 2 on prices and consumer plus producer welfare. I do not mean to suggest that the assumptions underlying the models are not contentious, or that these models can easily be implemented.¹³ I do mean that theory tells us how price and welfare will be determined and therefore theory tells us how to calculate the effect of either mergers or Section 2 behavior.

There is no model that I am aware of where market share (or more precisely its change) is the only variable that matters in predicting the change in either price or welfare. Moreover, it is clear from most models, especially those involving differentiated products, that there is no theoretical need even to define a market to get to the correct answer. At best, market definition and market shares can be used as a shortcut to start the analysis, especially when the correct analysis is hard to do.

12 Even if in the context of a particular case one could show that an act caused a decline in welfare, it could still be incorrect to create antitrust liability for the act. The goal of antitrust law should be to create a decision process that leads to maximization of expected welfare. Since the legal process consumes resources and since courts (and economists) can be wrong, it is sensible to create safe harbors for certain types of conduct, even if an economist can show that it is possible that the conduct could under certain circumstances harm welfare. For example, even though it is well-known that above-cost pricing can theoretically harm competition by driving inefficient rivals out of business, there is a safe harbor for such behavior. Even though it is well-known that the choice of product variety or advertising can theoretically fail to maximize welfare, the choice of product quality or advertising typically does not subject a firm to antitrust inquiry. Such behavior falling within safe harbors is sometimes called "competition on the merits". Choosing the appropriate safe harbors is an exercise that should depend on the frequency with which a practice is used in ways that harm society compared to its frequency of use in ways that benefit society, the ability of courts to identify the two uses, the harms from incorrect identifications, and the benefits from correct identifications. As experience with the effect of an act accumulates, the safe harbors should be adjusted. The calculation described in the text of the net effect of an act on social welfare should be done only for those acts that fall outside safe harbors. (A logic similar to that for creation of safe harbors applies to the creation of per se violations.)

13 For a critique of how these models have been used, see Dennis W. Carlton, *The Relevance for Antitrust Policy of Theoretical and Empirical Advances in Industrial Organization*, 12 *Geo. Mason L. Rev.* 47 (2003) and Dennis W. Carlton, *Using Economics to Improve Antitrust Policy*, 2004(2) *Colum. Bus. L. Rev.* 283 (2004).

Merger cases are typically much easier to analyze than Section 2 cases. Merger cases will usually be handled by answering whether price will rise as a result of the merger. Section 2 cases will usually be handled by asking whether the price increase is offset by some beneficial product change. A focus on the level of market power (rather than its change) can allow a court to provide a safe harbor for either merger or Section 2 behavior if the level of market power after the merger or alleged bad act is low. Courts often use market share to decide that market power is low and we now turn to an examination of whether they can do that in a rigorous way.

IV. Market Definition

We have seen that the theoretically correct analysis may be difficult to implement empirically. In such cases, it is reasonable to resort to a simpler analysis as a first step and that is exactly what market definition and the use of market shares is designed to do. I will discuss merger cases separately from Section 2 cases because, as I have already explained, merger cases are logically easier to analyze.

A. MARKET DEFINITION IN MERGER CASES

1. Mergers: Theory of Market Definition

In a merger case, one uses market shares to calculate industry concentration so as to determine the level of industry concentration and the change in industry concentration as a result of the merger. The implicit assumption is that increases in industry concentration lead to increases in price. (The effect of any particular change in concentration could depend on the level of concentration.) A typical starting assumption is that the post-merger share of the merged firm equals the sum of the pre-merger shares of the merging firms. This of course may not be so as, for example, when entry is easy. In such a case, the use of pre-merger market shares in this way may be inappropriate. But let's suppose that we are in an industry where post-merger the share of the merged firm is well predicted by the sum of the pre-merger shares of the merging firms, so that the use of pre-merger market shares is sensible. There are two virtually equivalent ways to define markets.

One is to rely on demand substitution to identify products and the geographic areas where they are sold and then separately to consider as market participants all those who would supply the product at the current price plus, say 5 percent. This is roughly the approach of the *Merger Guidelines*. A second and virtually equivalent approach is to combine this procedure into one step and define the market to include all those products and areas that constrain prices of the product under analysis from either the demand or supply side. Product A is a demand substitute for Product B if a price increase in B causes consumers to substitute to A. Product A is a supply substitute for Product B, if a price increase in B causes firms that produce A to shift their capacity to the production of B.

To see the difference between the two alternative ways of defining a market, consider the following example. There are two products golf clubs for right-handed golfers (right-handed golf clubs) and golf clubs for left-handed golfers (left-handed golf clubs). Consumers do not substitute between them, so there is no substitution on the demand side. For simplicity, assume that initially firms make either right-handed or left-handed golf clubs. A monopolist of right-handed golf clubs could profitably raise price by 5 percent above current levels as a result of a merger of all current and potential producers of right-handed golf clubs. Firm A makes left-handed golf-clubs, but could and would switch to producing right-handed golf clubs if the price of right-handed golf clubs rose by 5 percent, holding constant the price of left-handed golf clubs, so there is supply substitution. Under the *Merger Guidelines*' approach, the market is right-handed golf clubs, but when calculating shares, one considers all those right-handed golf clubs that would be produced by Firm A and other firms if only right-handed golf club prices rose 5 percent.¹⁴ Under the second approach, the market would consist of right-handed golf clubs plus left-handed golf clubs (somehow appropriately weighted, perhaps by value), and shares would be calculated accordingly. I will follow the first approach, but recognize that the second approach can also be a sensible way to proceed. Since market shares are only crude proxies for market power, these roughly equivalent approaches for calculating shares should not differ and, if they do, one should delve deeper into the underlying economics.¹⁵

The *Merger Guidelines* recognize the need to define a time dimension, a magnitude of increase, and a benchmark price to approach the question of whether a merger raises an antitrust concern by increasing market power. For example, one could ask whether, after the merger, prices could be profitably increased above current levels¹⁶ by a significant amount (e.g., 5 percent) for a significant time (e.g., 2 years). The *Guidelines* define a market to be consistent with this

14 Typically, one uses the likely capacity of the firm to produce a product as a measure of its market participation. Needless to say, capacity can be hard to measure or even define. As a technical matter, this artifice of holding constant all prices of products outside the market need not be a correct description of what would happen if the price of the product under analysis rose. For example, in the example in the text, the price of left-handed golf clubs could rise as left-handed golf club producers start producing right-handed golf clubs, causing less switching to right-handed golf clubs than in the text. This strikes me as one of many details that should not matter to the analysis and if they do, the analyst must think hard about the underlying economics using the theory of the previous section.

15 Proxies obviously can lead to erroneous conclusions under certain hypotheticals. I am not saying that these two approaches always yield the same result, but if they don't one should reexamine the underlying economics to make sure it is not a peculiarity of the proxy that is generating a strange result. See Jonathan B. Baker, *Market Definition: An Analytical Overview* (Nov. 2006) (mimeo, Am. Univ. Wash. Coll. of Law), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=854025.

16 The *Merger Guidelines* use the expected future price (absent merger) if that can be predicted to be different from the current price. They also indicate they may use the competitive price if the current price exceeds it. The logic for the latter approach presumably is that the competitiveness of the industry is expected to increase in the future.

phrasing of the issue. A market is defined by thinking about a hypothetical monopolist. A monopolist of all of the products in a market would raise price profitably above current levels by, say 5 percent, for some time, say two years, on the assumption that the prices of all the products excluded from the market remain unchanged. In this thought experiment of using a hypothetical monopolist, there is not necessarily a unique set of products that determines the market, nor is there an unambiguous methodology of how to raise the price of each product in the market (should each go up by 5 percent or just on average rise by 5 percent?).¹⁷ These strike me as details that again, if they matter, would cause me to pause about the usefulness of the proxy of market shares and to delve more deeply into the underlying economics as described in the previous section.

Aside from determining which products belong in the market, one must determine the geographic scope of the market. I would handle this in the same ways as product market definition is handled: by treating location as a product characteristic and asking the same type of questions as one does for inclusion of a product in the market. For example, apples in Chicago are in the same market as apples in Milwaukee, if an increase in the price of apples in Chicago would induce buyers to switch to buying apples in Milwaukee in such quantities as to defeat a price increase. Suppose no buyer would literally go to Milwaukee to buy these apples, but instead that DC Transport would pick them up and bring them to sell in Chicago. Technically, DC Transport has become a market participant in the market for apples in Chicago. Alternatively stated, there is supply substitution between apples in Milwaukee and those in Chicago. I would treat these two cases—one involving the buyer traveling, the other involving DC Transport traveling—in the same way. One could define the market to be apples in Milwaukee and Chicago, or one could define it using the other approach, in which the market is only Chicago, but DC Transport is a participant in that market. Again, this seems like a detail.¹⁸ If it matters, one should delve more deeply into the underlying economics.

2. Mergers: Practical Implementation of Market Definition

The theory underlying market definition for mergers is logically coherent. A separate issue is whether it is able to be implemented. It is possible to describe an

17 One could add the condition, as the *Merger Guidelines* do, that one use the smallest market and when it is necessary to add products to the candidate market one adds products to the market sequentially with the closest substitute product to the candidate market being added. Regarding which price to focus on, one could focus on the price of the products of the firms involved in the transaction when asking whether price will rise and one could assume that the hypothetical monopolist sets the price of each product in the market optimally. I return to these points in the next section.

18 The *Merger Guidelines* define the geographic area based on the location of production, not consumption. Although this initially may seem odd, it really is not. Because there is an assumption of no geographic price discrimination in this part of the *Guidelines*, they come to the same result as I do above. Notice that the prices in Chicago and Milwaukee become linked in my example.

econometric procedure to define markets.¹⁹ For any set of products (a_1, a_2, \dots, a_n), estimate econometrically a demand system in which the demand for product a_i depends on its own price and that of all other products. Suppose that Product 1 is the product under analysis, such as when two producers of Product 1 want to merge, and that we have ordered the products so that Product 2 is the closest substitute for (Product 1) and so on.²⁰ Now, assuming costs are known, calculate the price that a monopolist of just a_1 would charge. If that price exceeds the current average price for a_1 by, say, 5 percent, stop. If not, add a_2 , and calculate the optimal prices for a_1 and a_2 . If (by some measure) the average price of a_1 and a_2 rises above current levels by, say, a 5 percent, stop. If not, continue. In this way, a market can be defined.

This econometric approach requires a tremendous amount of information about a demand system, information that is typically not available. Moreover, if it were available it seems odd to use it only in this way. The reason is that with such a detailed demand system available, it might well make sense to calculate directly the effect of the proposed merger. This can be done by a merger simulation, as described in the previous section, where one uses the demand system combined with various assumptions of the competitive game (e.g., Cournot or Bertrand) and perhaps cost, to predict what the new pricing will be if there is a merger.²¹ This direct approach requires no market definition, but utilizes all the same information required to define a market. It is a much more refined way of making predictions on pricing than one based solely on market share. Indeed, this methodology can also account for the fact that products outside the market can affect the price under analysis and the prices of those products may themselves change in response to the merger, in contrast to the procedures for market definition under the *Merger Guidelines*.²² Market definition, with its dichotomous “in” or “out” classification (is a product in or out of the market?), is a crude simplification; a merger simulation can be a more accurate approach that automatically takes account of demand and supply substitutability.

19 See, e.g., GREGORY J. WERDEN, MARKET DELINEATION ALGORITHMS BASED ON THE HYPOTHETICAL MONOPOLIST PARADIGM (Economic Analysis Group, Discussion Paper No. 02-8, 2002), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=327282.

20 It is a bit tricky to define exactly what one means by closest substitute to a_1 . One could say it is the product a_2 such that the joint pricing of a_1 and a_2 allows the price of a_1 to be the highest. When the market consists of more than one product, it is less clear what a unique sensible definition is and differences in this definition can lead to differences in the products included in the market. Moreover, the procedure of adding the closest substitute does not necessarily lead to the smallest market in which a hypothetical monopolist would raise the price of a_1 by 5 percent. Again, these strike me as details that if they mattered to the analysis then one should examine more deeply the underlying economics.

21 As discussed in the previous section, one could at least theoretically assume a repeated game (and so deal with a coordinated effects analysis). Although possible in theory, such simulations are not commonly used in antitrust matters, unlike merger simulations based on static games (e.g., Bertrand).

22 The *Merger Guidelines* would look at price changes in other products, entry responses, and other supply responses, but after the market is defined.

The drawback of merger simulation is that it requires not only extensive demand estimation, but also assumptions about how firms will compete. Even if one has information on the former, many are uncomfortable about assumptions on the latter.²³

There are really two responses to this reluctance to use merger simulation. The merger simulation, when done under different assumptions, is really a way of revealing to the analyst the constraints on pricing that the demand system imposes and makes transparent all the underlying assumptions. The different merger simulations allow the analyst to see whether these constraints hold under a variety of assumptions. Second, if instead of doing a merger simulation, one defines a market and uses pre-merger market shares to calculate the change in the HHI, one is assuming that these market shares allow one to predict the price effect of a merger. That is, the price is assumed post-merger to depend on (pre-merger) market shares in a simple way (e.g., price is assumed to depend on just the HHI). There is no such model that I am aware of that has this property. There are models in which price depends on current concentration and other things such as elasticities, but not only are those models premised on assumptions that may not be relevant to the industry under analysis, worse yet, in such models there may not be a profit incentive to merge.²⁴ This is all a very long way of saying that the use of changes in market shares to calculate the change in the HHI is a very crude methodology for predicting whether a merger will increase price. The use of market shares is at best viewed as a crude merger simulation, but lacks the logical consistency underlying merger simulation. Its main attractiveness is its simplicity.

But there is a further problem. I had assumed that a detailed econometric demand system together with knowledge of costs was available. When it is not, then it is not possible to delineate a market with the precision that its definition demands.²⁵ Instead, one attempts to use various types of evidence to do one's best to see whether the price constraining effect of one product on another will be sufficient to prevent a significant price rise. Although the clear theoretical construct of market definition can guide one, the absence of estimates of the demand (or cost) system subject this exercise to possible error and arbitrary judgments.

23 See Carlton (2003, 2004), *supra* note 12.

24 For example, in a Cournot model with constant returns to scale, one can show that $(P - C)/P = HHI/E$ where P is price, C is cost, E is the absolute value of the industry demand elasticity, and HHI is the sum of squared market shares. See Stephen W. Salant et al., *Losses from Horizontal Merger: the Effects of an Exogenous Chance in Industry Structure on Cournot Nash Equilibrium*, 98 Q. J. ECON. 185 (1983), and Joseph Farrell & Carl Shapiro, *Horizontal Mergers: An Equilibrium Analysis*, 80 AM. ECON. REV. 107 (1990).

25 To define a market using the hypothetical monopolist test, one must specify marginal cost. To do a merger simulation, one could also use cost information, or alternatively infer cost from the profit-maximizing conditions that emerge from equilibrium of the assumed competitive game.

These errors can be mitigated by some of the types of econometric studies that I describe in the next section.

One alternative path to market definition in the absence of detailed econometric estimates of a demand system is simply to ask consumers to which products they would turn if price of the product under analysis rose by, say, 5 percent. Notice that this set of products does not satisfy the market definition under the *Merger Guidelines* because it may include products that attract so few switches that those products would not prevent a price increase. Therefore, although this method is simple, markets defined in this way will tend to be overbroad unless one includes only those products for which there is significant substitution (how much is significant?—well if I define it precisely then I am back to an approach like that of the *Guidelines*). However, consumer responses as to their switching possibilities can give one a rough estimate of demand price elasticities and cross elasticities, and those can assist in defining a market.²⁶

I have not discussed critical loss analysis, because it is not an alternative method for defining markets. When done correctly (as Harris and Simons recognize)²⁷, it is simply a rephrasing of the hypothetical monopolist test. It asks what is the critical amount of demand that has to be lost in response to a price rise before the price rise is unprofitable. That is a question about how big the demand elasticity has to be to make a price increase unprofitable. Critical loss can help one describe this critical demand elasticity, but it is not a new analytic tool and has been misused.²⁸

The methodology of market definition and market shares is an extremely crude way of assessing a merger's competitive effect, especially since market definition is usually not based on the extensive quantitative information required to define it rigorously. The methodology can certainly be informative in many cases, but it is only the first

THE METHODOLOGY OF MARKET DEFINITION AND MARKET SHARES IS AN EXTREMELY CRUDE WAY OF ASSESSING A MERGER'S COMPETITIVE EFFECT, ESPECIALLY SINCE MARKET DEFINITION IS USUALLY NOT BASED ON THE EXTENSIVE QUANTITATIVE INFORMATION REQUIRED TO DEFINE IT RIGOROUSLY.

26 For a more skeptical view of the value of relying on consumer responses, see Ken Heyer, *Predicting the Competition Effects of Mergers by Listening to Customers*, 74 ANTITRUST L.J. 1 (forthcoming 2007). Another procedure to define markets is to identify products whose prices are highly correlated. Stigler and Sherwin recommend this procedure. See George J. Stigler & Robert A. Sherwin, *The Extent of the Market*, 28(3) J. L. & Econ. 555-85 (1985). Although the procedure can sometimes be a useful way to start an analysis, it has quite serious drawbacks. See CARLTON & PERLOFF, *supra* note 54, at ch. 20 and Gregory J. Werden and Luke M. Froeb, *Correlation, Casualty, and All that Jazz: The Inherent Shortcomings of Price Tests for Antitrust Market Delineation*, 8 REV. INDUS. ORG. 329 (1993).

27 See Barry Harris & Joseph Simons, *Focusing Market Definition: How Much Substitution Is Necessary?*, in RESEARCH IN LAW & ECONOMICS 207 (Richard O. Zerbe, Jr. ed., 1989).

28 See Carlton (2004), *supra* note 12.

step in an analysis that must delve into the economic facts of the industry. It can be a useful guide, but only if subsequent analysis confirms its message. The methodology's 0 or 1 nature (i.e., "in" or "out") together with the arbitrariness of certain decisions (e.g., why hold the price of products outside the market constant?), emphasizes its crudeness. Still, the use of market shares (or changes in them) is simple, and it can be thought of as the first step in a merger analysis. Its best use is likely to provide a safe harbor when industry concentration and shares of merging firms are low.

B. MARKET DEFINITION IN SECTION 2 CASES

We have already discussed how the central issue in a Section 2 case is whether some alleged bad act enables additional market power to be exercised, and, if so, whether any exercise of additional market power is offset by the additional provision of valuable services made profitable as a result of the price increase. Estimating market power while adjusting for services provided can be difficult and it is even more difficult to figure out whether an increase in market power is offset by improved services—the traditional pro-competitive explanation for many alleged bad acts.

Instead of focusing on whether the alleged bad act increases market power, the courts typically focus on whether there is market power and, if so, whether the alleged bad act is justified on pro-competitive grounds. One reason, I think, for this current emphasis on the level of market power (whether it is measured before or after the bad act often seems not to be a focus of attention) is because at the summary judgment stage, a case can be thrown out if there is no market power, while it is thought to be more difficult to get the case thrown out at summary judgment if one concedes market power but defends by claiming that the action is pro-competitive. Because the courts focus on existing levels of market power, this has required markets to be defined in Section 2 cases to see whether market power exists (presumably, after the alleged bad act has occurred). My experience is that courts ask whether market power exists in the presence of the alleged bad act, a question with the potential to be answered in a misleading way if one ignores the efficiency justification for the alleged bad act, as I explained in a previous section. Moreover, such an analysis fails to consider whether the bad act creates any additional market power. Still, the procedure does have a logic because if there is no market power after the alleged bad act, then the antitrust inquiry ends.

To answer the question of whether the firm has market power, some have tried to adapt the procedure of the *Merger Guidelines* to define a market in a Section 2 context. As a logical matter, this initially seems fine with the benchmark price now no longer being the current price but rather the competitive price. So the hypothetical monopolist test to define a market is as follows: consider all those products such that a hypothetical monopolist of those products would raise price above the competitive level by, say, 5 percent. One then calculates the market

share of the firm in this market and if it is high one concludes that there is market power. But what sense does this make? Suppose the current price is \$10. If one knows that the competitive price is \$5, then the market definition exercise is useless! One can observe whether the current price (\$10) exceeds the competitive price (\$5) and the deviation is the measure of market power. There is no need to define a market and calculate market share in order to see whether the market share is so high that one can safely conclude that \$10 is higher than \$5. Alternatively, if one does not know the competitive price, there is no way to implement this market definition test.²⁹

But a bit more analysis shows that the logic of using the competitive price as the benchmark price is not necessarily correct. In a merger case, we typically use the current price as the benchmark, not the competitive price. That is sensible because the relevant question is whether the merger will raise price from current levels. By similar logic, in a Section 2 case we should use the price that would prevail in the absence of the bad act as the benchmark price in order to define a market and calculate market shares in an effort to determine whether the firm has enough market power so that it could possibly use (or have used) the bad act to elevate price.³⁰ The hypothetical monopolist test for market definition in a Section 2 case should be: include all those products such that the hypothetical monopolist would raise price by 5 percent above the benchmark price, defined as the price that would prevail absent the bad act. If the firm's market share is low, the inquiry should end.³¹ It may sometimes be difficult to figure out the benchmark price, though not always. For example, if the bad act has not yet taken effect, the current price can be used as the benchmark price.³² But when, as will commonly occur, this is not the case, the analyst could have difficulty.

In this situation, one is in the uncomfortable position of realizing how arbitrary market definition can be in Section 2 cases and how this arbitrariness can lead to errors. Perhaps the best one can say is that one might look at similar firms and throw out the antitrust case if there are enough of them—but that is a cop-out

29 It is also correct to say that in the absence of cost information, one cannot define a market in a merger case using the *Guidelines* in the rigorous way I described earlier.

30 If possible, the expected post-bad act market share of the firm should be used. The well-known *Cellophane* fallacy arises when one uses the post-bad act price as the benchmark price.

31 If one concludes that there is market power, then as described previously, one should compare the price effect of the bad act to any efficiency effects associated with the bad act. The change in market share pre- and post-bad act may give insight into the likely price effect.

32 If the benchmark price is known and the price after the bad act is known, then, as already explained, there is no need to go to the effort to define a market. If the benchmark price is not known, one cannot define the correct market. If the benchmark price is known, but the price after the bad act is not known, then one may benefit from defining a market and asking whether the bad act is likely to allow the firm to achieve a sufficiently high market share that market power concerns arise. If not, the inquiry ends.

unless one can define what “similar” means. If one is able to establish a benchmark price because there is a consensus that in some areas (or time periods) there are no bad acts, one can then use econometric techniques to try to use those benchmark areas and their characteristics to calculate the benchmark price in any area. This can be a useful approach, and one I describe in the next section.

V. Is Market Definition a Useful Tool for Understanding Market Behavior?

So far I have discussed market definition only in the context of antitrust cases, but what about as a research tool to understand economic behavior? Should economists study market definition and market shares in their academic research and if so wouldn't such studies be relevant in antitrust cases? It is undeniable that most of the current interest in market definition stems from its use in antitrust cases. But, although it is no longer as popular as it once was, there was a flourishing literature in relating market performance to market structure measured by market shares. This literature has been heavily criticized,³³ because, among other reasons, a market share does not have the same economic effect across industries, which differ enormously, and because market share is an outcome of industry fundamentals, not a basic characteristic of them. Such studies are sometimes still used in academic studies and can be done properly. They are used in antitrust studies and, under appropriate circumstances, can be a powerful tool not just for checking market definition, but also for understanding the economic behavior of the industry.³⁴

Consider a proposed merger between two firms. One may well be able to use the past historical relationship between price and concentration to predict the effect of the merger. One could use regression analysis to estimate this relationship, though caution is needed to deal with the determination of concentration.³⁵ Simply analyzing the relation between price and concentration over time may tell one nothing about the relation of competitiveness to concentration absent a theory explaining why concentration might be changing over time. However, it is sometimes possible to construct such theories and to use the estimated relationship between price and concentration as a predictor of a merger's effects. For example, in the railroad industry where tracks were laid many years ago, it seems sensible to predict the effect of a merger of two railroads that will

33 See, e.g., CARLTON & PERLOFF, *supra* note 5, at ch. 8.

34 See, e.g., Dennis W. Carlton & Hal Sider, *Market Power and Vertical Restraints in Retailing: An Analysis of FTC v. Toys 'R' Us*, in *THE ROLE OF THE ACADEMIC ECONOMIST IN LITIGATION SUPPORT* (Daniel Slottje ed., 1999); Carlton (2003), *supra* note 12; and Carlton (2004), *supra* note 12.

35 The statistical issue is whether concentration should be treated as an exogenous or endogenous variable.

reduce the number of railroads serving a route from 3 to 2 by comparing pricing on routes with 3 railroads to those with 2, after adjusting for other route characteristics. In fact, a recent paper by Peters, analyzing the airline industry shows that such predictions based on the historical relationship of price to concentration are often as or more accurate than those based on merger simulation.³⁶

Such econometric studies can also shed light on the appropriate market definition. For example, suppose there is a question whether Product B is in the same market with Product A. A regression reveals that there is a relation between the price of Product A and market concentration based on a market definition excluding Product B, but no relation based on a market definition including Product B. Under appropriate statistical circumstances, that can be quite informative as to the correct market definition and can indicate that Product B is not in the same market as Product A. I have often found these types of econometric analyses helpful in understanding both market definition and predicting the consequence of mergers.³⁷

Similarly, in the context of Section 2 cases, one can use econometric techniques to explore the direct effect of a bad act if one is fortunate enough to have data on periods when the bad act was in use and not in use. Again, one has to make sure that one can deal with the statistical issue of exogeneity properly, but if so these studies can be valuable. One can also use the same type of studies as just described in the merger context to test which definitions of market make sense and are useful for prediction.

VI. Common Mistakes in Defining Markets

Although I have stressed the limitations of the methodology of using market definition and market share, I have also explained that the methodology still can sometimes be useful if done in a way that captures the underlying economics, especially in the context of merger cases. In this section, I list a few of what I have found to be common mistakes:

- (1) **Firm 2 is producing at capacity. Hence, it cannot increase supply to offset a hypothetical price increase by Firm 1, and accordingly should be excluded as a participant from the market.** This logic correctly recognizes that Firm 2's zero supply elasticity means that increases in Firm 2's output cannot constrain Firm 1's price. But it fails to recognize that Firm 2's existing production constrains Firm 1's ability to raise price. Suppose it costs \$1 to make one unit of wheat. In equilibri-

³⁶ Craig T. Peters, *Evaluating the Performance of Merger Simulation: Evidence from the U.S. Airline Industry*, 49 J. LAW & ECON. 627-49 (2006).

³⁷ See Carlton (2003), *supra* note 5, and the similar views of Coleman and Scheffman in David T. Scheffman & Mary Coleman, *Quantitative Analyses of Potential Competitive Effects from a Merger*, 12 GEO. MASON L. REV. 319 (2003).

um, 1,000 units are sold at \$1 each. Imagine 1,000 wheat farmers including Firms 1 and 2 each of which produces one (and only one) unit. Each wheat farmer likely faces a highly elastic demand precisely because of the output of the others, and would on its own be unable to increase the price of wheat. Excluding capacity constrained wheat farmers would incorrectly indicate that Firm 1 has market power.³⁸

- (2) Firm 1 produces steel. It has several long-term customers. The capacity to serve those customers should not be considered in calculating the market for steel in evaluating a merger involving other firms.** If the customers have signed long-term, fixed-price contracts with Firm 1, but the steel can be resold, then the capacity to produce that steel should be in the market, but should not be attributed to Firm 1. If the steel cannot be resold, the contract will not be breached, and the output produced by these customers does not affect other customers of steel, then the steel sold to these customers should be excluded from the market. However, if the output of these customers does constrain the prices of the products of other steel customers, then the steel output to these customers should be included in the market, but should not be attributed to Firm 1. The presence of these customers constrains the price that these other steel customers can pay for steel. If there is no fixed-price contract, then the capacity is attributable to Firm 1. The price to long-term customers will be set in the marketplace where the price reflects competition amongst many other steel producers.
- (3) Used goods sell for a lower price than new goods and therefore are not part of the same market as new goods.** Used goods sell for a lower price than new goods for many reasons, including the fact that they have fewer years of service to provide. Whether they are in the same market as new goods depends on how good a substitute they are for various demanders. For example, if used goods have greater reliability problems than new goods, there may be a class of consumers willing to pay a (length-adjusted) price that reflects a premium for the reliability. That could mean that used and new goods do not tightly constrain each other's prices, but that is an empirical question.³⁹

VII. Market Definition in Complicated Settings

I now discuss two somewhat complicated settings and see how useful market definition can be. Since we have already seen its limitations in even relatively sim-

38 The elasticity of the residual demand curve facing a single farmer equals E/s where E is the aggregate demand elasticity and s is the market share of our single farmer. This elasticity facing a farmer will be large for small s .

39 See Dennis W. Carlton & Robert Gertner, *Market Power and Mergers in Durable-Good Industries*, 32 J. L. & Econ. 203 (1989).

ple settings, we should not be surprised that its limitations are even more severe as the circumstances become more complicated. We discuss two settings. One is where R&D is important. In such settings, I ask whether it is sensible to think of an “R&D innovation market”, a concept that was used by the DOJ in the 1990s. The second setting is one involving what are called “two-sided markets”.⁴⁰ These are markets where multiple inputs and outputs require coordination in order to produce desirable products. One example is a mall in which the mall owner must account for the fact that some stores attract customers to the mall, yet those customers buy at other stores in the mall. Another example is an operating system for computers, where the owner of the operating system wishes to induce application programmers to write applications programs for its operating system so as to make its operating system attractive to users. In such cases, there are interactions between different sides of the market that should be internalized. So, for example, the mall owner subsidizes the rent of the bookstore, but charges a high rent to the restaurant. Or, the owner of the operating system subsidizes application programmers, but charges users a high price for the operating system. Other common examples of two-sided markets include dating clubs, game stations and games, and card payment systems. As far as I know, there has been no recognition yet by courts of market definition in two-sided markets.

A. INNOVATION MARKETS

An innovation market consists of the future innovations in some area, presumably measured by the resources devoted to R&D in the particular area.⁴¹ Shares are calculated for each firm in the obvious way. Notice that this analysis is focused on an input (R&D) not the output (new products). It is a departure from the usual procedures of basing market definition on products. It would be a justifiable procedure if it were easy to predict which R&D will lead to which new product, but in many (most?) cases it is not possible to do this. The success of R&D is highly uncertain and predicting from where R&D breakthroughs will come is very hard. Perhaps pharmaceuticals are an exception because one can see exactly how far along a drug development is in its U.S. Food and Drug Administration trials. Yet a market for particular drugs in development really is not an R&D market, instead it is a market for a future product (uncertain as it may be). This is different from a market based on R&D for a particular general type of product. Moreover, we lack a theoretical framework for defining markets for R&D innovation markets. What is the analogue to a 5 percent price increase? What price is being measured if the product cannot be defined? Furthermore, the

40 See David Evans & Richard Schmalensee, *The Industrial Organization of Markets with Two-Sided Platforms*, 3(1) *COMPETITION POL'Y INT'L* 151–179 (2007) and Jean-Charles Rochet & Jean Tirole, *Two-Sided Markets: A Progress Report*, *RAND J. ECON.* (Autumn 2006).

41 Richard J. Gilbert & Stephen C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 *ANTITRUST L. J.* 569 (1995).

link between R&D concentration and new product output is quite weak.⁴² For all these reasons, I am skeptical that the already crude theoretical construct of market can be of much use in analyzing industries where R&D is key.⁴³ Of course, this does not mean that the effect of a merger on innovation in such industries requires no analysis. Instead, it does mean that the tool of innovation markets is likely to be of little help in the analysis.

B. TWO-SIDED MARKETS

In two-sided markets, one party (e.g., mall developer, owner of a computer operating system) internalizes the externalities across agents by effectively taxing and subsidizing different groups so that a total package is produced. There has been a literature questioning the empirical relevance of these two-sided markets (or the related concept of industries with network economies). In such markets, without the coordinating ability of a third party, markets cannot produce the efficient result. The lack of a third party could then indicate either no need for one or the existence of a market failure.⁴⁴ For purposes of this discussion, I assume that a third party is needed and does exist in order to coordinate activity among different groups. What is a sensible procedure to define a market in such a case?

To take a concrete example, suppose two shopping malls want to merge.⁴⁵ To simplify, assume that there are no surrounding competing retail stores that are not in malls. We start out by recognizing that a mall owner puts together a portfolio of stores that complement each other and whose existence he coordinates by lowering the rent of one type of store to stimulate demand (and elevate rent) at another. Suppose that the mall owner charges each store a rent based on its retail sales. Following an approach similar to the *Merger Guidelines*, we ask: Which nearby malls must a hypothetical monopolist control in order for it to be profitable for the merged firm to raise the price by, say five percent? But just as in the earlier discussion of market definition when multiple products were in the market, one must define what “price” means. Is it the rent of one particular retail store, average rent, or total rent that has to rise? Or, to complicate matters fur-

42 *Antitrust Modernization Committee Hearings* (2005) (statement of Richard J. Gilbert, Professor, Univ. of Cal. at Berkeley, “New Antitrust Laws for the ‘New Economy’,” Nov. 8, 2005), available at http://www.amc.gov/commission_hearings/pdf/Statement_Gilbert.pdf.

43 For a more detailed critique, see Dennis W. Carlton & Robert Gertner, *Intellectual Property, Antitrust and Strategic Behavior*, in *INNOVATION POLICY & THE ECONOMY* (Adam Jaffe & Joshua Lerner eds., 2003).

44 For example, when cars were being developed, the car manufacturers could have perhaps benefited from subsidizing location of gas stations. The fact that no such subsidization occurred shows either the market was inefficient, or alternatively, that whatever inefficiency existed, it was too small to cause it to be corrected. See S.J. Liebowitz & Stephen E. Margolis, *Network Externality: An Uncommon Tragedy*, 8(2) *J. ECON. PERSP.* 133-50, 133 (1994).

45 For an application of market definition to credit cards, see Eric Emch & Scott Thompson, *Market Definition and Market Power in Payment Card Networks*, 5 *REV. NETWORK ECON.* (2006).

ther, if customers pay a parking fee, or are provided with elegant surroundings, how should those be changed when this hypothetical monopolist raises “price”? In the earlier discussion of market definition when the market contained multiple products, I recognized the ambiguity in the definition of price but said that I doubted that it should matter much, though I indicated a preference to focus on the products of the merging firms, rather than all products in the market. But here, there is no one type of retail store to focus on.⁴⁶ Therefore, one should focus on an aggregate measure of rent. Moreover, we know that because of the two-sided nature of the market it is unlikely that it is optimal for the hypothetical monopolist to raise rents to all stores by 5 percent. Indeed, the whole point of having a mall is to charge different rents to different types of stores. Failure to allow the hypothetical monopolist to set rents optimally could lead one to a misleading market definition and, depending on the circumstances, to either overstate or understate the market power of a mall owner. For example, one might conclude that post-merger there is no market power (i.e., a very broad market in which the post-merger mall owner has a small share) when with optimal pricing the market is narrower and the mall owner has a large market share reflecting market power created by the merger. Conversely, if one ignores the ways in which mall owners can compete to attract customers directly or indirectly through low rents to some stores, one could find market power when in fact there is none. My sense is that this problem of using the right price will make market definition in two-sided markets more difficult than in the typical case and will therefore further limit reliability of market definition and market shares.

MY SENSE IS THAT THIS PROBLEM OF USING THE RIGHT PRICE WILL MAKE MARKET DEFINITION IN TWO-SIDED MARKETS MORE DIFFICULT THAN IN THE TYPICAL CASE AND WILL THEREFORE FURTHER LIMIT RELIABILITY OF MARKET DEFINITION AND MARKET SHARES.

VIII. Conclusion

Market definition is a crude though sometimes useful tool for identifying market power. The ambiguity in what analysts mean by market power (price above marginal cost, or excess profits) cannot be resolved by market share. When being

⁴⁶ Notice that the product is malls, not individual retail stores. If one does mistakenly focus on rent to only a particular type of retail store, one must recognize the two-sided nature of the market in which feedback effects occur in other retail stores in the mall. An increase in the percent of sales charged as rent to the bookstore could lead to higher book prices and fewer customers to the bookstore and, thereby, to all other stores in the mall. The fall in mall customers leads to a decline in sales in other retail stores and a decline in rents from these stores. Failure to understand this feedback effect could lead one to overestimate the profitability to the mall owner of raising rents to the bookstore and, thereby, lead one to define markets too narrowly and overestimate market power.

Notice that this type of feedback effect can also arise in one-sided markets, when a firm sells complementary products. The price increase in one product will adversely affect sales of the other, and that effect will temper the profitability of a price increase in the initial product.

used to analyze a merger or Section 2 case, it is not just the level of market share, but also the changes in market shares that are relevant to calculate whether any increase in market power occurs. Despite this, in Section 2 cases courts often use market definition to figure out whether market power exists, a question that we have shown can be especially problematic to answer by using market definition. In Section 2 cases, the full antitrust analysis is difficult because any increase in market power typically has to be weighed against any benefits of the alleged bad act. The procedure for defining a market in a merger case or Section 2 case can be rigorously described, but the information required to implement the procedure is typically unavailable. Few analysts (or courts) follow the rigorous procedure in either merger or Section 2 cases. Instead, most markets are defined with some guidance from theory and some qualitative knowledge. Econometric studies using market definition may be helpful both in testing various definitions and in understanding the economic consequences of either the merger or the bad act.

My view is that the definition of a market and the use of market shares and changes in market shares are at best crude first steps to begin an analysis. I would use them to eliminate frivolous antitrust cases when shares are low, but would use them cautiously for anything else. Their usefulness in Section 2 cases is especially weak. Despite their limitations, when they can be used to eliminate frivolous antitrust cases, that use can contribute enormous value to society. ▼