COMPETITION, CONSUMER WELFARE, AND THE SOCIAL COST OF MONOPOLY

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Chapter 17

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Conventional deadweight loss measures of the social cost of monopoly ignore, among other things, the social cost of inducing competition and marginal cost pricing, and thus cannot accurately capture the loss in social welfare. In this chapter, we suggest an alternative method of measuring the social cost of monopoly. Using elements of general equilibrium theory, we propose a social cost metric where the benchmark is the Pareto optimal state of the economy that uses the least amount of resources, consistent with consumers’ utility levels in the monopolized state. If the primary goal of antitrust policy is the enhancement of consumer welfare, then the proper benchmark is Pareto optimality, not simply competitive markets. We discuss the implications of our approach for antitrust law.

1. Introduction

Monopoly and market power constitute the backbone of federal antitrust law. The Sherman Act—a largely regarded as the origin of the federal antitrust law and passed in 1890—was the government’s response to cartelization and monopolization. Section 2 of the Sherman Act specifically prohibits monopolization as well as attempts to monopolize. In modern antitrust law, the existence of monopoly power is one of the two essential elements of the Grinnell test, a test that is applied in all Section 2 cases of the Sherman Act. Judge Richard A. Posner argues that “the economic theory of monopoly provides the only sound basis for antitrust policy.”

But what determines the extent to which society is hurt by monopoly or market power? Professor William M. Landes and Judge Posner remark that the size of the market should be a determinant factor in judging whether a certain degree of market power should be actionable under antitrust law. They note that “the actual economic injury caused to society is a function of [the size of the market]” and “[i]f the amount of economic activity is small, the total social loss is small, and an antitrust proceeding is

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unlikely to be socially cost justified. . . ." Accordingly, a clear understanding and a workable definition of the social cost of monopoly are essential in shaping and implementing antitrust law.

The most familiar measure of the social cost of monopoly is the deadweight loss triangle—the social surplus unrealized due to monopoly pricing. In this chapter, we review the current deadweight loss analysis of the social cost of monopoly. Most prominently, we suggest three reasons to reconsider this analysis. First, the deadweight loss analysis uses the sum of consumer and producer surplus to give an approximate measure of gains and losses without giving any consideration to the consumers’ utility levels. Second, the traditional analysis relies on the questionable assumption of profit maximization for firms with market power and does not take into consideration that where the shares of firms are widely held—as is the case with most firms that have monopoly—managers may be motivated by goals other than profit maximization. Third, the analysis is problematic to the extent that it ignores the social cost of inducing perfect competition—or, alternatively, of increasing the output level to the socially optimal level—in a given industry, and thus assumes a counterfactual that is not attainable even by a benevolent social planner.

As an alternative approach to analyzing the social cost of monopoly, we propose an applied general equilibrium model. The index of social cost we use is the coefficient of resource utilization introduced by Gerard Debreu. We take as a benchmark a Pareto optimal state of economy that provides the same level of consumer satisfaction as achieved in the monopolized state. Debreu’s coefficient then provides an exact, ordinal measure of the economic cost of monopolization in terms of the amount of real resources wasted. These wasted resources are the difference in resources necessary to provide that level of consumer satisfaction in the monopolized state as compared to the Pareto optimal state. If the primary objective of antitrust policy is to promote consumer welfare and efficiency, then Pareto optimality embodies this objective. We emphasize that marginal cost pricing—selling output at marginal cost—is not only a consequence of perfect competition but also a necessary condition for achieving Pareto optimality. This perspective on marginal cost pricing, while not new, is worth stressing as it appears to have been all but lost in the current antitrust literature, which relies primarily on partial equilibrium analysis.

The rest of this chapter is divided into several sections. Section 2 is a review of the current analysis of the social cost of monopoly based on the deadweight loss triangle. In Section 3, we introduce the basic concepts of general equilibrium theory and discuss how the notion of Pareto optimality as the benchmark state of the economy can lead to a more appropriate measure of the cost. In Section 4, we briefly describe the current debate on the competing notions of welfare in antitrust law and in welfare economics, and explain how our model fits into this larger paradigm. In Section 5, we formalize the social cost analysis using a two-sector model and illustrate how to compute the

6. Id.
8. See infra Section 5. Whenever this condition is violated in a sequence of observed equilibria, we can calculate the social cost in each observation via Debreu’s coefficient of resource allocation.
2. Reconsidering the deadweight loss as the social cost of monopoly

By now, most economists agree as to the nature of the problem posed by monopoly and market power. A monopolist that cannot price discriminate has an incentive to reduce output and charge a price higher than marginal cost, which, in turn, prevents transactions that would have been mutually beneficial. Faced with monopoly pricing, consumers either pay higher than necessary prices to obtain their goods or must choose false alternatives—alternatives that appear to be cheaper even though they might require more resources to produce.\(^9\) Put differently, monopoly is inefficient because in preventing such transactions, society uses up more resources than necessary to achieve given levels of utility among consumers.\(^10\) Although destruction of mutually beneficial transactions is patently inefficient from society’s perspective, it remains unclear what is the proper metric to measure the social cost of monopoly. Intuition tells us that, whatever the metric is, it should indicate the extent to which the current state of monopolized economy deviates from an efficient state of economy that could have been achieved if resources were better allocated. In traditional textbook microeconomics, the social cost of monopoly is measured by the deadweight loss triangle.

Triangle A in Figure 1 depicts this loss because this area represents the amount of additional social surplus in the monopolized market that could have been realized had the pricing been at marginal cost. Alternatively, taking potential rent-seeking behavior among firms into consideration, Posner argues that in certain markets where firms compete to become a monopoly, the social cost should include producer surplus in addition to the deadweight loss.\(^11\) In Figure 1, this quantity is represented as the sum of A and B.

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9. This point has long been recognized. A. P. Lerner, in a landmark article, writes that “increasing the price of the monopolized commodity [causes] buyers to divert their expenditure to other, less satisfactory, purchases. This constitutes a loss to the consumer which is not balanced by any gain reaped by the monopolist, so that there is a net social loss.” See A.P. Lerner, The Concept of Monopoly and the Measurement of Monopoly Power, 4 REV. ECON. STUD. 157 (1937).

10. The foregoing analysis is the “resource allocation” aspect of monopoly. See Arnold C. Harberger, Monopoly and Resource Allocation, 44 AM. ECON. REV. PAPERS & PROCS. 77 (1954). Clearly, there is also a distribution effect: monopoly pricing tends to redistribute income in favor of the monopolist. But insofar as these are mere transfers, antitrust economists do not regard them as socially inefficient. See, e.g., Lerner, supra note 9, at 157 (“A levy which involves a mere transference from buyer to monopolist cannot be said to be harmful from a social point of view unless it can be shown that the monopolist is less deserving of the levy than the people who have to pay it . . . .”); Posner, supra note 4, at 13, 24.

11. Richard A. Posner, The Social Costs of Monopoly and Regulation, 83 J. POL. ECON. 807 (1975). To formalize this idea, Posner sets forth three conditions that need to be satisfied for this assertion to hold: (1) firms compete to obtain a monopoly, (2) firms face a perfectly elastic long-run supply of all input, and (3) the costs the firms spend in attempting to obtain the monopoly serve no socially useful purposes. Id. at 809. See also Posner, supra note 4, at 13-17.
Social cost metrics such as these, which are based on the conventional deadweight loss triangle, require implausible assumptions to measure the inefficiency of monopoly. These measures of social cost and surplus use the money metric: all benefits and inefficiencies are quantified in terms of dollars. How should we understand the relationship between the money metric and social surplus? Suppose Abigail is willing to pay as much as $5 for a widget, and Brian, $4, but a widget only costs $2. Then after purchasing a widget, Abigail is left with $3 to spare, and Brian, $2. They can devote their remaining dollars towards consumption of other goods. But to add these values together and say $5 is the measure of social welfare does not really tell us what benefit each of them could have derived from additional consumption; little information is revealed about consumer welfare. In order for this surplus measure to truly represent the social loss, we would need “the heroic assumption that a dollar is worth the same to

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12. See infra Section 4 for a discussion on compensating variation and equivalent variation.
This notion of maximizing social surplus is related to the notion of Kaldor-Hicks efficiency, but the relationship is only approximate because we are using dollar values as a proxy to measure social welfare. An additional shortcoming of the traditional deadweight loss analysis is that it utilizes the concept of a profit-maximizing monopolist who produces goods until marginal cost equals marginal revenue. Let us forget for the moment that this directive may be extremely hard to carry out in reality due to imperfect information. What is somewhat striking is that even with perfect information, the profit-maximizing condition often fails to describe accurately the actual behaviors of monopolists. The literature provides several reasons why a monopolist might not consciously seek to maximize profit.

For example, rarely do we see any prominent monopolist firms that have a sole owner or a sole shareholder. Instead, most monopolist firms have multiple shareholders; and in many cases, these firms’ shares are widely held. Investment and cost decisions of a firm are ultimately made by the managers of the firm who receive salaries and bonuses but are not necessarily owners. These managers may neglect to maximize profits if that is not in their own best interest to do so. This could be the case, for instance, if managers were allowed to reap personal profits at the expense of corporate well-being; insider trading is one example. Fortunately, corporate law provides several institutional safeguards to minimize this type of opportunities for managers. Insiders trading and false financial reporting are illegal under Rules 16, 10(b), and 10(b)-5 of the Securities and Exchange Act of 1934. Managers and directors owe a duty of loyalty to their shareholders and cannot benefit themselves at expense of the corporation. The corporate opportunity doctrine precludes directors from taking a business opportunity for their own when the opportunity is within the firm’s line of business and the firm can afford to exploit the opportunity. In addition, a majority of shareholders can vote out the incumbent management in case they are dissatisfied with the firm’s performance.

But more importantly, even if shareholders and corporate law can create incentive schemes for managers to induce them to do what is best for the shareholders, managers would maximize profits only if that is in the best interest of shareholders. Shareholders come in various types, and for many, the firm’s profit maximization can run afoul of their best interest. First, if a shareholder happens also to be a consumer of the firm’s output, then he will suffer by paying high prices for the firm’s output. Second, a shareholder who sells factor inputs to the firm would stand to lose if the firm uses its resources inefficiently.

13. POSNER, supra note 4, at 23. In the terminology of economic theory, consumer surplus only measures changes in consumers’ welfare if the marginal utility of income is the same for every household, rich and poor alike.

14. There may be instances where the only feasible and testable solution is to quantify all benefits and costs in terms of dollars. The cost/benefit analysis commonly used in health and safety regulation is one example. The cost/benefit analysis paradigm, however, has been criticized on many grounds, not the least of which is the validity of this “heroic assumption.”


16. This argument is only briefly summarized in this section. For a more detailed treatment, see DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY 726, 729 (1990). Kreps concludes that the notion of profit-maximizing firm is more applicable to price-taking firms without market power.
market power to drive down the price for the factor he sells. Third, a shareholder who owns a diversified portfolio may be hurt if the firm uses its market power to hurt its competitors. Finally, even if the shareholder has no interaction with any of the firm’s output, he may be hurt if he consumes a good that is complementary to the firm’s output, because the firm’s pricing policy will necessarily impact the demand curves for complementary goods.

Noneconomic arguments may also play a role, as “[w]hen the monopolist is not working on purely business principles, but for social, philanthropic or conventional reasons” or more likely “when the monopolist is working on purely business principles, but keeps the price and his profits lower than they might be so as to avoid political opposition.”

Although the notion that a monopolist maximizes profit has some intuitive appeal, it may nevertheless run counter to the shareholder’s best interests, and thus will not always be pursued. Cost minimization is a necessary condition for profit maximization but encompasses a much broader category of behaviors. As such, it is a less problematic aspect of monopoly pricing. In a cost-minimization problem, the producer fixes a level of output and subsequently decides on the combination of factor inputs to minimize his production costs to produce the given output level. If monopolists do not satisfy profit-maximizing conditions in practice, then the social cost of monopoly should not be measured on the assumption that they do.

Our most important point is that the social cost of monopoly as measured by deadweight loss is problematic to the extent that it implicitly assumes that the relevant benchmark of efficiency—the counterfactual against which we measure the social loss—is the state of perfect competition. The rationale is that under perfect competition price will equal marginal cost, and a willing buyer and a willing seller will engage in transactions without wasting any resources. Nevertheless, the assumption of perfect competition as the ultimate benchmark is less innocuous than it appears. Perfect competition requires atomism of firms and buyers. But the literature is often silent as to exactly where these “other” firms suddenly come from. It is unlikely that there are firms sitting idly by and not producing any socially useful goods but instead waiting to enter this market. A more likely scenario is that firms or individuals somewhere have to cease their current socially useful activities in order to enter a particular industry. For this reason, the perfect competition benchmark unrealistically assumes a sudden costless creation of countless new firms while everything else in society remains unchanged.

We can illustrate the last point with a stylized example. Suppose we initially have a competitive market for widgets. Then, one of the widget-manufacturing firms patents a new formula to make “twidgets,” which is a new more profitable invention otherwise unrelated to widgets. Twidgets, however, use the resources and technologies originally used to produce widgets. Twidgets become an instant hit in the market, but for the first 20 years they are produced under monopoly because of the patent. In this case, we have a government-sanctioned inefficiency. As the patent expires, other widget companies will rush into the twidget market, consumers can then buy twidgets at marginal cost, and the deadweight cost from the twidget monopoly will be eliminated. Notice, however, that the widget market will likely suffer because widget firms are expending their resources to

17. See Lerner, supra note 9, at 170.
producing twidgets. In other words, in order to induce perfect competition in one industry that was originally monopolistic, one would have to pull out resources from other industries. The supply curve in one or more of the other industries will, shift inward, and the new resource allocation reduces the social surplus generated from those industries.

Figures 2a and 2b demonstrate this example. Figure 2a represents the twidget market, and Triangle ABC measures the gain in social surplus due to competition in the twidget market. Meanwhile, Figure 2b refers to the competitive widget market and the counterfactual when the twidget patent expires. The area represented by EFGH measures the reduction in social surplus due to the inward shift of the supply curve in the twidget market. A more accurate measure of the social cost, therefore, would have to consider the changes in social surplus in both the now-competitive twidget market and the competitive widget market. Thus, the gain ABC would have to be measured against the loss EFGH, and the deadweight loss overstates the actual gain from eliminating the monopoly. All of sudden, it is not at all obvious that eliminating deadweight loss by inducing perfect competition in the twidget industry is particularly desirable; the result may be an overall reduction in social surplus.

An economic analysis which focuses on the social surplus of one sector without considering possible implications for other sectors is called partial equilibrium analysis. Partial equilibrium analysis remains a powerful methodology for analyzing the behavior of firms in an isolated market where the impact on prices in other markets is negligible. And yet this is hardly the case with interesting instances of monopoly power, e.g., AT&T, IBM, and Microsoft. In all of these cases, prices were affected well beyond the immediate markets, and the static one-sector model cannot correctly estimate the social cost of monopoly. At a minimum, we must consider the effect of inducing perfect competition in one industry on a different industry from which resources are drawn; a proper model thus would have to consider at least two separate sectors with common factors (which can be, broadly speaking, capital and labor). Moreover, because inducing perfect competition in and of itself may not be desirable on the whole, we must also consider other states of the economy that are potentially superior.

Finally, one may ask whether the perfect competition benchmark can be salvaged if we view it simply as a condition precedent for inducing marginal cost pricing in the industry; that is, when we talk about “perfect competition,” all we really care about is making sure price equals marginal cost. In other words, would the marginal cost pricing counterfactual, without necessarily inducing other firms to enter the industry, provide a more workable benchmark of welfare comparison? The answer still remains no. The firms cannot simply be expected to price their goods at marginal cost and maintain the monopoly output level at the same time. Because the demand curve is downward sloping, at marginal cost pricing there is necessarily a higher demand for the goods than at the state of monopoly. Unless the firm can expand its output level to a higher output level—which would still require more resources, such as capital and labor, to be drawn from other firms or industries—at equilibrium, the price of the good will be raised accordingly to ensure the demand equals the supply. The marginal cost pricing benchmark thus necessarily implies an output level that is higher than monopoly. Whether this is done by promoting competition from other firms or by expansion of the monopoly firm’s production set is immaterial.
Figure 2a.
Monopoly and competition in the twidget market.

Figure 2b.
Competitive widget market.
3. **General equilibrium theory and the welfare theorems**

The aim of general equilibrium theory is to provide a more holistic view of the economy by capturing potential interactions among interdependent markets. In general equilibrium theory, consumers simultaneously provide labor and capital to firms, own shares of the firms, and maximize their utility based on consumption subject to their income constraints; meanwhile, firms from different sectors produce different goods but use common factor inputs, labor, and capital. Notwithstanding the seemingly all-encompassing features of general equilibrium theory, its application to antitrust policy and the social cost of monopoly has been remarkably limited to date.\(^\text{18}\) In this section, we briefly discuss the basic elements of general equilibrium theory and propose an alternative method of measuring the social cost of monopoly power—one not subject to the concerns raised above but nonetheless consistent with a consumer welfare approach to antitrust law.

The notion of efficiency and welfare in general equilibrium theory is Pareto optimality, also known as *allocative efficiency*.\(^\text{19}\) A state of the economy is said to be Pareto optimal if no consumer can be made better off through reallocating productive resources or trading without also making another consumer worse off. Pareto optimality thus represents a state of maximal consumer welfare for a given initial allocation of resources. The most important results of general equilibrium theory are the two welfare theorems developed by Kenneth J. Arrow and Gerard Debreu.

*The First Welfare Theorem:* Under perfect information, complete markets, and perfect competition, every equilibrium is Pareto optimal.\(^\text{20}\)

*The Second Welfare Theorem:* Every Pareto optimal allocation can be achieved through competitive markets with lump sum transfers of income among households.\(^\text{21}\)

The First Welfare Theorem indicates that if the market conditions are right, perfect competition results in an economy in which it is impossible to make someone better off without making another one worse off. In short, we tend to “value competition because

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\(^{18}\) The conspicuous absence of application of general equilibrium theory to antitrust law is due in part to the indeterminacy of the price level in the Arrow-Debreu general equilibrium model. As such, the model does not admit price-setting, profit-maximizing firms.

\(^{19}\) The literature appears to use these terms interchangeably. *See, e.g.*, Thomas D. Morgan, *Cases and Materials on Modern Antitrust Law and Its Origin* 8–9 (2000) (describing allocative efficiency as the state in which “there [is] no combination of production or exchange that could make anyone better off without making someone else worse off”).

\(^{20}\) For an excellent treatment of general equilibrium theory, see Andreu Mas-Colell, Michael D. Whinston & Jerry R. Green, *Microeconomic Theory* 511–786 (1995). For the First Welfare Theorem in particular, see *id.* at 549. The theorem requires that consumer preferences to be locally nonsatiated. Additional assumptions include rational behavior, and no externalities or public goods. This is an idealized approximation of real economies that is used to justify government intervention in the presence of market failure.

\(^{21}\) For the Second Welfare Theorem to hold, we need consumers’ preferences and firms’ production sets to be convex. A set is convex if for any pair of points in the set, the segment joining these two points lies in the set.
it promotes efficiency, that is, as a means rather than as an end.”

Significantly, the First Welfare Theorem illustrates Adam Smith’s invisible hand metaphor. In *Wealth of Nations*, first published in 1776, Smith famously postulated that buyers and sellers in the market seek their own gain and prosperity, but are led as if by an invisible hand to promote the interests of society at large. Arrow and Debreu thus formalized Smith’s idea and provided a mathematical proof.

Although Smith was essentially correct, he did not specify the conditions under which his statement would hold. Further, he failed to recognize that, by the Second Theorem, any particular Pareto optimal outcome can be achieved by a simple redistribution of income, after which we can leave the competitive market to realize the efficient outcome.

We have stressed that a reasonable measure of the social cost of monopoly should be based on a proper counterfactual. If perfect competition is inappropriate as a counterfactual, then what should be the ideal state of the economy against which to measure the social cost of monopoly? A correct social cost metric needs to reflect both the degree of deviation from a Pareto optimal outcome and the amount of resources wasted. We propose that the benchmark of comparison for the purpose of measuring the social cost of monopoly should be a counterfactual state *that achieves the same or greater level of utility for everyone, but one that uses the least amount of resources*. If such a state can be constructed, then the economic cost of monopoly is simply the amount of wasted resources; the given monopolized state performs no better than the counterfactual for any individual but simply uses up more resources.

The proposal merits some explanation. We have not yet specified which of the many possible Pareto optimal states we should take as the relevant benchmark. We propose the unique Pareto optimal state characterized by Debreu’s *coefficient of resource utilization, ρ*. This coefficient is the smallest fraction of total resources capable of providing consumers with utility levels at least as great as those attained in the monopolized state. Hence, the efficiency loss in real terms is $(1 – \rho) \times$ total resources; the economy can throw away $(1 – \rho) \times$ total resources and not make anyone worse off.

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23. Adam Smith, *The Wealth of Nations*, bk. IV, ch. II, 484-85 (Edwin Cannan ed., The Modern Library 2000) (1776); see also Lerner, supra note 9, at 162 (noting that the “importance of the competitive position lies in its implications of being . . . the position in which the ‘Invisible Hand’ has exerted its beneficial influences to the utmost”).

24. Debreu analyzes economic loss associated with nonoptimal states and identifies three kinds of inefficiencies in economic systems. Only one need concern us here: “imperfection of economic organization such as monopolies or indirect taxation or a system of tariffs.” See Debreu, supra note 7, at 289. To measure the economic loss, he posits a cost-minimization problem consistent with Pareto’s maximization of social welfare.

25. An attentive reader might reason that this measure actually offers a lower bound of the social cost because applying the same $\rho$ across all resources is constraining. Indeed, if we can determine the minimum level of resources necessary to achieve the same utility level without imposing the same proportion of reduction across all resources, the measure of social cost might be greater. Nevertheless, there is no guarantee that such minimum bundle of resources is uniquely determined. The coefficient of resource utilization provides the benefit that such a level necessarily exists and is uniquely determined.
For example, suppose Abigail has ten apples, Brian has ten pears, and although each would prefer a mixed bundle of pears and apples, they are prohibited from trading for some reason. If Abigail is indifferent between having ten apples and having a bundle of two apples and four pears, and Brian between ten pears and a bundle with five apples and three pears, then the current state of the economy is no better off than one that could be achieved with only seven apples and seven pears. Thus society is squandering three apples and three pears, as they add nothing to consumer welfare. If no smaller bundle can achieve the same level of consumer welfare as the current state of the economy, then the coefficient of resource utilization in this case is 0.7.

Importantly, the fact that we choose \( \beta \) to be the smallest coefficient renders the new state of the economy—in which no one is worse off than in the monopolized state—Pareto optimal relative to the reduced resource endowment. Recall our discussion earlier that the inefficiency of monopoly could be viewed as using up more than necessary amounts of resources to achieve particular utility levels. Then the natural benchmark for a monopolized economy is the Pareto optimal economic state that uses the least amount of resources but produces the same or higher level of consumer satisfaction; specifically, society’s endowment in the new state will be exactly \( \alpha_1 \) total resources. The associated economic cost indicates the inefficiency due to monopolization and can be converted into a dollar amount.

This cost is indicated in Figure 3. The original production possibility frontier (PPF) can be thought of as a social budget constraint. \( \alpha_1 \) is the given state of economy, and \( \alpha_2 \) is an alternative state that lies on the community indifference curve and is tangent to the counterfactual PPF. The counterfactual PPF represents the PPF produced with “minimal” social resources and yet is tangent to the community indifference curve. This ensures every individual in the community is indifferent between the current state and the counterfactual state.

Of course, this notion of economic cost would have meaning only insofar as the relevant benchmark is actually achievable. After all, one of the reasons why we were not satisfied with the deadweight loss triangle as the measure of the cost of monopoly was that the counterfactual was an unachievable state of the economy. Enter the Second Welfare Theorem: because we have a Pareto optimal economic state, we know this state of economy can be realized as a competitive equilibrium with lump sum transfers of income.

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26. The proof is by contradiction, and we include only a sketch here. Assume every consumer’s utility strictly increases, by however small amount, with a positive change in any one of their goods. If the new economy were not Pareto optimal with respect to the reduced endowment, then the reduced endowment can be reallocated so as to increase at least one consumer’s utility by a positive measure. Then we can take some of this consumer’s endowments away from him and distribute them across all other consumers so as to increase everyone’s utility by a positive measure. By continuity we can find a way to distribute goods so that everyone’s utility returns to the normal level, or remains slightly higher, when everyone’s endowment is systematically reduced by a fraction close to but less than 1, say \( \beta \). This violates the assumption that \( \beta \) is the smallest possible value, because \( \beta \rho < \rho \). This argument makes no assumption about the nature of the economy’s production possibility set, e.g., it may be nonconvex because of increasing returns to scale in some sectors.

27. We thank T. N. Srinivasan for suggesting this diagram.
between households. As a result, using only a portion \((\rho)\) of total resources and lump sum transfers, society can achieve the desired Pareto optimal state. Our task thus reduces to estimating \(\rho\) and the amount of resources wasted in a given monopoly state.

Note that the potential social cost of instituting specific lump sum transfers among households is not of relevance here. The counterfactual looks at society’s given resources and asks, given the opportunity to distribute resources in a different way, how much would be saved. It does not ask what it would take for an inefficient state of economy to transform to an efficient state. This distinction is critical. Because the true competitive equilibrium actually requires more resources and higher output levels,

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\rho = \frac{E_0}{E_0}
\]

\(\alpha_1\) = aggregate equilibrium demands

\(\alpha_2\) = aggregate demands in counterfactual competitive equilibrium with transfers

**Figure 3.**

*General equilibrium analysis.*

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28. See Mas-Colell, Whinston & Green, *supra* note 20, at 551-58. If the economy’s production possibility set is nonconvex, then, in general, the Pareto optimal allocation cannot be realized as a competitive equilibrium with lump sum transfers. It can be implemented as a market equilibrium with lump sum transfers and a system of two-part tariffs. For a discussion of the Second Welfare Theorem in this context, see Theorem 2 in Donald J. Brown, Walter P. Heller & Ross M. Starr, *Two-Part Marginal Cost Pricing Equilibria: Existence and Efficiency*, 57 J. ECON. THEORY 52 (1992), and Chapters 2 and 3 in Martine Quinzii, *Increasing Returns and Efficiency* (1993).
society cannot achieve this benchmark regardless of the distribution of initial endowments. By contrast, a benevolent social planner with perfect information can achieve the Pareto optimal counterfactual (i.e., at utility levels under the monopoly) through a lump sum redistribution of resources.

4. Consumer welfare and Pareto optimality in antitrust law

In this section, we consider our model’s relevance to antitrust law. There seems to be a growing consensus that economic efficiency and the enhancement of consumer welfare should be the primary goals of antitrust policy. In addressing the notion of efficiency, Robert Bork “[insisted] that the achievement of Pareto optimality was the sole objective of Congress (as long ago as 1890) when it enacted the nation’s antitrust statutes.”

Similarly, President Ronald Reagan’s first Council of Economic Advisers specifically defined efficiency in an economy in terms of Pareto optimality, not Kaldor-Hicks efficiency. Curiously, this nexus between Pareto optimality and antitrust law has been all but overlooked in the antitrust literature due to the singular focus on the deadweight loss analysis. Our analysis restores this nexus by positing that the proper benchmark for measuring the cost of monopoly should be a Pareto optimal state of the economy, not simply competitive markets.

The issue is a bit more complicated and controversial when it comes to consumer welfare. While antitrust scholars, economists, and legislators increasingly seem to agree that antitrust law should promote consumer welfare, they lack a common, agreed-upon understanding of consumer welfare. From the perspective of antitrust law, the longstanding controversy is whether the proper welfare standard should be “consumer surplus” or “total surplus.” In arguing for consumer surplus, Professor Steven Salop claims that the legislative history of the Sherman Act favors consumer surplus as the measure of consumer welfare and that the current confusion came out of Judge Bork’s usage of the term “consumer welfare” to refer to the aggregate welfare standard.

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29. William F. Baxter, the first antitrust chief during the Reagan administration, stated “the antitrust laws are a ‘consumer welfare prescription’”—that is, they are intended to promote economic efficiency, broadly defined.” Likewise, Bork insists that the “only legitimate goal of American antitrust law is the maximization of consumer welfare.” See Walter Adams, James W. Brock & Norman P. Obst, Pareto Optimality and Antitrust Policy: The Old Chicago and the New Learning, 58 SOUTHERN ECON. J. 1, 6 (1991). Modern courts also appear to understand the aim of antitrust law as enhancement of consumer welfare. Antitrust case law suggests that courts have shifted their focus from promoting competition to maximizing consumer welfare. See HYLTON, supra note 3.

30. Adams, Brock & Obst, supra note 29, at 45.

31. According to the Council, an economy “is said to be ‘efficient’ if it is impossible to make anyone better off without making someone else worse off. That is, there is no possible rearrangement of resources, in either production or consumption, which could improve anyone’s position without simultaneously harming some other person.” See id.

32. One of the few analyses that link monopoly and Pareto optimality was given by A. P. Lerner as early as 1937. See Lerner, supra note 9, at 162.

33. The deadweight loss analysis relates to Pareto optimality only in that the area represents mutually beneficial transactions between buyers and the firm that do not take place.

Assistant Attorney General Charles Rule, on the other hand, argues for total surplus and remarks that the notion of consumer surplus as a measure of consumer welfare implicitly assumes that “in any given market, the consumers are more worthy than the producers” and antitrust enforcement thus becomes a means of wealth redistribution that is hostile to property rights. Meanwhile, Professor Jonathan Baker takes an intermediate position and argues that even if the ultimate goal of antitrust is viewed as maximizing aggregate welfare, the courts should nonetheless apply the consumer surplus standard because such an approach will likely deter firms from proposing aggressive, anticompetitive mergers but will continue to encourage efficiency-enhancing mergers.

As we discussed in Section 2, however, the pure consumer surplus approach seems to establish an unmistakable dichotomy between consumers and producers and ignores the possibility that consumers may in turn be producers. If Mary is a shareholder of a widget company which has market power and is also a purchaser of widgets herself, she will benefit either from the low price of widgets or from high dividends coming from the company’s profit. Focusing exclusively on consumer surplus dictates that we consider only Mary’s welfare increase from the price effect and neglect the possible welfare increase she may experience through higher dividends. Such calculation may be possible, but very difficult to carry out and even more difficult to justify.

Meanwhile, the antitrust controversy over consumer welfare is not the only controversy—or even the most fundamental controversy—regarding consumer welfare. The literature on welfare economics proffers more subtle problems we encounter in properly defining consumer welfare. That is, even if we cared only about consumers and not producers, consumer surplus continues to pose several problems as a welfare measurement. First, as we mentioned, it is not entirely clear how enhancement of consumer surplus relates to Pareto optimality. Second, from the tale of Abigail and Brian from Section 2, consumer surplus is the arithmetic sum of the changes in people’s willingness to pay, and thus it carries only ordinal significance without directly measuring consumer utility levels. Third, it is also well known that the change in consumer surplus is not well defined for the case where several prices changes simultaneously—or worse still, where income changes with prices. For example, if the

36. Id. at 5.
38. The Antitrust Modernization Commission’s hearing on November 17, 2005, demonstrates that this dispute has important implications for consumer welfare. See Transcript of Public Hearing, Antitrust Modernization Commission (Nov. 17, 2005).
40. For an exposition of the controversy surrounding consumer surplus as a measure of consumer welfare, see John Martin Currie, John A. Murphy & Andrew Schmitz, The Concept of Economic Surplus and Its Use in Economic Analysis, 81 ECON. J. 741 (1971); see also Ralph W. Pfouts, A Critique of Some Recent Contributions to the Theory of Consumer’s Surplus, 19 SOUTHERN ECON. J. 315 (1953).
prices of oranges and apples change simultaneously, we may get two different calculations of consumer surplus depending on which price change we consider first. This is known as the path dependence problem of consumer surplus. Consistency in consumer surplus calculation holds only when consumers’ utility functions are of certain restricted form. 41

Welfare economists have thus opted for willingness to pay as measured by two other metrics: compensating variation (CV) and equivalent variation (EV). Given a price change, the CV measures the amount of money necessary for an individual to restore his original utility level after the price change. The EV measures the change in his income level that would have the same effect on his utility level as the price change. The CV and EV are more attractive because they do not suffer from the same path dependence problem as consumer surplus, and the quantification of money measurement is done in order to maintain the same utility levels. Unfortunately, the CV and EV are generally not equal, 42 and when they are different there are generally no a priori reasons to prefer one method over the other. This in turn can cause a dilemma because “a project that is justified using one measure may not be justified using the other.” 43

Our suggested metric circumvents the problems associated with consumer surplus and makes use of the idea of maintaining the same utility levels for consumers, as is the case with the CV and EV. In considering the social cost of monopoly, we do not ask how much consumer welfare has been lost through a state of monopoly; we ask instead how many resources have been lost in achieving the current level of consumer welfare. The resulting measure of social cost provides the benefit of assuming only ordinal measures of utility. We need no longer assume either that a dollar is worth the same to everyone or that utility functions can be aggregated across consumers. Adding up the cost of resources, too, makes sense with this framework because we are not equating these economic costs with gains or losses in individual utility levels. Insofar as the primary objectives of antitrust law are Pareto optimality and consumer welfare, the notion of promoting consumer welfare using minimal resources embodies these objectives.

Our model’s emphasis on the preservation of consumers’ utility levels may appear as if we are ignoring the welfare of the producers. This approach would then be inconsistent with the original concern for total surplus, which includes both consumer surplus and producer surplus. This is not so. While we focus on consumers’ utility levels, consumers’ income levels are determined in part by dividends coming from ownership of the firms. This is because in general equilibrium theory, consumers collectively own the firms. If the industry is competitive, firms earn zero economic profits. When a firm has monopoly power, the firm’s profits are distributed back to the consumers according to their shares of ownership. Firm decisions are made so as to maximize the welfare of consumer-shareholders, and there are no personas associated with the producers. Our approach thus rejects the artificial dichotomy between consumers and producers. If one were to make an analogy at all, general equilibrium

41. See JUST, HUETH & SCHMITZ, supra note 39, at 102 (“[A] necessary and sufficient condition for uniqueness of consumer surplus change is that all income elasticities for the subsets of goods with changing prices must be equal.”).
42. In order to have $CV = EV$, we require zero-income effects.
43. JUST, HUETH & SCHMITZ, supra note 39, at 132.
theory’s notion of Pareto optimality should be compared with maximizing total surplus from partial equilibrium theory.

5. A two-sector model and cost-minimizing equilibria

In this section we illustrate the computation of $\rho$ with a two-sector general equilibrium model.44 While our model can be generalized to accommodate multiple sectors, we only need two sectors in order to convey the main ideas effectively. There are two consumers, two commodities, two firms, and two factors of production.45 We make the standard assumptions from microeconomic theory. Consumers have utility functions and endowments of capital and labor and shareholdings in firms; they maximize utility subject to their budget constraints. Each firm produces a single output with inputs of capital and labor purchased from consumers. In equilibrium, all markets are clear.

Competitive firms maximize profits and produce output at minimum cost and sell it at marginal cost. Most of general equilibrium theory conventionally assumes competitive markets in all sectors.46 In order to extend the paradigm to encompass the existence of monopoly power, we introduce a new notion of market equilibrium. Specifically, we assume firms with monopoly power produce output at minimum cost, as do competitive firms, but need not sell output at marginal cost.47 This means, for instance, that Microsoft may have monopoly power in the software market, but it still needs to pay competitive wages for its employees. Meanwhile, in equilibrium they make supracompetitive profits because the monopoly price exceeds the marginal cost of production. Our analysis derives from a subtle but important distinction between price-setting profit maximization—which we rejected—and monopoly power, i.e., the power to raise price above the competitive level and make supracompetitive profits.48

44. The analysis in this section derives in part from Donald J. Brown & G.A. Wood, The Social Cost of Monopoly (Cowles Foundation, Discussion Paper No. 1466, 2004). The basic set-up follows the work of John B. Shoven and John Whalley. See generally JOHN B. SHOVEN & JOHN WHALLEY, APPLYING GENERAL EQUILIBRIUM (1992). The relevant parts are Sections 3.2 and 3.3, and also Chapter 6, where the authors include Arnold Harberger’s two-sector general equilibrium analysis of capital taxation. This model can easily extend to three or more sectors.

45. This model is widely used in the applied fields of international trade and taxation, where the focus is on general equilibrium comparative statistics for policy evaluation. Also the data available such as national accounts and input-output data are easily accommodated in a two-sector model. For readers unfamiliar with the properties of the two-sector model, we recommend SHOVEN & WHALLEY, supra note 44. Here we follow the notation in Donald J. Brown & Geoffrey M. Heal, Marginal vs. Average Cost Pricing in the Presence of a Public Monopoly, 73 AM. ECON. REV. 189 (1983).


47. See KREPS, supra note 16, at 726-29. This approach is also consistent with Lerner, supra note 9, at 168 n.2: “By pure monopoly is meant a case where one is confronted with a falling demand curve for the commodity one sells, but with a horizontal supply curve for the factors one has to buy for the production of the commodity; so that one sells as a monopolist but buys in a perfect market.”

48. This latter definition is consistent with Lerner’s index: “If $P = price$ and $C = marginal \ cost$, then the index of the degree of monopoly power is $(P – C)/P.$” Id. at 169.
We denote the two consumers as $x$ and $y$. The inputs or factors are capital ($K$) and labor ($L$). The outputs or goods are grain ($G$) and electricity ($E$). Each consumer has a utility function denoted $U_x$ and $U_y$. Consumers are endowed with capital and labor, which they provide to firms in exchange for wages and rental rates; they also have shares in the ownership of the firm. Endowments and shareholdings in firms for $x$ and $y$ are given by $(K_x, L_x), (K_y, L_y), (\theta_{xG}, \theta_{xE}), (\theta_{yG}, \theta_{yE})$. Each firm has a production function, $F_G$ and $F_E$. Let $K = K_x + K_y$, and $L = L_x + L_y$. Let $P_G$ and $P_E$ denote the prices of grain and electricity, and $w$ and $r$ denote the prices of labor and capital. Consumers can freely trade goods with each other, but not their labor or capital endowment; firms can freely trade factor inputs. We suppose that the grain market is competitive but the electricity market is monopolized. Therefore $P_G = MC_G$, the marginal cost of producing grain, and grain is produced with constant returns to scale.

Let us consider how the economy operates. Consumers consume electricity and grain to maximize their utility subject to their budget constraints. They have several sources of income: wages from providing labor, interest rates on their capital investment, and dividends from the firms’ shares, which are determined by the firms’ profits. Therefore, we write the consumer’s problem as follows:

**Consumer’s problem:**

$$\max U_i \left( E_i, G_i \right)$$

subject to $P_G E_i + P_G E_i \leq I_i \quad i = x, y$

where $I_i = wL_x + rK_x + \theta_{xi} \left( P_G G - wL_G - rK_G \right) + \theta_{xi} \left( P_E G - wL_E - rK_E \right)$

Because utility increases in $E_i$ and $G_i$, the weak inequality ends up binding. In addition, because the grain market is competitive, the third term in the income equation is zero.

Meanwhile, firms minimize their cost of production given their target levels of production.

**Firm’s problem:**

$$\min wL_j + rK_j$$

subject to $F_j \left( L_j, K_j \right) = j \quad j = E, G$

Notice that these target levels are not necessarily determined by profit-maximization motives. For monopoly or any other market structure, it does not matter how the actual target levels are chosen. Our methodology gives a measure of inefficiency based on the observable production levels the firms choose and market prices.

**Market equilibrium.** A cost-minimizing equilibrium is defined as a set of relative prices $P_E/w$, $P_G/w$ and $r/w$; consumer’s demands for goods $E_x$, $G_x$ and $E_y$, $G_y$; firm’s demands for factors $L_E$, $K_E$ and $L_G$, $K_G$; and output levels $E$ and $G$ such that (1) consumers maximize their utility levels given the prices of goods; (2) firms make nonnegative profits and minimize their costs of production given the prices of factor inputs; and (3) all markets clear. That is,
Product markets:

\[ E_x + E_y = E \]
\[ G_x + G_y = G \]  

(3)

Factor markets:

\[ L_E + L_G = L \]
\[ K_E + K_G = K \]  

(4)

Nonnegative profits:

\[ P_x E \geq wL_E + rK_E \]
\[ P_G G = wL_G + rK_G \]  

(5)

An important result from general equilibrium theory is the set of conditions necessary for Pareto optimality of the economy.\(^{49}\) We will first state them and explain intuitively why these conditions are necessary:

\[ MRS_x = MRS_y \]  

(6)

\[ MRTS_E = MRTS_G \]  

(7)

\[ MRS_x = MRT = MC_G / MC_E \]  

(8)

To begin with, what can we say about a Pareto optimal state of the economy? At an optimal state, consumption should be efficient in the sense that the consumers should not be able to trade their consumption goods with each other and achieve a Pareto improvement. In addition, production should be efficient in the sense that the firms should not be able to trade their factor inputs and achieve a Pareto improvement on society’s production levels. Finally, we also want to make sure the product mix is efficient in the sense that society should not elect to produce a unit of grain instead of some additional amount of electricity if a consumer prefers more electricity to grain in his consumption. The above conditions are simply abstractions of these intuitions.

In the first condition, \( MRS_x \) refers to the marginal rate of substitution of electricity for grain for \( x \), and it represents the rate at which \( x \) is willing to give up electricity for grain, holding his utility constant. This is also equal to the ratio of marginal utilities for each good: \( MU_{x,G} / MU_{x,E} \). The first condition says that, at optimum, \( x \)’s willing rate of substitution must equal that of \( y \)’s. Let us see why this is true. Without loss of generality, suppose that \( MRS_x = 2 \) and \( MRS_y = 1 \) at some point. This state cannot be optimal. \( x \) is willing to give up as much as two units of electricity to obtain one unit of grain, and \( y \) is willing to make a one-to-one trade and still able to maintain his current utility level. Then \( y \) can choose to trade one unit of his grain to extract two units of electricity from \( x \). This exchange will not change \( x \)’s utility but will increase \( y \)’s utility because \( y \) would have achieved the same level of utility with just one unit of electricity and now he ends up with one extra unit. Because this is a strict improvement for \( y \)

49. For the intuition and derivation of these necessary conditions, see generally Francis Bator, *The Simple Analytics of Welfare Maximization*, 47 AM. ECON. REV. 22 (1957).
without hurting \( x \), the new state is a Pareto improvement to the original state, contradicting our assumption that the current state is Pareto optimal. They will continue to trade until gains from trade are no longer available, at which point the Pareto optimal outcome is achieved. Thus we must have \( MRS_x = MRS_y \).

The second condition refers to the marginal rate of technical substitution, and the analysis is similar to the first one. The marginal rate of technical substitution measures the rate at which the firm can replace one input, say labor, by the other, capital while maintaining the same production level. If \( MRTS_E = 2 \), this means firm \( E \) can produce the same amount of electricity while trading in two units of labor for one unit of capital. It is then easy to see why we need \( MRTS_E = MRTS_G \) at optimum. For example, if \( MRTS_E = 2 \) and \( MRTS_G = 1 \), then firm \( E \) can maintain its current production level by taking one additional unit of capital and giving up two units of labor. Because firm \( G \) can trade at a one-to-one ratio and maintain its current level of production, firm \( G \) can increase its production level by offering one unit of its capital to firm \( E \) and receiving two units of labor. This is an overall improvement to the current state, and thus it violates the optimal condition. Therefore, we must have \( MRTS_E = MRTS_G \) at optimum.

The third condition equates \( MRS_x \) with \( MRT \), the marginal rate of transformation. \( MRT \) represents how many units of electricity must be sacrificed in order for society to produce grain; this incorporates the marginal costs of production for both. That \( MRT \) should equal to the ratio of \( MC_G \) and \( MC_E \) can be explained by the fact that is \( MC_G \), the cost to society of producing one additional unit of grain (by expending some combination of labor and capital) and \( MC_E \) the cost to society of producing one additional unit of electricity. A more interesting question is why \( MRS_x \) should equal \( MRT \). If \( MRS_x = 2 \) but \( MRT = 1 \), for example, that means \( x \) is willing to give up as much as two units of electricity to obtain one unit of grain. Because the costs to society are equal for production of grain and production of electricity at the margin, it would have been better to have forgone the production of the last unit of electricity and instead devote this resource to producing an additional unit of grain. This would have made \( x \) happier because his utility level would have been the same with giving up two units of electricity and obtaining one unit of grain, but with society’s alternate production plan he need only give up one unit of electricity and obtain one unit of grain. Therefore, we need \( MRS_x = MRT \). Analogously, \( MRS_y = MRT \) and in the end society’s marginal rate of transformation must be equal to the marginal rate of substitution for every consumer in the economy.

In addition to these necessary conditions, we derive a few more conditions from the consumer’s and the firm’s optimization problems. The firm’s cost-minimization problem relates the marginal rate of technology substitution with wages and rental rates. As for the consumer’s problem, because the consumers make their consumption decisions based on the market prices, the first-order conditions from the consumer’s problem tell us that

\[
MU_{x,G} / MU_{x,E} = P_G / P_E
\]

(9)

Because \( MRS_x = MU_{x,G} / MU_{x,E} \), if we combine Equation (9) with Equation (8), we have

\[
P_G / P_E = MC_G / MC_E
\]

(10)
Because the market for grain is competitive, \( P_G = MC_G \). Hence for Pareto optimality, \( P_E = MC_E \)

\( (11) \)

It is in this sense that we should view marginal cost pricing not only as a result of perfect competition but also as a necessary condition for society to achieve Pareto optimality.

We now turn to the computation of \( \rho \) in this two-sector model. Suppose the given economic state of the model is a cost-minimizing market equilibrium where \( P_E / P_G \neq MC_E / MC_G \), and suppose in equilibrium \( x \) consumes \((\bar{E}_x, \bar{G}_x)\) and \( y \) consumes \((\bar{E}_y, \bar{G}_y)\). \( \rho \) is the minimum nonnegative \( \delta \), where the given two-sector model with reduced social endowments \( \delta K \) and \( \delta L \) can produce sufficient electricity \( \bar{E} \) and grain \( \bar{G} \) such that

\[
U_x (\bar{E}_x, \bar{G}_x) > U_x (\bar{E}_x, \bar{G}_s) \quad (12)
\]

\[
U_y (\bar{E}_y, \bar{G}_y) > U_y (\bar{E}_y, \bar{G}_s) \quad (13)
\]

\[
\bar{E}_x + \bar{E}_y = \bar{E}; \quad \bar{G}_x + \bar{G}_y = \bar{G} \quad (14)
\]

\[
\bar{E} = F_E (L_E, K_E) ; \quad \bar{G} = F_G (L_G, K_G) \quad (15)
\]

\[
L_E + L_G = \delta L; \quad K_E + K_G = \delta K \quad (16)
\]

These equations and inequalities define the optimization problem for determining \( \rho \) and we can solve them using the Lagrange multiplier method.

We can illustrate this with Figure 4. The outputs \((\bar{E}, \bar{G})\) produced in a cost-minimizing market equilibrium lie on the PPF, as a consequence of competitive factor markets and production at minimum cost. \( \alpha_1 \) is the output \((\bar{E}, \bar{G})\) produced in the cost-minimizing market equilibrium without marginal cost pricing. \( \alpha_2 = (\bar{E}, \bar{G}) \) and satisfies Equations (12) through (16). The social endowments used to produce \( \alpha_2 \) are \( \rho K \) and \( \rho L \), where \( K \) and \( L \) are the original social endowments of capital and labor. If the slope of the PPF is \( P_E / P_G \), then \( \rho \) is the ratio \( G_N / G_0 \). The existence of \( \rho \), as the minimum nonnegative \( \delta \), is guaranteed because solutions to Equations (12) through (16) are guaranteed for \( \delta = 1 \) by virtue of the existing market allocations. The uniqueness is also assured because we choose the smallest such \( \delta \). Given this theoretical framework, Brown and Wood demonstrate how \( \rho \) can be actually calculated from a history of observed market data.

In the constrained minimization problem defining \( \rho \), we denote the Lagrange multipliers for the labor and capital constraints in Equation (16) as \( w^0 \) and \( r^0 \), respectively. These “shadow prices” are used by Debreu to give an intrinsic valuation of the economic costs of inefficiency. He defines the opportunity or economic cost in real terms as the vector \( < (1 - \rho)K, (1 - \rho)L > \) and the economic loss as \( (1 - \rho) [ w^0 L + r^0 K] \).

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50. Likewise, because consumers make decisions about how much labor and capital to offer to the firms based on wage and rental rates, the optimization condition from the firm’s problem dictates that the marginal rate of technical substitution of capital for labor must be equal to the ratio of \( w/r \).

51. See Brown & Wood, supra note 44.
A natural question at this point is how this dollar amount would compare to the dollar amount of the deadweight loss triangle. As it turns out, there are no systematic relationships between these two figures. The economic wastes from the applied general equilibrium model can be lower, higher, or equal to the dollars corresponding to the deadweight loss costs.

6. Applications to antitrust law

In this section, we show how our model can be used in antitrust law. The first application is in measuring the extent of monopoly power. One definition of monopoly power in the literature of antitrust economics is the existence of substantial market power for a significant period of time. For cases involving Section 2 of the Sherman Act, courts use the *Grinnell* test: the offender must have both “(1) the possession of monopoly power in the relevant market and (2) the willfull acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior
The determination of the second element depends on the intent of the monopolist and will necessarily turn on the factual background of the case; the court will have to look at the business practice and exclusionary conduct. The first element, however, is an empirical question and its determination must turn on the history of price and demand data over a period of time. That is, in order for the courts to apply the Grinnell test they must review a history of the alleged monopolist’s pricing behavior to ascertain the existence of monopoly power.

How might this work in practice? If a given industry is relatively competitive, then the price will be close to the marginal cost, the social cost from the firms’ behavior will be small and the resulting $\rho$ will be close to one. If we can estimate $\rho$ and find that it is significantly smaller than one, then this is evidence that the market is not competitive, and we can infer monopoly power accordingly. But in order to estimate $\rho$, we must solve the minimization problem defined by Equations (12) through (16), and we have neither the utility functions nor the firm’s production functions to work with. Instead, we only have a history of market data, which tells us how consumer behavior has changed over time with varying prices and how production levels have changed over time with varying factor prices. Because these data only provide us with the equilibrium behavior, they are incomplete in that the utility functions of consumers and the production functions of firms are not observable. In a separate paper, we discuss how this estimation can be carried out given a history of market data and firm behavior.

Second, our model may be used to analyze the efficiency of a proposed merger. The analysis would begin with an estimate of the merged firm’s production possibility set. Using the current equilibrium utility levels, we compute $\rho$ by minimizing over all possible multiples of the social endowments of capital and labor. If $\rho$ is greater than one, i.e., the merged technology requires more resources than the current technology to produce the present level of consumer satisfaction, then we reject the proposed merger, but if $\rho$ is less than one then the merged technology is more efficient and the merger is approved.

Third, our approach also provides a useful framework within which to conceptualize the harm in predatory pricing. We showed above that marginal cost pricing was a necessary condition for Pareto optimality. Supracompétitive pricing, of course, is not the only instance where Equation (11) is violated: firms practicing predatory pricing violate Equation (11) also by artificially setting prices below marginal costs. Thus, this perspective on marginal cost pricing illuminates an important aspect of predatory pricing: the harm in predatory pricing is that by selling goods at a price below marginal cost, the firm destroys Pareto optimality in society in much the same way monopoly pricing does. This observation challenges the current approach towards predatory pricing in antitrust law established in *Brooke Group v. Brown & Williamson Tobacco Corp.* Under this standard, an incumbent monopolist cannot be held liable for predatory pricing unless the plaintiff can show not only that the monopolist priced goods

below marginal cost but also that the monopolist had a reasonable prospect of recouping the incurred costs. Judge Easterbrook reasoned in another case that “if there can be no ‘later’ in which recoupment could occur, the consumer is an unambiguous beneficiary even if the current price is less than the [marginal] cost of production.”

Our model shows that a monopolist who practices predatory pricing incurs social cost even absent the prospect of driving out competition or the prospect of recouping the costs. This symmetry between monopoly pricing and predatory pricing should not come as a surprise in light of the fact that predatory pricing, too, offers consumers false alternatives in terms of consumption goods, just as monopoly pricing does. Due to the lowered pricing, consumers may elect to consume a particular good over another even though the consumed good may be more costly to produce.

7. Conclusion

In this chapter, we join with Robert Bork and William Baxter in proposing Pareto optimality as the embodiment of the goals of antitrust law. As such, it implicitly defines the proper benchmark for assessing the social cost of monopoly as the Pareto optimal state that utilizes minimal economic resources to provide the same level of consumer satisfaction as realized in the monopolized state. These wasted real resources provide a measure of the social cost of monopoly free from the vagaries of the social surplus measure used in conventional deadweight loss analysis of monopoly pricing, such as assuming a constant and equal marginal utility of income across consumers. Our model uses applied general equilibrium theory, which takes into account the effects of monopolization on multiple sectors in the economy. Our approach allows for an empirical determination, using a series of historical observations, of allegations of monopoly power, as required by the Grinnell test, and it suggests a reappraisal of the proper antitrust welfare standard for predatory pricing and mergers.

55. A.A. Poultry Farms v. Rose Acre Farms, 881 F.2d 1396, 1401 (7th Cir. 1989).
56. This allocative inefficiency of predatory pricing—more accurately, of pricing below short-run marginal cost—is also noted in Paul L. Joskow & Alvin K. Klevorick, A Framework for Analyzing Predatory Pricing Policy, 89 YALE L.J. 213, 224 n.31 (1979).