

Price Discrimination Without Market Power

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Politicians, regulators and antitrust analysts have often used the presence of price discrimination as an indicator of market power. They are often motivated by political pressure from buyers facing the higher of the discriminatory prices to regulate or to pursue antitrust remedies in price-discriminating industries. Their justification for doing so is provided by economic models that equate deviation from marginal cost with market power. In the unusual case where costs are completely separable, this position may have validity. But most commonly, real-world goods and services are produced under conditions where costs (sunk or not) like R&D, advertising or production or distribution costs like common facilities, are shared with other products. Under these common conditions, firms constrained by competition from earning monopoly rents will adopt price discrimination as the optimum strategy to allocate common costs among buyers. Not only is this very often welfare-enhancing (as Ramsey pricing suggests it is for certain monopolists), it is not evidence of the unilateral or collusive power to affect industry output, which is at the heart of the “monopoly power” or “market power” concepts. A version of price discrimination also can be used to recover sunk costs in a competitive environment, thus providing a solution to the “destructive competition” problem that has plagued regulatory economics from the late nineteenth century to the late twentieth. This view of price discrimination also helps to explain and justify network pricing behavior that has been accused of being predatory. Price discrimination can, of course, be used to facilitate and preserve the exercise of market power. But while some price discriminating sellers can earn monopoly rents, price discrimination alone is not evidence of market power and should not be used to justify regulatory intervention.

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Introduction

Price discrimination often bothers disadvantaged buyers and stimulates regulators to action. As buyers find that their particular consumption needs can only be satisfied at prices higher and apparently more profitable than those paid by others to satisfy their similar needs, they complain. The complaint usually involves suggesting that only a monopoly or a conspiracy stands between them and lower prices and that someone should do something about it. The “someone” is usually a politician acting through a government regulator or prosecutor who is asked to intervene to eliminate the price discrimination or the market structure that is presumed to sustain it. Academic economists often support the buyers, imagining that market power underlies the price discrimination and reasoning that even if price discrimination can be an efficient way to ameliorate the effects of market power, eliminating the market power is a more certain road to efficiency.

For example, even as airline deregulation has made airline markets generally competitive, airline fare structures have become more complex. Aggressive market segmentation has become a feature of most airline markets, as it is in telephone markets and other network businesses, and its existence has generated discussions of just how competitive the deregulated airline industry is. This price discrimination has engendered accusations of persistent market power (particularly focused on airline “hubs”) and calls for further government intervention to reduce or eliminate it. Airline executives have responded, among other things, by

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pointing out that returns to capital remain substandard, which they say should be taken as evidence that the industry is competitive.

Of course, not all airline price segmentation is discriminatory. Some price differences in airline tickets and elsewhere are supported by product cost differences and some by opportunity cost differences. But many are not. Since airline price segmentation has generated accusations of predation and proposed regulatory responses,¹ and these accusations and responses have broader implications, there is a need for clearer understanding of market segmentation through complicated pricing structures.

Pricing structures designed to accomplish segmentation are not limited to the airline industry. They can be found elsewhere in the economy in services like restaurants and hotels, and in complex manufactured goods like automobiles and computers. In fact, they are probably typical rather than unusual. This phenomenon is widely misunderstood, even among some economists, partly because the classical formulation of economic theory has defined efficient markets as those pricing at marginal cost and partially because price discrimination has been most explicitly addressed in natural monopoly industries or industries regulated due to some claimed market imperfection. Additional confusion is caused by the fact that some of the techniques designed to extract relatively more revenue from some classes of customers than others look like traditional price discrimination (different prices for the “same” product) and others work the same way by devising and using product variations to segment markets. A better understanding of how widespread the various forms of price discrimination are and their relationship to competition will improve public policy and highlight gaps in existing economic theory.

I. The Problem, Viewed Historically

In thinking about price discrimination, economists have historically constructed the following argument: In a competitive market, price equals marginal cost. Wherever there is price discrimination, price deviates from marginal cost. Therefore, if there is price discrimination, the market must not be competitive and there must be market power. In the historic formulation, economists then often go on to say that, given that market power already exists, price discrimination can be output-increasing and is

¹ See for example the proposal of the U.S. Department of Transportation to regulate competitive responses by airlines for the purpose of promoting competition to eliminate the market power presumed to underpin high fares at hubs. 63 Fed. Reg. 17,919-22 (Apr. 10, 1998).

therefore not necessarily bad.² Indeed it is often desirable. However, there is still a general assumption that the existence of price discrimination implies the existence of market power.

In the hands of those who make economic policy, this formulation is dangerous. Price discrimination is often unpopular, at least among those paying the higher of the discriminatory prices. And the existence of market power is inefficient, since it implies a state of the world in which it is in the interest of producers to reduce output and distort price signals to buyers compared to those that would prevail under competition. Thus, political pressure generated by resentment of price discrimination is usually expressed as calls for measures that eliminate the market power assumed to underlie it. And given that perfect regulation is as rare as perfect markets, those measures can easily produce results inferior to those they were intended to remedy. This imperfect regulation is a particular problem when the market power does not exist. Especially pernicious are measures designed to eliminate the price discrimination itself, thus attempting to ameliorate the effects of apparent market power by controlling one of its symptoms. For reasons addressed below, these measures almost always produce less efficient outcomes than the ones that they were designed to change.

Note that the historic discussion depends heavily on the association of price discrimination with market power (usually modeled as monopolistic competition or oligopoly) and with the presumed inefficiencies that attend it. But economists have long understood that price discrimination where there is market power often enhances efficiency.³ In fact, it can alleviate or cure the output-reducing incentives where market power exists. It is a commonplace of economic theory that a monopolist who could perfectly price discriminate would not reduce output and hence cause inefficiency (a “welfare loss”) although it would transfer wealth from consumers to itself (which might have political or social effects that would prompt intervention). And less-than-perfect price discrimination often, if not usually, allows a monopolist to suboptimize by producing more output

2 An interesting beginning at making a systematic modification of this argument can be found in the work of J.M. Clark, who explicitly associates price discrimination with efficiency in normally competitive markets, but is unclear about whether market power is required to support it. J.M. CLARK, *STUDIES IN THE ECONOMICS OF OVERHEAD COSTS* 417 (1923).

3 Katz disputes the conventional view, maintaining that price discrimination in monopolistically competitive markets can be welfare reducing. M.L. Katz, *Price Discrimination and Monopolistic Competition*, 52 *ECONOMETRICA* 1453-72 (1984).

Armstrong and Vickers use an innovative model—firms market utility directly to consumers, abstracted from the products and services that provide it—to assess the welfare effects of various forms of price discrimination in a wide variety of market structures, including effective competition. They find that price discrimination in competitive markets generally but not always enhances utility, but the exercise is an entirely abstract one. They provide no institutional structure or intuition as to how the discrimination is generated or maintained. M. Armstrong & J. Vickers, *Competitive Price Discrimination*, 32 *RAND J. ECON.* 579 (2001).

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than it would produce at a single price. But perfect price discrimination is extremely difficult to accomplish in practice and unregulated price-discriminating monopolists almost always price in ways that reduce output and welfare compared to the results that obtain under competition. Allowing price discrimination by these monopolists has generally been described as a “less-bad” outcome than forcing a single-price solution, but it has been generally assumed that at least some market power is required to maintain a price-discriminating equilibrium.⁴

In this Article I do not address the traditional line of argument, although I am certainly in general agreement with it. Unlike that argument, in this Article I do not seek to answer the traditional question, “given market power, can price discrimination enhance efficiency?” Rather, I address the question, “given price discrimination, can we assume market power?” The assumption that we can assume market power wherever we find price discrimination underlies much of the literature of competition policy.

A typical example linking monopoly power and price discrimination can be found in a recent Special Report of the Transportation Research Board to the U.S. Congress supporting an evaluation of competition policy in the airline industry.⁵ Referring to airline price discrimination as a form of Ramsey Pricing,⁶ a long-accepted variety of beneficial price discrimination, the Report states, “In the long term, sustaining such a pricing scheme usually requires government regulation or monopoly power to bar entry.”⁷

4 The conventional view that price discrimination implies market power is summarized in H. Varian, *Price Discrimination*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 599 (R. Schmalensee & R. Willig eds., 1989), which states, “First, the firm must have some market power.” In a later article, Varian discusses the application and welfare implications of price discrimination in industries with declining or very low marginal costs. H. Varian, *Differential Pricing and Efficiency*, at <http://www.firstmonday.dk/issues/issue2/different/index.html> (last visited Dec. 3, 2001). However, he is ambiguous about the competitive conditions required for maintaining discrimination. He seems to suggest that this discrimination is limited to situations of quasi-public goods or services with unusually high ratios of fixed to variable cost, whereas this Article argues that the existence of significant common costs and resulting discriminatory pricing is the norm in markets in which there is no market power.

Most economists would agree that, if market power could be eliminated without negative side effects, doing so would be a superior policy alternative to allowing a monopolist to price discriminate.

5 NAT’L. RESEARCH COUNCIL, TRANSP. RESEARCH BD., ENTRY AND COMPETITION IN THE U.S. AIRLINE INDUSTRY: ISSUES AND OPPORTUNITIES 25-26 (1999).

6 See *infra* note 25.

7 NAT’L. RESEARCH COUNCIL, TRANSP. RESEARCH BD., *supra* note 5, at 26.

II. Modern Developments of the Theory

In the last decade, work by economists has extended the concept of price discrimination to situations where there is no market power.⁸ Baumol posits a case where single-product firms have differently shaped cost curves, requiring that efficient production be shared between them in an equilibrium that requires price discrimination (but not pricing above marginal cost).⁹ Prescott¹⁰ and Eden¹¹ have observed that price discrimination and price dispersion can occur in a competitive environment. Associated with this kind of price discrimination can be a price dispersion equilibrium in which competitive firms all charge discriminatory prices, but the mix of prices varies among firms. Dana has extended this model to airline capacity management under uncertain demand and has noted the apparent paradox that as the industry he studied (airlines) became more competitive, price dispersion apparently *increased*. At the same time, he notes that there are other discriminatory features of airline pricing under competition that apparently have their genesis elsewhere. He characterizes his framework as, “too simple to satisfactorily explain airline or hotel pricing, but nevertheless informative.”¹² Dana extends the analysis further—still under uncertain demand—to cover “yield management” systems that allocate seats to different customers at different times and at different prices and finds that there are many circumstances under which this is efficient. He then warns “the model . . . serves as another warning against the use of price dispersion or yield management as evidence of price discrimination or market power.” He further points out that “policy makers should consider other evidence of market power before concluding that behavior that appears to be discriminatory is anticompetitive.”¹³

In an explanation of discriminatory equilibria that reaches a result analogous to the one reached here but focuses on supply rather than price,

8 Earlier, Borenstein postulated that price discrimination can exist under zero-rent conditions of monopolistic competition with fully separable costs. I am making a more general claim here, since I assert that the phenomenon can exist even when firms are price-takers and that it is linked to the recovery of common costs, the more usual case. (In contrast to the other work cited here, Borenstein has difficulty proving an equilibrium, but uses empirical techniques to suggest that his result is robust). Severin Borenstein, *Price Discrimination in Free-Entry Markets*, 16 RAND J. OF ECON. 380 (1985).

9 William J. Baumol, *Predation and the Logic of the Average Variable Cost Test*, 39 J.L. & ECON. 49, 65-69 (1996).

10 E.C. Prescott, *Efficiency of the Natural Rate*, 86 J. POL. ECON. 1129 (1975).

11 Benjamin Eden, *Marginal Cost Pricing When Spot Markets are Complete*, 98 J. POL. ECON. 1293 (1990).

12 James D. Dana, *Advance Purchase Discounts and Price Discrimination in Competitive Markets*, J. POL. ECON. 395, 396 (1998).

13 James D. Dana, *Using Yield Management To Shift Demand When the Peak Time Is Unknown*, 30 RAND J. ECON. 456, 473 (1999).

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Carleton argues that transaction costs may make it less than optimal to clear markets at a single price when there is stochastic (random and unpredictable) variation in demand among purchasers.¹⁴ Fluctuations in demand may make it difficult or impossible to find a single price that efficiently recovers costs that persist from one period to another (a form of common costs). In that situation, a producer may choose a price that recovers total cost under certain demand states and avoid taking on new customers while rationing demand among existing customers according to their presumed or learned demand characteristics. In this situation, a discriminatory supply equilibrium analogous to a Ramsey price equilibrium can exist as a way of recovering costs common to more than one period.

In another article that addresses an aspect of the phenomenon addressed by this Article, Klein¹⁵ has argued in the context of the *Kodak*¹⁶ antitrust case that the existence of a tying arrangement designed to segment customers' use was neither inefficient nor evidence of market power on Kodak's part. He argues that many firms face sloping demand curves but do not have market power in any ordinary or useful sense of the term, and that they segment customers by varying product characteristics and availability.¹⁷ He goes on to provide a rationale for Kodak's practice of tying its customers to Kodak spare parts that does not depend on market power. Klein rejects the historic definition of market power, noting that even if product heterogeneity and branding give firms negatively sloped demand curves, they still do not have the power to earn rents. He concludes that no useful definition of market power depends on firms facing the horizontal demand curve of a wheat farmer, who loses all her sales if she prices above the market price. In an extended discussion of the relationship between market power and pricing discretion, he cites with approval Judge Easterbrook's formulation that market power consists in "the ability to cut back the market's total output and so raise price."¹⁸ That definition captures what seems to be the only necessary condition for market power, and I will adopt it for this Article.¹⁹

14 Dennis W. Carleton, *The Theory of Allocation and its Implications for Marketing and Industrial Structure: Why Rationing Is Efficient*, 34 J. L. & ECON. 231 (1991).

15 Benjamin Klein, *Market Power in Antitrust: Economic Analysis after Kodak*, 3 SUP. CT. ECON. REV. 44, 71-85 (1993).

16 *Eastman Kodak Co. v. Image Technical Servs., Inc.*, 504 U.S. 451 (1992).

17 This argument is developed in an earlier and particularly lucid exposition by Richard Craswell & Dr. Mark R. Fratrik, *Predatory Pricing Theory Applied: The Case of Supermarkets vs. Warehouse Stores*, 36 CASE W. RES. L. REV. 1 (1986).

18 *Ball Mem'l. Hosp. v. Mut. Hosp., Inc.*, 784 F.2d 1325, 1335 (7th Cir. 1986).

19 The formulation preferred here is: "The unilateral or collusive power to effect total industry output of a good or service."

III. A More Comprehensive Explanation

I argue in this Article that it is possible to extend the basic thrust of these modern results to a very broad set of circumstances. It is my contention that, contrary to the standard formulation, price discrimination, in the sense of price differences unsupported by identifiable cost differences, is typical even in competitive industries in the real world. While price discrimination can be associated with and used to exploit and sustain market power, much or most of it is not itself an indicator of market power.

Price discrimination without market power and a price dispersion equilibrium can occur without the special production cost functions postulated by Baumol, without the transaction costs, information costs, product heterogeneity, location, and other impediments to perfect substitutability described by Craswell and Fratrik in their article on predatory pricing²⁰ and by Klein, and without the uncertainty of demand modeled by Carleton and by Dana. These are important characteristics of a real-world economy and are very widely found, but there is yet another, perhaps even more nearly universal, underpinning to the phenomenon of price discrimination without market power. Price discrimination and a price dispersion equilibrium very often occur in competitive markets as a way of recovering costs common to producing more than one unit of a good or service. These costs may be common to simultaneous production or common to production over time.²¹ In these instances, price discrimination is simply a way of distributing the burden of common costs among customers in the least output-restricting way.²² In a competitive market, all producers of goods or services involving substantial common costs will need to adopt discriminatory prices or product strategies to survive.

Common costs are sufficiently widespread that the existence of price discrimination alone can never be taken as evidence of market power, which needs to be inferred either from structure or conduct independent of market segmentation. Accordingly, even where price discrimination generates complaints, it should not be the basis for efficiency-justified regulatory intervention based on the market power supposedly associated with it.

20 Craswell & Fratrik, *supra* note 17, at 1.

21 As used here, "common costs" means costs which are either "fixed" (or "sunk") or variable costs necessarily incurred in a way which is common to more than one unit of output, whether of the same product or not.

22 The logic of this is entirely consistent with Dana's "capacity conserving" rationale.

A. *Classical Models Do Not Adequately Reflect the Impact of Common Costs*

In addition to the demand uncertainty and impediments to perfect substitutability discussed above, economists have had difficulty applying the classical model of perfect competition to a world that has obstacles (temporal or physical) to perfect separability of costs. At the same time that they note the presumed efficiency of marginal cost pricing, economists also regularly note that marginal costs are often indeterminate and that marginal cost pricing, while efficient, may not allow the recovery of various forms of common costs.²³ Since the recovery of total costs is necessary to sustain production in the absence of government intervention, this presents a problem.

There is a substantial literature devoted to this problem focused on declining-cost industries (that is, industries in which average unit costs decline with greater total output over the entire relevant range). These industries will never recover total cost if they price at marginal cost. A variety of solutions was urged historically, from subsidy and government ownership—which then had better reputations than they have today—to multipart pricing. The solution usually advocated now is one or another form of multipart pricing²⁴ or Ramsey pricing,²⁵ that combines multiple prices with some form of rent limitation through regulation, rent extraction by taxation, or rent redistribution by a combination of the two.

Ramsey pricing is a form of price discrimination by which a natural monopolist can increase output and cover total costs without collecting monopoly rents. In Ramsey pricing, consumers are charged prices that are derived in inverse ratio to the slope of their demand curves, and a total revenue constraint is imposed to prevent monopoly profits. Higher prices are charged to those consumers with relatively inelastic demand curves and lower prices to those with more elastic demand curves. The common and sunk costs are recovered in greater part from those consumers paying the higher prices. In a perfect world using this pricing, no consumer willing to pay marginal cost or more would ever be priced out of the market and the producer would recover the inframarginal costs of production.²⁶

Ramsey pricing is regarded as benign and preferable to alternatives because the declining cost structure of the industries for which it is

23 See R.H. Coase, *The Marginal Cost Controversy*, 13 *ECONOMICA* 169 (1946).

24 *Id.*

25 For an excellent short exposition of Ramsey Pricing, see William J. Baumol, *Ramsey Pricing*, in 3 *THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW* 49-51 (1998).

26 See *id.*

prescribed makes monopoly, and hence market power, inevitable.²⁷ From a policy standpoint, eliminating market power is irrelevant, so the exercise becomes one in comparative statics, with output and price compared in different states of the world, all involving market power. Ramsey pricing becomes a tool whose results can be compared favorably with, for example, single-price monopoly.

The problem with insisting that price discrimination is identified with market power is that it is singularly unhelpful in interpreting many instances of the pricing behavior seen in the real world. The classic cases of price discrimination that fit the market-power model involve either natural monopoly or firms with separable costs. Without natural monopoly, the price discriminating paradigm is to sell for two different prices—at least one of which is above marginal cost—two identical units that can be efficiently produced separately. The separability of production costs makes marginal cost easily observable and deviations obvious. Because it is hard to see how a firm could succeed with such a strategy without the power to affect total industry output—thus preempting the possibility of someone else’s making the sale to the “high-price” customer at a price closer to marginal cost—it is easy to attribute the deviation of price from marginal cost to the exercise of market power. Where cost separability is violated through the existence of economies of scale (producing more units of the same thing together lowers costs) over the entire relevant output range, the implied natural monopoly implies market power as well.

B. *Difficulties of Allocating Common Costs*

Unfortunately this model does not adequately fit a real world in which many, perhaps most, products and services are sold in competitive markets²⁸ under conditions where the cost of efficient production of each unit is inseparably joined with at least some of the costs of some other units and of other products or services. While one can talk of the marginal cost of producing each bundle of associated products and services, it is difficult to assign common costs to individual units to whose production they contribute. No unit can be produced without the joint input, but eliminating the production of one of the commonly produced units would

27 I leave aside the theoretical argument for market contestability, which separates market structure from market power by positing a producer facing costless and instantaneous entry and exit, a very unusual situation.

28 As we shall see, this does not deny that some, perhaps many, goods and services use input factors which earn rents or are sold under conditions in which rents are generated by location, brand uniqueness or otherwise. And some of these factors may also contribute to successful price discrimination. But where common costs exist, the existence of market power is not necessary for price discrimination and is often not the most important element in determining its presence or magnitude.

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not reduce the marginal common cost. Each additional unit sold lowers average total cost *for that product*—but not for the total output of the firm, which would be the natural monopoly case—but incremental common costs cannot be assigned to any particular product or class of users.

It may be technically correct to say that the marginal common costs of producing $n-1$ units using the common inputs are the same as for producing n units or that the marginal cost of going from $n-1$ to n units is zero, but this is of little practical use in pricing the units. The most common of common costs may be such mundane input factors as facilities rent, the time and effort of general management, administrative overhead, brand (as opposed to product) advertising, or the costs of operating a network. They must be recovered for the firm to continue in business. To which unit or units should these common costs be assigned? Should they be assigned equally to each unit? And how should we interpret the marginal cost of a unit of a product when it contains inputs whose costs are shared across several products? To which product should each cost be assigned as we price them for sale?²⁹

To make things harder, many of these costs, in addition to being common, are sunk. In principle, according to the comparative statics analysis used to discuss price discrimination, all such producers should have difficulty under competitive conditions recovering their sunk costs. How do such producers recover their sunk costs? And how do they attract investment? This problem, under the rubric of “destructive competition,” absorbed regulators from the railroad cases from the 1880s on, through interventions in trucking, taxis, and airlines that started in the interwar years of the twentieth century. They were generalized during the years of the Great Depression to all industries as reductions in output left overheads stranded, creating the concerns that animated the National Recovery Administration. These arguments lost ground in some industries in the 1970s and early 1980s, but are still with us yet in many state and Federal regulatory contexts. Finally, some of the common or sunk costs, like R&D or brand advertising, which are not product specific, have declining cost or public goods characteristics.

If common costs are typical and the economy is basically competitive, then many, if not most, products and services produced with common costs are produced and sold in markets in which market power is absent or *de minimis*. To the degree to which these common costs are a trivial percentage of total costs, pricing will be driven and output defined by rising marginal costs, typically related to increasing input scarcity, etc.

29 See, e.g., DENNIS W. CARLETON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 50-51, 58-62 (1994).

But in modern businesses, even service businesses, common or sunk costs are a significant proportion of total cost.³⁰ How do private producers faced with these problems solve them in those competitive markets? Since they are constrained to recover total cost from total revenues, how can they do so? Do they face marginal cost prices in the markets in which they sell? If prices are based on something other than marginal cost, does that mean that there is inefficiency? And is it possible to have prices based on something other than marginal cost while facing competition?

Standard analysis is a bit vague on these points. It tends to model a world dominated by rising incremental costs. And it allows recovery of total variable costs for products produced with common inputs by setting price at average variable cost. For example, it allows recovery of common costs in homogeneous production like agriculture by dropping producers who can't recover total costs from inframarginal rents and assigning any returns above costs to factor rents. But many or most real-world markets do not resemble this model, especially as to individual products produced in common. For units produced with common inputs, whether all units will be the same or sold at the same price cannot be determined without considering whether there is a dominant strategy involving a set of discriminatory prices, perhaps supported by product differentiation, that also yields zero rents. And classical price theory has no good explanation for the recovery of *sunk costs* in competitive markets.

Another common way to account for these phenomena is to posit monopolistically competitive markets with modest locational or brand market power allowing rents.³¹ These rents can then finance sunk cost recovery in much the way that inframarginal rents are competed away in setting total output in the joint-product agricultural markets discussed above. For a single-product firm, this can produce a zero-rent equilibrium, even though the firm faces a sloped demand curve. But this theory does not really confer market power on the firm because it doesn't have the unilateral power to earn rents by reducing output or to reduce output for the entire collection of firms whose demand is related (industry output). And it doesn't really tell you in what way common costs for multiple outputs will be recovered, for example whether price discrimination will result and how it is supported. Purely separable costs are rare, while markets in which producers make competitive returns are not. More importantly, many common-cost inputs can be used in producing a variety of products in varying mixes, so that producers and markets often overlap and producers don't face exactly the same mix of consumers in exactly the same markets. Finally, the model requires that firms face sloped demand

30 These costs can include human capital investments like education, training, or reputation as well as more tangible costs.

31 See *supra* note 29.

curves, while for many products in various markets firms are in fact price takers who can control their own output but must sell at the prevailing market price.

C. Price Discrimination Efficiently Allocates Common Costs

My claim is that the most common way in which competitive producers of products and services that share common costs recover those costs is to charge different prices to customers who buy different units or different products that share those costs. The prices are market clearing prices determined by the slope of the total demand of each customer segment for each of the units or products, in a way that resembles Ramsey pricing. Instead of the regulator imposing a total revenue constraint, the market imposes the constraint. Consumers in the same demand segment are charged the same prices by competing producers. Entry is free and total supply for all the connected units equals the output that can be financed by the sum of the revenues available at each of the set of prices. Quantities are bounded by the constraint that total revenue must equal total cost (disregarding factor rents) for each producer and that the last group of units receives marginal revenue equal to its marginal cost of production. No group of units is produced for which incremental revenue does not equal incremental costs, but different units within the group are sold at different prices.

As in the standard common-cost models, prices are bounded by the fact that under competitive conditions, rents will continue to call forth supply from producers (who, depending on circumstances such as participation in geographic or product submarkets, may not be producing exactly the same product mix using the common inputs) until no additional unit can be supplied under conditions where total and group incremental cost can be recovered and a reduction in total revenue will require a reduction in total output. The price for each unit includes all separable costs, plus a share of common costs determined by the elasticity of demand of the customer set. This price is subject to change as input costs and technology change and as changes in demand for other connected units affect total revenue and total cost. Output then changes, producing a new market-clearing price for the quantity of the individual product produced jointly with the others. Efficient production requires full use of all common inputs, except those of a public goods character like R&D or advertising for which full use is in principle impossible.³² Firms that

³² Important elements of production cost do not vary with output. For inputs that behave like public goods, it is necessary for those inputs to be available for purchase or for a firm to have sufficient scale or scope that the burden of producing them does not place the firm at a disadvantage compared to its rivals.

cannot produce efficiently do not survive. No producer has market power and no monopoly or oligopoly rents are taken.

How does the industry reach these prices? This is difficult to specify with rigor. I posit that there is a repeated non-cooperative game whose outcome tends toward equilibrium, and in which deviations from equilibrium exist but tend to be anticipated or addressed in the next iteration. Producers whose pricing does not optimize given their production function and demand in the market segments to which they are selling do poorly and adjust or exit. In the real world, this is the way most markets reach equilibrium. The strategies of firms that do relatively well are imitated by others. Why can't firms recognize that there are price/output combinations that would produce rents and sustain prices and output programs at those levels? Because other firms will enter, driving output up and prices down, thereby eliminating rents. Why don't firms lower prices and increase output above levels that can be sustained? Because other firms are forced to match these prices, and firms learn that these prices are not sustainable.

To understand the underlying intuition explaining the equilibrium, consider the market for beef: The cost of producing cattle is determinate and the animals are produced in a competitive market. They are sold to processors at prices that tend toward equilibrium at the marginal cost of producing beef-on-the-hoof. But almost no final or intermediate consumer buys beef or beef products in this way. Processors in a competitive market buy whole animals, dressing and cutting them up in the way that maximizes revenue subject to competitive constraints and using prices from which they must recover the total cost of purchasing and processing the animal. Consumers or intermediate producers buy parts of processed animals at a variety of prices that include components of both the common costs and any separable costs of preparing the particular cut.

Some parts of the animal (the tenderloin) are valued more highly than other parts (bones). Although these parts were bought from the grower at the same price per pound, they are sold to customers at very different prices per pound. The price for each type of cut is a function of the intersection of the demand for that cut and the supply available from the number of animals that can be produced, taking into account the costs of determining and maintaining market segmentation. The total steer is sold for prices that cover the marginal cost of producing an animal and the various products derived from it.

Differences in culture or changes in wealth can affect or change the relative prices of particular cuts. Hispanic immigration and the popularity of Mexican food have raised the price of skirt steak relative to other cuts. This should produce higher total revenue, calling forth a larger supply of beef and inducing a decline in the price of hamburger as more cattle are

produced and byproducts must be sold. Another example: organ meats sell for relatively higher prices in countries where they are more highly prized than they are in the U.S., and the equilibrium total output and relative prices of different cuts should change. Finally, as any American who has tried to get her favorite cut of meat from a European butcher can attest, processors may cut up animals in different ways to maximize their value to consumers. As tastes change, the way the animal is cut and to whom the parts are sold may change. As Carleton observes, in the real world, determining these changes and defining a response is costly (“marketing costs”) and these costs are optimized in the process of segmentation.³³

In the end, identical parts will be sold at “discriminatory” prices based on the demand for those parts, not on their cost, which is mostly indeterminate. The total revenue will equal the total cost of processing the animal. What market power or collusion supports these prices? None. The producers are price takers. If the processor tries to get too high a price for steak, it doesn’t sell and her total revenue goes down. If she charges less than the market price, she sells out and gets less steak revenue to add to the hamburger revenue, bone revenue, etc., thus reducing her ability to pay the market price for the cattle. She can’t produce more steak without producing more hamburger. If we relax the model so that she can somehow substitute steak for hamburger (perhaps by buying a different breed of cattle), so can the other producers (unless she has unique access to the technology and thus gains market power), who will match her prices. If the new steak/hamburger price set will support more cattle supply, supply expands. If the price will support less, supply contracts.

One could argue that this is not really discrimination because these are “different products.” Economics does not have an unambiguous definition of “product.” Some definitions rely on substitution in production or consumption. They define products by saying that physical objects that are perfect substitutes are the same product. But this is not an exclusively technical question. To the extent that the substitutes have to be acceptable to consumers, they clearly depend on consumer tastes. Some production substitutes may not be perfect substitutes for some consumers and vice versa. The degree to which, for example, two objects or services are perfect substitutes therefore depends on the user. For one buyer, otherwise identical cars of different colors are the same. For others, the color differences will support price differences. Are they the same product?³⁴

33 Carleton, *supra* note 14.

34 This is a separate matter from whether medium-sized cars which are well-equipped are sufficiently differentiated from one another so that buyers would pay a premium to drive one brand rather than another, thus allowing design rents to be taken by the more desirable design. In the real world, it can be a problem distinguishing design or production expenditures designed to keep a product competitive with those that it is hoped will generate rents. The beef example abstracts from these issues.

As long as some consumers have different rates of substitution for two products that are perfect substitutes for at least one consumer, ambiguity exists as to where the product “boundary” lies and an opportunity for product segmentation to support price discrimination exists.

It can also be argued that because the product mix is fixed, this example isn’t really apposite. But, as in other industries, some variation in output mix is possible, for example by leaving a cut intact instead of grinding it into hamburger or vice versa. What can be produced is still defined by total revenue and only where substitution is possible could certain input costs be assigned as the opportunity revenue of the products is foregone. As in many cases, for most cuts, there is no defined marginal cost of producing a particular cut short of the cost of producing another animal to get just one product (as commercial buffalo hunters are said to have killed bison for their tongues alone).

A clearer way of looking at this problem is to see all beef cuts as “beef” for which customers are willing to pay different prices. Producers maximize their revenue by finding the combination of cuts from a single animal for which consumers will pay the most.³⁵ They must do so to survive because their competitors are doing so and there are no agreed upon or arbitrary limits on industry production. The mix differs from one market to another. In one, many different parts of the animal are ground together and sold as “ground beef.” In another, consumers value certain parts unaltered, and they are sold separately at different prices. The difficulty of transforming one cut into another is what allows the market to maintain the price differences. Price differences are limited by the extent to which products can be produced free of common costs or to the extent that it is possible to transform one product into another.

The regulatory and antitrust literature is ambiguous about what exactly “market power” is except that it is tied to the evils of monopoly. It is often associated with market structure, as in natural monopoly or monopoly achieved through barriers to entry or predation. At other times, it is associated with the ability to price above marginal cost, and sometimes with the ability to earn rents, or with above-competitive levels of return. As we have seen, stripped to its fundamentals, market power is the ability, unilaterally or collusively, to restrict total industry output to levels lower than could be supported by total revenue. While market power

35 As a thought experiment, imagine cutting up the animal in one-foot cubes and then iteratively varying the size and shape of the cuts and pricing them differently until revenue is maximized. The number of cuts that it will be worth labeling and pricing separately depends on the degree to which buyers value differences. As another example, before Americans were very sophisticated about seafood, many fish species caught and/or distributed together were sold at the same price as “rockfish” or “sea bass.” Many of these species are now separated in the market and priced separately. Were they the same product before and different products now?

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in this sense gives producers the opportunity to sever prices from marginal cost, the converse is not necessarily true. The presence of prices unrelated to marginal cost does not signal market power. When common costs are incurred in producing nonidentical units, unit prices will commonly be ambiguous to the degree implied by the nonseparable marginal costs. These costs will not necessarily be divided uniformly among the products or units that incorporate them. This lack of a determinate tie to marginal cost does not imply market power. Prices above marginal cost may be a sign of market power when costs are separable, but the market power allows restricting industry output so that prices can then be raised to clear the market. Without the ability to restrict industry output, there is no market power.

If total cost recovery in the face of sunk costs requires using prices set with reference to demand, competing producers will be required to adopt such a strategy to survive. If common costs render the cost per unit indeterminate, that does not mean that markets can't clear. It just means that industry output limited by unit marginal cost will give way to industry output constrained by the equation of marginal total cost for a group of units or products and the total revenue that can be extracted from industry-wide discriminatory pricing based on demand. In all cases, the producers will be price takers, not price setters, although here as in real-world single-product markets *tatonnement*³⁶ may produce behavior that looks like price setting as producers search to determine how factors should be combined into products and service and where the competitive price is for each segmentable group of customers for each product or service they produce. In short, the claim of this Article is that where there are significant common costs, any competitive equilibrium that recovers the firm's total cost must include price discrimination.

D. *The Price Equilibrium and Its Implications*

Is the set of prices an industry will charge under any given conditions unique? While one might strongly suspect that it is where all producers face exactly the same costs, including segmentation costs, and sell the same mix of products in the same market, I have not proved that claim. I can only demonstrate that firms will be price takers and not rent earners, and that the prices charged will recover different proportions of common costs from differing customer groups according to the slopes of their demand curves. It seems likely that in the more common case in which there are significant common costs that can be used to support different

³⁶ "Tatonnement" is the name Walras gave to the mechanism by which buyers and sellers "grope" for equilibrium levels of output and price. LEON WALRAS, *ELEMENTS OF PURE ECONOMICS* (Porcupine Press 1984) (1874).

product mixes sold by different firms to different customer mixes in different markets, there is not a unique price equilibrium which can be supported.

The argument I am introducing here does not settle the question of the uniqueness of the price equilibrium or how it is achieved. Consider a firm producing only steak and ground beef in a proportion limited by the proportion of steak that can be derived from each animal, with costs that differ only in cutting and grinding. One cannot say what the marginal cost of producing steak or ground beef is. The firm must recover its total costs to stay in business. Let's say those costs are \$100 per animal, and the firm sells steak and ground meat at a combination of prices determined by the slope of the demand curves for the two products that will exactly equal the cost of the animal plus processing costs, in this case \$70 for the steak and \$30 for the ground beef.³⁷ If the firm attempts to sell ground beef for more than \$30 per animal, its rivals will undercut it and none will be sold. If it sells for less, it won't recover its costs. But of course it could survive selling the steak for \$60 and the ground beef for \$40, and if it sold in some markets where steak was less popular, the market prices there might be \$40 and \$60, respectively. If markets overlap, some producers might have access to both sets of prices, but many may not.

If any producer chooses to charge different prices from those prevailing, whether higher (she won't be able to sell the overpriced units) or lower (she will lower her unit revenue, since she can't expand her production of any of the goods without paying for the others), her total revenue will decline and she will not be able to cover the cost of the marginal set of units. If, in the course of a repeated game, competitive matching of too-low prices results in industry revenue falling below industry total cost, firms (acting without coordination) will either have to adjust output or pricing strategy with the hope of correcting the imbalance in the next iteration. While any producer could experiment with other price strategies, charging the market-clearing prices dominates all the others.

But the typical case is more complex than the two-product beef example. For example, not all of the output using the common units comes from identical production or is sold into the same markets, and the precise mix of products sharing the common costs may differ from producer to producer. In such cases, the demand curve faced for the output sold to each customer segment will be the same, but each producer may produce the products in somewhat different proportions in response to those prices or produce additional products using some of the same inputs, so that the total set of prices offered by different producers may exhibit dispersion.³⁸

37 I am assuming for simplicity that all animals are the same size and yield the same proportion of steak.

38 See Dana, *supra* note 12, at 416.

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It is obvious that there can be considerable significance to consumers as to which set of prices prevails in which markets and precisely which set of products is produced using common inputs. The wealth distribution effects on persons with different tastes will be different. And if differences in price reflect differences in buyers that are tied to other characteristics (such as race or ethnicity or urbanity or rurality), there may be other social implications of the two price sets which government might want to take into account for non-economic reasons.³⁹

I observe that we can have price discrimination and product segmentation incorporating varying common or sunk cost recovery strategies where no firm earns rents, and price discrimination will not itself evidence market power in any of these circumstances. The sum of the prices must equal the firm's costs and it won't be able to recover those costs without price discrimination. In this model, market power only arises when collusion or a declining natural cost function leaves one or a few firms of efficient size, protected from competitive entry. In such circumstances, individual producers (or a cartel) are able to restrict industry output. They might do so by restricting production in certain market segments, or even by redefining the product mix to produce more variety—to maintain segmentation by reducing substitutability—or less than could be supported in a competitive market. They might do this to make some markets harder to enter or because of fixed output proportions find it in their interest to destroy output or sell it into apparently less lucrative markets.⁴⁰ In these ways, price discrimination could be used to entrench market power and decrease welfare. In such a case, prices might well rise above the competitive multi-price case, and they should rise along the multiple demand curves at different rates. Output will then be set at a new level that maximizes profit and leaves unsatisfied demand that could have been satisfied under competition. Welfare will decrease.

This certainly is not optimal, but note that one cannot distinguish between the market power case and the competitive case by observing segmentation or multiple prices. To find market power, one will be required to do a conduct or structure analysis that is independent of the existence of multiple prices and which is designed to find restriction of output by intention or effect.

39 See, e.g., Ian Ayres & Peter Siegelman, *Race and Gender Discrimination in Negotiation for the Purchase of a New Car*, 85 AM. ECON. REV. 304 (1995).

40 One view of the California electricity crisis of 2000-2001 is that electrical generating firms have found that taking units out of service for maintenance or directing incremental power into apparently lower-priced markets sufficiently raised prices in California to compensate them for the lost or lower-priced output.

E. Sustaining Price Discrimination

Companies in competitive markets can maintain segmentation of their customers in order to price discriminate effectively. Consider the case in which what is being produced is a service, a perishable good, or a good technically difficult to transfer from user to user.⁴¹ In such a case, there need be no physical difference between units of the good or service to allow multiple prices to prevail, and if the production conditions for these units entail common costs, it will be possible to observe what appears to be particularly egregious price discrimination under competitive conditions (without market power). The analysis is similar to the beef case, but here the “cuts” may not look or taste very different. Recovery of common costs from the production of this service or good will be undertaken through market segmentation. The producer who neglects to do this will have lower total revenues. Other producers may have to compromise optimal segmentation by matching to reduce losses, but total revenue will not support total output. If a producer is unable to survive until the next iteration, she will leave the market and output will drop. If producers stay in, they will learn that there is unsatisfied demand that can be satisfied only through segmentation—charging lower prices to some customers and higher prices to others—even if what is being supplied to different customers is identical.

This situation depends critically on the ability of producers to identify and separate customers based on demand curves with different demand slopes. The effort to do so is costly and will limit the degree of segmentation that is worthwhile. One way to do so is to sell services in different geographic markets, even if there are no differences in the cost of serving them. Another is to separate submarkets by distribution system or even language.⁴² A third way is to artificially differentiate services by deliberately making those sold at the cheaper prices less attractive to the buyers in the more expensive markets (even if there is no associated cost saving in supplying the less desirable service to the cheaper market) as long as the incremental cost of creating the new segment is less than the incremental revenue from satisfying it.

The same strategy can be developed even further with respect to products. Product variations can be introduced that enhance or degrade the value of products that share common costs. As long as consumers are

41 It might, for example, be something that is permanently installed and cannot be economically changed by a subsequent purchaser, such as paint color, antilock brakes or many other kinds of optional equipment on an automobile.

42 It has been customary in airline markets to sell certain tickets at very low prices to travel agencies or wholesalers who have a price-sensitive customer base that speaks a different language than the dominant one. The agents advertise and sell in the “foreign” language without disturbing the prices at which tickets are sold to the dominant language-speakers.

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unable to transform the products themselves into the more or less valuable variant at a cost less than the price difference, common costs can be recovered differentially through demand-driven pricing. As in the case of price discrimination, product segmentation can be a way to recover common costs in a competitive environment, or it can be a way to capture rents by creating market power through product differentiation. And as with price discrimination through market power, product differentiation can be an output-increasing method of capturing consumer welfare or can be an output-reducing way to entrench monopoly by making entry more difficult.

As long as segmentation of demand is feasible, total revenue is increased by the segmentation and all producers will have the same cost functions (including common costs). Producers will all have similar incentives to discriminate and will tend toward a discriminatory equilibrium in a repeated non-cooperative game. And as long as there is no restriction on entry or output, producers will be price takers in each submarket, and continue to invest in production or development as long as incremental total revenue (from all of the units using the common input) equals or exceeds the incremental cost. Independent confirmation of the unilateral or collusive ability to limit industry output is necessary to associate this discrimination with market power.

IV. Airlines: A Real World Example

The airline industry represents a particularly dramatic opportunity for this kind of segmentation. First, all of the seats on a particular flight are produced in common at nearly identical cost (leaving aside class of service issues).⁴³ Second, the infrastructure costs of running the airline network (examples include station costs, flight control, maintenance overhead and labor, and reservations overhead and labor) are not produced separately for each passenger or usually even for each flight. Third, for a network airline, the cost of providing each passenger with a trip is shared with passengers with different itineraries. Airline networks combine passengers originating at and/or destined for multiple cities on the same flight in order to share the indivisible burdens of providing desirably frequent service in markets that do not attract enough passengers to support nonstop service at competitive costs.

As an example, assume that Ruritania produces a number of passengers each day to all destinations sufficient to fill a number of aircraft

⁴³ Stochastic variations in demand can create inventory holding costs as well as opportunity costs from premature sale at lower prices. While devices like advance purchase requirements make it less costly to estimate and accommodate stochastic demand and to accommodate last-minute high-priced demand, these cost savings are not the principal drivers of airline fare differentials.

of minimum efficient size, but not enough to offer satisfactorily convenient service to any one destination (Metropolis). It can easily be seen that useful service can only be achieved by combining passengers with different itineraries. The most efficient way to do that is to take these passengers to a central point we can call Centralia (a “hub”) and recombine them with travelers from other origins but going to Metropolis so as to form groups large enough to pay the costs of flying aircraft of minimum efficient size. Consider a city big enough to produce enough passengers to do this on several competing airlines, but not big enough to fill aircraft of efficient size flying at the minimum competitive frequency to any individual city. In such an example, passengers could receive service from competing firms, each of which would have to combine service for many itineraries on the same plane.

What is the marginal cost of carrying a passenger from Ruritania to Metropolis? We know the cost of flying an airplane from Ruritania to Centralia, but only a few of the passengers on board are going to Metropolis. We know the cost of flying an airplane from Centralia to Metropolis, but only a few of the passengers on board came originally from Ruritania (or Centralia, for that matter). We know the cost of operating the whole network for a day or a year. But leaving aside separable costs such as meals and the small amount of extra fuel burned by filling a seat, we simply do not know the marginal cost of carrying a passenger from Ruritania to Metropolis, or for that matter between any two points in the network.

Now suppose that passengers vary greatly in the price-sensitivity of their demand for travel. A business passenger values time and convenience highly. She wants to go at a time that allows her to make her meeting without wasting time and may wish to combine stops on a business trip in a way that requires very precise flight selection. She is willing to pay a relatively high fare for a flight that leaves on her preferred schedule. If she cannot get the schedule she wants, she may not want to go at all. At the opposite end of the spectrum is a retiree with a car. She is willing to drive on shorter trips if the airfare is too high and on longer trips she is willing to endure stops, long connections, flights departing over a wide range of departure times and other inconveniences in order to save airfare. She is only willing to pay a small fraction of what the business passenger will pay for the trip, and she is even willing to stop or change planes at Nowheresville instead of flying nonstop to Centralia if that is required to get her price.

In this model, producing a network of competitive size (with respect to both scope and scale) requires finding a way to combine the demand of the business traveler with the demand of the leisure traveler so as to allow frequent service at competitive prices. This arrangement requires price

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discrimination to provide capacity and frequency efficiently for all the reasons discussed above, as well as to accommodate uncertain demand in the way that Dana⁴⁴ and Carleton⁴⁵ model. Passengers willing to pay more are combined with more price-sensitive passengers and production is increased in frequency and scope to attract convenience-oriented higher-paying passengers, while indivisibilities are accommodated by offering capacity to price-sensitive travelers. In this way, firms can remain scope-competitive while remaining price-competitive as well. Firms that experience indivisibilities (common costs), sunk costs and uncertain demand cannot operate efficiently without price discrimination. In a competitive market, all surviving firms will adopt a variant of this strategy, although common costs may be shared in more than one combination of outputs and prices.

But there is a significant obstacle to this result: Since (unlike beef cuts) the transportation offered (a seat in the coach cabin on a convenient flight) is objectively identical to most passengers, how can the firm price discriminate? What keeps the business traveler from flying at leisure fares? Asking the customer the purpose of her trip or how much she is willing to pay will only elicit strategic behavior. And even if one firm could somehow separate these customers, how can it keep a competitor from offering lower prices to the “high-price” customers?

For the first question, the answer in the airline industry is to limit access to the lower fares by putting conditions on them that will be unacceptable to most business travelers. Requiring a twenty-one-day advance purchase will make the fares unusable by customers whose trips arise out of a last-minute business need. Requiring a round-trip purchase makes it harder to put together an uncertain or complicated itinerary. And requiring a Saturday night stay will make business travelers who wish to take advantage of weekends for leisure reluctant to use the lower fares and their employers reluctant or unable to force them to do so.

The answer to the second question is that, as suggested above, firms that do not price discriminate can neither offer as wide a choice of flights nor can they minimize their capacity costs. They will earn less revenue per unit of capacity offered. Over time, they will tend to disappear. Because competition moves toward a set of prices that generate no rents, it will be necessary to maximize revenues (subject to the competitive constraint) and minimize costs to stay in business. Since the only way to maximize revenue and to minimize costs is to have price segmentation based on elasticity of demand, surviving firms will tend to do so.

44 This is the function of airline revenue management systems.

45 For example, under conditions where it doesn't pay to expand capacity or change prices to meet excess demand, an airline may give its most frequent fliers preference in booking flights that are or will be sold out.

Network airlines with effective revenue management (price discrimination) systems consistently operate at higher revenue per available seat mile and higher load factors (percentage of seats filled, meaning less capacity cost per unit of output) than airlines without good revenue management systems. These systems are readily available to any network airline, either by self-development (no longer common for new users, given the quasi-public-good character of software) or by purchase from several different vendors.

Even point-to-point airlines, whose business models do not exhibit the extreme common-cost characteristic of network airlines, find that the indivisibilities that come from constant aircraft size in the face of fluctuating demand and the attractiveness to customers of increased flight frequency force them to price discriminate. But because discount point-to-point or “quasi-network”⁴⁶ airlines offer less convenience at less cost (less extensive networks, more remote and less-congested airports, less-coordinated connections and fewer customer service features) and limit their high-end fares to attract customers from network airlines to their less attractive product, their optimum discriminatory pricing mix is different from network airlines, and the optimum price set for network airlines exhibits a much higher difference between the highest and lowest fares.

If the competitive equilibrium is to have price discrimination in airline fares, how can the industry distinguish between low-fare and high-fare customers? Multiple classes of service offer a partial answer. They use commonly produced space on the plane but price it differently. But this is only a partial answer, since many passengers won't pay for amenities. And unlike an expensive cut of beef, a business ticket in coach doesn't look or feel any different from a bargain-priced leisure ticket—same seats, same meals (or lack thereof), same departure and arrival times. The answer is to degrade the attractiveness of tickets bought at lower prices by imposing restrictions that make them less attractive to those willing to pay high fares for convenient travel.

As mentioned above, the most common of these is to put advance purchase, roundtrip and Saturday-night stay restrictions on access to those fares. While the advance-purchase and roundtrip requirements may also have cost-saving aspects,⁴⁷ they clearly also function as “fences” (as these kinds of restrictions are called in the industry) to keep out business travelers whose demand often arises on short notice. The Saturday night

46 “Quasi-network” airlines can be defined as airlines whose route systems allow passengers in markets too thin to support nonstop service to make connections, but which are unwilling to incur significant costs to make those connections more convenient. They are distinguished from network airlines, which incur significant costs to make connections convenient so as to attract high-value customers in markets that will not support nonstop service.

47 See Dana, *supra* note 13. The roundtrip requirement also slightly reduces transaction costs.

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stay has no cost-saving justification, but represents an effective way to screen out business travelers who wish to spend weekends with their families or in other leisure pursuits not at their business destination. Other price-discriminating features are to limit notice of availability of last-minute low fares to certain distribution channels (consolidators) or to a random selection of routes publicized on very short notice (internet fares).

The phenomenon of price segmentation is also linked in an important way to the structure of networks. Networks exist to provide economies of scope, but they also are built around indivisibility thresholds. That is, the size of the sustainable network is in part a function of the smallest unit of production that produces unit costs consistent with maintaining service. That unit size depends on technology, of course, but it also depends on the structure of prices that the network can charge. Hence, the apparent lowering of the indivisibility threshold in airline networks to allow the use of small jet aircraft to provide relatively frequent jet service between points that previously could not sustain this service is related perhaps more to the increase in the spread between the highest and lowest fares charged in the network than it is to any technological advance in the design and manufacture of aircraft. (It is also highly dependent on a discontinuity in the price of labor contained in the labor contracts typical of large network airlines.) The ability to segment and charge very high prices to certain travelers means that trips that are disproportionately attractive to them (direct service in small jets on routes or at times that will attract business travelers) can achieve very high unit revenues to offset their high unit costs.

V. Examples from Other Industries

Arguably, this same phenomenon is seen in pricing express package delivery services. Depending on capacity and load at any given point, once the infrastructure for providing overnight service is in place, it may be no more costly except on peak days to provide overnight service than two-day service. But rather than simply undertake peak/off-peak pricing, giving premium service priority and delivering two-day packages overnight when capacity permits, the typical and better strategy is to actually incur additional costs to store two-day packages enroute and thus fully segment the market by offering two consistent “products” to customers with different elasticity of demand for package express service. Shippers who elect to pay for the lowest level in service and have demonstrated indifference to delivery time are actually more likely to get the benefit of any stochastic variation in shipment time, since this is cost minimizing. In the same way, high speed Internet access subscribers are charged on a monthly basis by the data transfer rate they wish to purchase, even though

the “cost” (other than the modem) of serving them is the same. The result of all this segmentation is the ability to support large networks with relatively ubiquitous service, offering some very low prices and some very high prices and many prices in between.

But there is nothing unique to airlines or networks or even to services about this strategy. It works easily for services, because the provider can withhold service at the lower price from a customer she and her competitors can reliably identify as a “high-paying” customer. And the strategy is common in networks, because the scope of a network is crucial to its competitiveness and price segmentation is essential to spreading the common costs of a network in a way that will allow the greatest scope of service.

As indicated above, this strategy can be adopted for transferable goods as well, as long as a way can be found to make it more expensive for customers to alter characteristics so as to make the lower-priced product variant less desirable than the spread in price. Hence, auto manufacturers will choose to limit the availability of optional equipment that is thought to be attractive to high-end buyers so that it can only be ordered on a higher-priced product line that shares common costs with a lower-priced line. Price-sensitive buyers who don’t care so much for features or who are not as brand-sensitive get a low-priced offer. Buyers who care more about what they drive pay more. After-sale installation is expensive and often less functional. For example, when air conditioning was a novelty and “factory air” was much more desirable than aftermarket air conditioning, it was only made available on expensive car lines. Similarly, even today anti-lock brakes are not an available option on some manufacturers’ lowest price lines.

Why would a manufacturer not make these options available at the same price on both its higher priced and lower priced lines? It incurs common engineering and production costs across vehicles. It must recover them to survive, and competition forces it to spread these costs over as many vehicles as possible. Because customers vary in the value they place on vehicle characteristics, its optimum strategy for recovering those costs is to segment customers by developing as many vehicle variations as they will pay for and then by price discriminating among them. One reason for limiting the availability of desirable variations is to provide incentives for customers to purchase the higher-priced lines. Price discrimination and broad model scope allow it to spread common research, production and marketing costs over the largest number of units. Again, because

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competitors face similar (but not always identical) cost functions, they will be forced to adopt similar (although not always identical) solutions.⁴⁸

Carried to its extreme, this strategy can find expression in the production of goods on which the manufacturer incurs extra cost to offer a lower-performance version. Consider, for example, computer chips. A computer chip with the same basic architecture is produced with several different clock speeds or even (in the case of the Celeron compared to the Pentium III) with a computing feature disabled.⁴⁹ Research and development expenses and many production costs are shared in these chips, which are designed to a maximum performance specification. They are then sorted for production variation or disabled in a way that is prohibitively expensive for consumers to modify and are sold at widely differing prices.⁵⁰ Until volume allows production of a submodel at a cost lower than the opportunity cost of occupying space on the chip with unneeded features, the chips may actually be identical, except for the speed setting. The fastest chips are priced considerably higher than the slowest, so that performance-minded buyers can pay more of the common costs than budget-minded customers. Competing producers need the revenue from the higher-paying buyers to maintain competitive research and development budgets and the volume from the lower-paying buyers to spread production costs. Once again, competing producers are forced to adopt similar strategies.⁵¹

Finally, even in very competitive industries where there are significant non-separable costs, like ordinary restaurants without special cachet, discriminatory pricing strategies are often adopted. Items are available a la carte that aren't available on a combined lower-priced dinner. Lunch is less expensive than dinner. Wine and liquor carry higher margins than food. While, for example, the lunch/dinner distinction may be based on peak/off-peak needs, it is often the case that restaurants that are not full at either time price in this way, or that they are more crowded at lunch than at dinner. Lunch is usually more hurried and is not part or all

48 This explains the acquisition of specialty auto manufacturers by large producers. Separable costs can be recovered from separate models and distribution systems (or spread discriminatorily within a brand line), but price discrimination managed through brands allows the most efficient recovery of common costs.

49 *Rivals Releasing New, Cheap PC Chips*, THE SAN DIEGO UNION-TRIBUNE, Mar. 28, 2000, at 17.

50 As of January, 2000 Pentium prices ranged from \$851 (800MHz) to \$193 (500Hz). Perhaps most interesting was the way the price range declined at certain "break points," such as at 750-733MHz and at 650-600MHz, suggesting discontinuities in common costs. AMD's prices, not surprisingly, show similar progressions and breaks. See *Intel and AMD Cut Prices*, Geek.com (Jan. 25, 2000) at <http://www.geek.com/news/geeknews/jan2000/gn2000125000505.htm> (last visited Dec. 10, 2001).

51 Michael Kanellos, *Intel: Upcoming Itanium Chip Will Hit 800 MHz*, CNET NEWS.COM, (Feb. 7, 2000) at <http://news.cnet.com/news/>.

of an evening's entertainment. The demand curves for lunch and dinner have different slopes.

Perhaps an even more dramatic example can be found in the fast food industry. It is a commonplace in the business that a fast food restaurant sells hamburgers with a much lower markup from variable cost than is entailed by the prices of french fries and soft drinks (which are sold separately at very high margins above variable cost). How can we explain this in a world without market power?

One way is to assume that all restaurants are the same size and that this size is a constraint on how many customers can be served per hour. Customers are all identical, and each has a separable utility function, yielding separate demand curves for hamburgers and fries. The restaurant's cost function includes a fixed common cost for maintaining the facilities plus separate marginal cost curves for hamburgers and fries. Restaurants are free to separately price hamburgers, fries, and tables. What is the equilibrium?

In this example (unlike the real world), the restaurant is going to be full all the time, since this is a perfect competition model with no stochastic demand or other complications. Hence, the restaurant faces a known demand curve for hamburgers—the demand curve of one customer times the number of customers. It maximizes surplus (consumer plus producer) by setting the price of hamburgers at the intersection of that demand curve and its marginal cost curve for hamburgers, and similarly for french fries.

We now add one additional assumption: Restaurants only charge for food, not for entry or use of a table. Some economists might think this odd, but this is the observed behavior of restaurants in the real world.

Suppose that with marginal cost pricing of hamburgers and fries, total cost is larger than total revenue. In order to cover costs, the restaurants raise prices. How do they do it?

They still want to maximize total surplus, subject to the new constraint. Suppose demand for fries is very inelastic, and demand for hamburgers is very elastic. A ten-percent increase in hamburger prices will then produce a large deadweight cost, while a ten-percent increase in the price of fries will produce a small deadweight cost. So they minimize the deadweight loss by increasing the price of fries a lot and the price of hamburgers only a little. They thus cover their total costs while providing more surplus to the customers than with any other pattern of prices that would cover those costs. The same thing would happen if the entry fee had been negative, except that in that case they would be pricing hamburgers a

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little below marginal cost and fries a lot below marginal cost, in order to pay customers to come.⁵²

This account explains prices not proportional to marginal cost in a competitive industry. It does not require strong assumptions, provided that the one pricing constraint (not charging separately for tables) exists. And one might argue that the constraint is a reasonable one for fast food restaurants, given that the inefficiency per customer is probably low (fast food being cheap) and the cost of monitoring entry and tables is significant.⁵³ To the extent that practical considerations often prevent separate “entry” charges to recover common costs, it appears to represent at least one common version of the phenomenon I have been describing in this Article—the use of Ramsey-like pricing in a competitive market.

VI. Regulatory Implications

The preceding argument is not meant to deny that market power can be found along with competitive markets in a complex multiprice real-world environment. Local airline monopolies can exist even where global markets are competitive. Distinctive product attributes may make one brand less than a perfect substitute for another for particular consumers, and price strategies can be adopted that make it difficult for entry to occur even if it would be possible at a different set of prices. Input rents can affect output and price. Scale indivisibilities may leave only one firm in a market or submarket, giving it power to reduce output locally, with substitution limited by transportation, transaction or transition costs (such as the sunk cost of displacing a monopoly producer whose monopoly is sustained by indivisibility). Where such cases involve joint costs, there can be two different sets of discriminatory prices, one with rents and one without. But in each case, it is not the existence of the price segmentation that signals the market power.

In competitive discriminatory situations, price competition occurs within product or customer classes, but is bounded across them (within the economic limits of segmentation). As we will see, airlines may compete for discretionary travelers by reducing the low fares currently on offer with discriminatory conditions, but they cannot afford to relax the conditions.

52 I am greatly indebted to David Friedman for this example and have adopted verbatim much of the language in which he suggested it. Professor Friedman participated in a seminar at Stanford University and supplied this example to the author in an email communication. Any errors introduced by my editing and adapting it or by its inappropriate use or context are, of course, mine alone.

53 In fact, restaurants whatever their class rarely charge separately for tables, although it is common in hotels to charge different prices for the same items prepared in a common kitchen but consumed in different surroundings and common in Europe to charge different prices for certain items such as drinks consumed at tables instead of at a bar. Some of these differences may be cost based, but others are clearly meant to reinforce market segmentation.

On the other hand, they may raise or lower fares to business travelers, subject to competitive constraints. Some price movements represent experiments to find the slope of the segment demand curves and would take place whether or not market conditions are competitive, but others may represent responses to competition within a price segment or may be an attempt to increase business volume within that segment at prices that exploit a cost advantage. The cost advantage may be from increased efficiency or from unused capacity that is maintained due to indivisibilities and therefore has a low opportunity cost.⁵⁴

To determine whether a market is competitive, one must know the degree to which the firm's total revenue is constrained by competition. If all firms must engage in Ramsey-like pricing to recover common costs efficiently, then competitive conditions will be reflected in limits on total revenue imposed by the willingness of competitors to capture business in each segment by lowering prices along the segment's demand curve, subject always to an incremental cost constraint. This process will proceed until all monopoly rents have been dissipated, but it will still exhibit multiple discriminatory prices at each stage because a discriminatory price strategy allows maximum common cost recovery from any given set of demand conditions.

This general result has important policy implications. It partly explains the political paradox referred to at the beginning: Network airlines have many common costs, both cross-sectional and temporal. By almost any measure and according to nearly every serious study that has been done, airline deregulation has been a great success and airline markets are generally competitive. But notwithstanding more than twenty years of evidence and a near-unanimous chorus of scholarly approbation, a steady drumbeat of political and media criticism continues. Complaints about airlines are a reliable audience-getter for congressional hearings, political speeches, newspaper stories and TV news segments.

While there are complaints about airline attitudes, lost baggage and on-time performance, in objective terms there has been little deterioration along these dimensions and in some areas, such as choice of service or reduction of the number of multi-stop itineraries, there has actually been improvement. Airline amenities have worsened, but that is because once the public was free to do so, it chose low-price service with tighter seating and worse food over the previous product which was the outcome of the service competition at fixed high prices that prevailed under regulation. Deregulation has disadvantaged some while it has benefited many; this is

⁵⁴ Several airlines whose systems or service attract fewer full-fare passengers and first-class passengers than their competitors offer "first class travel for the price of coach."

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true of virtually every public policy change and doesn't explain the intensity, popularity or durability of criticism of airline deregulation.

In order to recover their common costs while expanding their networks to stay competitive, network airlines engage in extensive market and price segmentation. Under the pricing freedom of deregulation, the top fares paid, usually by business travelers, for walk-up fully refundable tickets have risen substantially. Coupled with falling leisure fares, this has created a spread between the highest and lowest fares paid by air travelers that is unprecedentedly wide.⁵⁵ Even as low fares continue to expand overall traffic substantially, market segmentation continues to increase and a relatively significant and increasing share of revenue comes from a relatively small number of passengers. Passengers paying very high fares sit next to passengers paying low fares, receiving the same inflight service and having purchased what appears to be the identical product. Finally, the fare structure is almost laughably complex.

Motivated by the hostility that price discrimination creates and armed with a model that says that price discrimination requires market power, both academics and the public have engaged in a widely publicized hunt for the sources of the monopoly power in the airline industry that is presumed to underpin the highly discriminatory price structure which has emerged since deregulation. The strongest evidence adduced for the existence of substantial monopoly power is the price structure itself. Even strong defenders of deregulation seem to concede that some sort of monopoly power is necessary to support the current airline price structure.⁵⁶

Armed with this sort of analysis, politicians have been pressured to bring the power of the government to bear to eliminate the pricing disparities. Since airline deregulation has eliminated the attraction of direct price regulation, the administrative branch and the Congress have been searching to identify remedies that can be directed at the presumed sources of monopoly power that have been "discovered" without introducing "reregulation." And even the academics and policy analysts who generally support airline deregulation have felt constrained by the "evidence" of the price structure to devote their energies toward trying to figure out how to eliminate the supporting monopoly elements while keeping the benefits that entry and pricing freedom have brought the public.⁵⁷

The significance of all this from a regulator's standpoint is that the pricing described here presents a classic and politically salient dilemma. Very high discriminatory price differentials support larger networks in

55 See *supra* note 5, at 22-40.

56 See *id.* at 73.

57 See, e.g., Severin Borenstein, *Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry*, 20 RAND J. ECON. 344 (1989).

which total revenue equals total cost and every purchase is voluntary. The large price differentials, especially when there is little or no onboard service difference to “justify” them in the mind of the high-paying consumer, create complaints of invidious discrimination. They also engender complaints from firms that offer different product mixes with different configurations of common costs and find it difficult to compete with prices at the low end of the differentiated range.⁵⁸ If the regulator is not seen to be responding to complaints then political pressure will mount, news stories will point out the unfairness and “absurdity” of the wide disparity in fares paid by customers and the regulator will end up testifying before Congress and suffering abuse from the representatives of those paying high fares, many of whom are also representatives of previously underserved cities which have gotten new service supported by the discriminatory price structure. Complaints of “monopoly” abuse will be widespread and “action” will be demanded.

VII. Misusing Price Discrimination in Competition Analysis

A striking example of these misguided attempts to eliminate monopoly power is the accusations of predation that have been made by new entrant airlines attempting to compete with network airlines, many of whose costs are incurred as common costs. The usual scenario is that a would-be competitor enters one segment of a price-discriminating network airline’s system, charging some fares much lower than those prevailing before entry. It sees its competitive opportunity as that of undercutting the fares that the network airline is charging to its least price elastic customers on that route segment and/or in relaxing the conditions that the network airline imposes on low-fare customers in order to make those fares unattractive to less price-sensitive customers from whom the airline hopes to recover more of its common costs. The network airline matches the fares, even though its average unit costs are higher than the new entrant’s, and expands capacity to accommodate the expanded demand at the new fares. Since there is now no incentive to switch airlines, many local customers stay with the network airline. The new entrant withdraws from the market, and the network airline then returns fares to the previous level.

The predation claims that follow can be pursued either in court under the antitrust laws⁵⁹ or in an administrative setting.⁶⁰ In either case, they

58 These firms often have lower average costs than the firms with which they compete, prompting them to perceive prices with which they find it difficult to compete as “predatory.”

59 See, e.g., *United States v. Am. Airlines*, 140 F.Supp. 2d 1141 (D. Kan. 2001).

60 See generally DEPARTMENT OF TRANSPORTATION, DOCKET NO. OST-98-3713, POLICY STATEMENT REGARDING UNFAIR EXCLUSIONARY PRACTICES—STATEMENT OF ENFORCEMENT POLICY REGARDING UNFAIR EXCLUSIONARY CONDUCT (1998).

follow the same basic pattern. They allege market power and attempt to support that inference by noting the existence of a discriminatory price structure. They accuse the airline of lowering prices below “cost” to match the competition, expanding capacity to accommodate traffic even though the route is “losing money” at the lower fare and then raising the fare back to monopoly levels once the new entrant has left the market. There is a superficial plausibility to these claims which has engaged government officials and journalists, but which has so far eluded judges.

As discussed above,⁶¹ the network airline serves any given city-pair as part of a pattern of service connecting a city to a hub at which connections can be made to many other points on the network. Service in a particular market, say *A-B*, is provided, using common costs, with service from *A* to London, New York, Los Angeles, Tokyo and the hundreds of other cities served by connections from their hub. The network airline competes with other network airlines on many itineraries and doesn’t earn monopoly rents from its network activities.⁶² Any given aircraft flying between the two cities carries passengers with many different itineraries. The incremental cost of carrying each passenger is small. The airlines create a price structure that recovers common network costs from passengers based on their elasticity of demand. The calculation of demand elasticity takes into account the value the passenger places on the trip and all of the passenger’s alternatives, including service provided on other airlines, in other transport modes and the possibility of postponing or avoiding the trip. As we have seen, this discriminatory price structure will be adopted by all network airlines and their competitive offerings in the markets in which they compete will ensure that monopoly rents are not earned. The price structure should maximize revenue subject to the competitive constraints.

When the new entrant appears, the network incumbent must go through the following reoptimization exercise: First, it must ask whether matching the new prices or not matching at all would result in revenue losses that would force the airline to abandon the connection to the network. Because eliminating *A-B* service would mean eliminating service between *A* and the large number of other cities connected to it through *B*, not only costing the airline that revenue but reducing the value of the network at all the other points it serves, optimization for the network airline very rarely involves abandoning the network spoke.

Second, the network incumbent must ask whether, given that the airline will stay in the market, it pays to match the fare. Since the new fare covers the new entrant’s total costs, it is very rare that it won’t present a

61 See *supra* Part IV.

62 This is not to say that it does not earn monopoly rents anywhere, only that they are irrelevant to its behavior in this example.

valuable incremental revenue opportunity to an airline already serving the point as part of a network serving many other points.

Third, it must ask whether demand at the new fare can be accommodated on the existing service and, if not, whether capacity should be expanded to do so. Given that most system costs are already in place, incremental capacity costs go down as aircraft size goes up, marketing costs exhibit extreme economies of scale, and local station costs exhibit indivisibilities, it will almost always pay to expand capacity to accommodate demand stimulated by the new fare.

Note that the incumbent is maximizing subject to the constraint that the new local fare will be that set by the new entrant. The result doesn't leave it better off than it was before entry occurred, only better off than it would be without staying in, matching price and expanding capacity.⁶³ The network incumbent therefore matches the fare and increases capacity to cope with the increased quantity demanded.

The new entrant often discovers that the market will not support both it and the incumbent or incumbents and leaves the market. The incumbent now reoptimizes the prices and quantities on the network, using exactly the same process that it went through in the previous iteration. Prices and capacity return to the previous state or, if the incumbent has learned something about demand or costs from the experience, to a different equilibrium that takes account of that information.

From the perspective of the regulator or the customer whose appetite was stimulated by low prices that are then removed when the competitor disappears, this process can look predatory. But no intent to eliminate competition is necessary to this scenario and the matching behavior in this scenario does not constitute a loss to be repaid from future monopoly profits. Note that prices were being optimized subject to competitive constraints before, including the discriminatory price structure necessary to maximize revenue, and are now being maximized in this way again. No market power is necessary to explain or support this behavior.⁶⁴ The behavior cannot by itself support a claim of predation.⁶⁵

If the regulator heeds the complaints and attempts to compress the fare structure, service will be withdrawn from some markets or frequency

63 If the lower fare would have been more profitable in the first place, the network maximizer would have charged it. Sometimes, of course, the network incumbent discovers that its demand or cost assumptions were incorrect and that it does better at the new fare than it had anticipated. In that event, the entry has revealed information that previously wasn't apparent. Of course, in a competition scenario with networks having different total costs, one of the networks may be forced to drop out. Presumably, given free entry, it would reappear once the new entrant exited.

64 This analytic process need not be limited to airlines. It applies to almost any network industry and, by extension, to any firm whose products share a great many common costs, when faced with an exogenously-driven price change in one of them.

65 As the court found in *United States v. American Airlines*, 140 F.Supp. 2d 1141 (D. Kan. 2001).

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(availability and variety) will be reduced. This will frustrate some willing purchasers (perhaps even some of those who complained about prices but bought the service anyway!) by eliminating transportation options they preferred to not traveling or to using other modes. Efficiency will suffer, and the regulator may not escape criticism, which will now be from geographic or consumer interests that suffer from the service reduction. Pressure will mount to mandate and perhaps subsidize more service, for example to smaller communities. The regulator may end up testifying before Congress and suffering abuse from the representatives of underserved cities.

If an increase in price discrimination is part of the explanation of why airline deregulation has come under so much criticism, it still leaves the rest unanswered. If my observations are correct, this sort of pricing is extremely widespread. Why don't the same complaints exist about goods and services that are priced similarly elsewhere in the economy? Here, I have no model and no systematic explanation. My surmise is that it is because the unregulated industries do not have a history of regulation that suppressed price differences that support greater output and more efficient use of common inputs. In addition, most previous regulation of such other network industries as electricity and telephones enforced, rather than suppressed, price discrimination (probably because they were perceived to be natural monopolies in which Ramsey pricing was an efficient way to achieve cost recovery) in a way that accustomed consumers to this kind of pricing. The mandated difference between business and residential, and local and long-distance pricing in the telephone industry is an example. Deregulation has certainly rearranged and expanded many of these discriminations, but it has not moved so dramatically from government-enforced pricing simplicity to widespread segmentation.

In that sense, the rest of the explanation here may be the historic fact of the elimination of government constraints on price segmentation in competitive network industries. This is, of course, one of the major sources of the enormous expansion of output in the airline industry since deregulation. The resulting expansion both in the scale and scope (network extent and frequency convenience) of the industry has been welcomed, but the simplicity and apparent equity of pricing that constrained it are missed.

Conclusion

What I have tried to do here is: (1) explain the prevalence of highly differentiated price structures in an economy that is generally competitive; (2) "de-link" discussions of price discrimination from discussions of monopoly power and its preservation; and (3) as an example, demonstrate that the price segmentation we see in extreme form in the airline industry

represents a “normal” response to the existence of many common costs and does not in and of itself suggest market power. I have shown that this is the most efficient strategy to allow recovery of these costs and is seen in most areas of the economy. Deregulating the industry has allowed it to behave normally. This is not to argue that market power is nowhere to be found in the airline industry. I have suggested elsewhere⁶⁶ some of the sources of that market power, although the analysis I employ in this Article suggests that I did not fully understand the origins and effects of the highly differentiated price structure I identified in that work.⁶⁷ The unilateral power to limit market output can exist in the airline industry under some circumstances, just as it can in other normal industries under special circumstances. When and where it exists, it may support price discrimination additional to that which occurs in competitive markets and may serve to deter entry. But it is clear that price discrimination *per se* cannot be relied on in the airline industry or any other industry as evidence of market power, which itself warrants intervention, and that attempts to stamp it out will ordinarily do more economic harm than good.

It is to be hoped that the political pressures now operating against efficient segmentation will not prevail and that misunderstanding will not encourage academics to aid and abet the suppression of a pricing system that brings so many benefits. This is not only true, of course, for airlines but for regulation and especially antitrust enforcement in general. We should remain aware of Ronald Coase’s caution,

if an economist finds something—a business practice of one sort or another—that he does not understand, he looks for a monopoly explanation. And as in this field we are very ignorant, the number of ununderstandable practices tends to be rather large, and the reliance on the monopoly explanation, frequent.⁶⁸

Too frequent, it appears.

66 See Michael E. Levine, *Airline Competition in Deregulated Markets: Theory, Firm Strategy and Public Policy*, 4 YALE J. ON REG. 393 (1987), reprinted in THE ECONOMICS OF TRANSPORT 283 (Herbert Mohring ed., 1994).

67 It is now clear to me that much of the pricing behavior that is cited by that Article as evidence of market power and possibly predatory was an efficient response to price changes along customer segment demand curves revealed and shaped by new entrant competition. *See id.*

68 R.H. Coase, *Industrial Organization: A Proposal for Research*, in POLICY ISSUES AND RESEARCH OPPORTUNITIES IN INDUSTRIAL ORGANIZATION 59, 67 (Victor R. Fuchs ed., 1972).