

Article

NEW TELECOMMUNICATIONS TECHNOLOGIES AND REGULATION: THE CASE OF PERSONAL COMMUNICATIONS SERVICES

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I. INTRODUCTION

In 1990, the Federal Communications Commission (FCC) began investigating whether a portion of the radio spectrum should be allocated for new wireless telecommunications services made possible by evolving advanced technologies.¹ In addition to asking what part of the spectrum should be allocated to these new wireless services, called Personal Communications Services (PCS), the Commission sought comments regarding the number of providers that should be authorized and the regulatory structure best suited for these services. The FCC also requested comments on how the Commission should move current spectrum users to other portions of the electromagnetic spectrum in order to provide these services.

At present, it is unclear whether and to what degree these new telecommunications technologies should be regulated. Any regulatory scheme will have to take into account the effects PCS will have on existing telecommunications markets. Rational public policy demands that regulation be based on sound economic principles so that new advanced technologies are not halted or forestalled by too much reliance on the regulatory status quo. The emergence of wireless technologies such as PCS may require regulators to make a significant break with past practices if the timely and efficient diffusion of new technology is to be encouraged in the future.

The purpose of this article is to provide an analytic framework for determining the regulatory method best suited to meet the public policy goals of these new telecommunications services. It is not meant to serve as a guide or checklist for formal state or federal regulatory proceedings, nor is it intended to provide a list of evidentiary standards to be used to determine if a service should be subject to public utility regulation. Instead, it provides a conceptual discussion as to which considerations are important, and which are not, when determining whether new services that advanced technologies make possible should be regulated. The ensuing conceptual discussion is based on modern regulatory and antitrust economics.

This article concludes that services with the proposed capabilities of PCS do not require any increased regulation of telecommunications.

1. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services (F.C.C. 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

Because PCS would be part of a large market that includes voice and data communication, PCS would not necessarily change any of the critical factors in this market and would not necessarily need to be regulated. An examination of possible entry barriers, expected market demand characteristics, essential facilities issues, predatory pricing concerns, and spectrum allocation issues leads to the conclusion that the introduction of PCS will not require additional regulation. Regulation of personal communications services would be similar to that observed with today's cellular service. Further, the spectrum allocation for PCS should be limited to an amount sufficient to foster competition among providers of this service.

Section II of this article describes the new technologies currently being examined by the FCC. Section III discusses the implications of PCS on the current telecommunications network. Section IV examines the economic criteria that must be considered in determining whether PCS should be regulated. Section V applies these criteria to the new technologies.

II. NEW TECHNOLOGIES

Personal communications is a set of services that allows a customer to control the origination and termination of a call without regard to an individual's geographic location or telephone service provider. Although the FCC implies that this new capability requires the construction of a separate telecommunications network, PCS can also be provided to a large extent in today's wireline (i.e., the traditional telephone system) network. By using a personal telephone number (PTN), an individual can tell the wired network his identity, where calls should be delivered, what calls to accept, what services or features the user wants, when to interrupt the user, and how to signal the user when an important call arrives.

Although these advanced features can be offered on the landline network, the local exchange carriers (LECs) cannot *currently* offer one of the key features of PCS. By being tied to the wired network, PCSs cannot offer the complete freedom of some alternative technologies that permit the user to communicate with a wireless device.² The implied purpose of the FCC's inquiry is to establish rules for personal communications which will provide all the features of the wireline network along with the added benefit of portability.

2. LECs can provide some wireless services, such as BETRS (Basis Exchange Telecommunications Radio Service), cellular service via separate subsidiary, and some radio paging services. These products, however, do not offer the all the features of PCS.

A. Second Generation Cordless Telephones

The first generation of cordless telephones (CT-1) available today uses analog technology and is restricted to a single location referred to as a base station. These products have a spectrum allocation in the 46–49 MHz band and have a range of 100 meters. Typically the customer places a base station (i.e., a receiver) inside a home and has the convenience of wireless telephone service in and around the house by using a cordless handset. While the performance quality of these units is limited, there are now about 30 million cordless telephones in the U.S.³ Clearly, consumers desire telecommunications services that are not limited by a telephone line.

CT-2 describes the proposed second generation of cordless telephones that, unlike its predecessor, can access multiple base stations up to a range of 100 meters.⁴ Using digital technology, CT-2 allows users to place calls through a network of base stations located in such places as airports, shopping centers, and gas stations. When a CT-2 user is in range of a base station, the subscriber enters his or her personal identification number (PIN) and the call is then carried across the same public switched network used for ordinary telephone calls. At regular intervals, the service provider collects the calling information by a central computer and bills it directly to the user's home or business. CT-2 also allows a user to continue his or her phone conversation while moving away from the original receiving base station. As long as a subscriber is within range of any base station, CT-2 permits the same sort of "handoff" capability currently available only with cellular service.

Unlike the current form of cordless telephone, CT-2 cannot receive calls. Reception of incoming calls is not possible with CT-2 because the network is not capable of tracking the called party while moving from location to location. To overcome this limitation, some CT-2 applicants have proposed the inclusion of a display pager within the handset.⁵ A CT-2 user would receive a digitized paging message indicating a number to call whenever someone attempts to call the wireless subscriber.

CT-2 technology is currently being tested in the United Kingdom. Early in 1989 the British Department of Trade and Industry granted licenses to four groups of operators⁶ to provide CT-2 (sometimes referred

3. *Personal Wireless Communications: The Metropolitan Alternatives*, INSIGHT, DEC. 1991, at 47.

4. *Personal Communications: The Emergence of the Consumer Mobile Communications Market*, YANKEEVISION, June 1990 at 10 [hereinafter *Emergence*].

5. See, e.g., Application for Experimental Radio Station Construction Permit and License by American Personal Communications, Inc. (F.C.C. 1990) (File No. 1321-EX-PL-90) (filed on November 29, 1989).

6. These four consortia are: 1) Phonpoint (British Telecom, NYNEX, France Telecom, STC, and Deutsche Bundespost Telekom); 2) ZonePhone (Ferranti); 3) Mercury Callpoint

to as Telepoint in Britain). By stipulating that a carrier use a common air interface (CAI), the British government assured that any CT-2 handset can interconnect with any provider of Telepoint service.⁷ Although only 5,000 subscribers are claimed by the three vendors currently providing CT-2 service,⁸ most vendors expect Telepoint to eventually establish itself as an inexpensive alternative to cellular or public telephones.⁹

B. Personal Communications Networks

Personal Communications Networks (PCN)¹⁰ use many of the features of CT-2 technology to provide tetherless two-way communications. As with CT-2, PCNs use a wallet-sized, digital cordless telephone to offer communication services. Combining an intelligent network architecture with state-of-the-art modulation techniques, PCNs will offer voice, data, and image delivery from low-power wireless terminals. Among the new features advertised by the proponents of this technology are: medical imaging from an accident site, automatic amplification of any PCN handset for a hearing-impaired subscriber, or even locating a lost child who is carrying a PCN terminal.¹¹

As with the cellular telephone system, PCN calls are seamlessly handed off from one cell to the next as the subscriber moves about the network. By using microcells (such as in every floor of an office building or located at regular intervals along a residential subdivision), PCN provides substantially greater calling capacity than is currently possible with today's cellular architecture. PCN signals are transmitted digitally along the network to provide greater call security, more reliable transmission of information, and higher quality. Because this technology uses a higher frequency and lower power than traditional cellular telephones, PCN does not allow communications from a moving car. Mobile communications with PCN will be limited only to pedestrian movement.

(Mercury, Motorola, and Shaye); and 4) BYPS (Barclay's Bank, Philips, and Shell). *Emergence*, *supra* note 4, at 11.

7. In the U.K., CT-2 with the Common Air Interface does not provide for call hand-off. Incoming calls are possible if the subscriber registers his/her terminal at a base station and stays within the coverage region of the base station.

8. *Emergence*, *supra* note 4, at 10.

9. The last CT-2 operator in the U.K. recently ceased operations. Phonepoint, after constructing roughly 3,000 base stations in Britain, had only 800 subscribers when it closed its operations in October 1991. *COMM. DAILY*, Oct. 23, 1991, at 9.

10. PCN is sometimes referred to as CT-3. In order to avoid any confusion, the authors of this Article will use CT-2 to refer to the wireless microcell technology which has only out-going call capability. PCN will refer to the microcell technology which permits both in-coming and out-going call capability. PCS will refer to all Personal Communications Services, including CT-2 and PCN.

11. See, e.g., *In re* Petition of PCN America, Inc. (F.C.C 1989) (RM-7175) (filed on November 7, 1989), at 29.

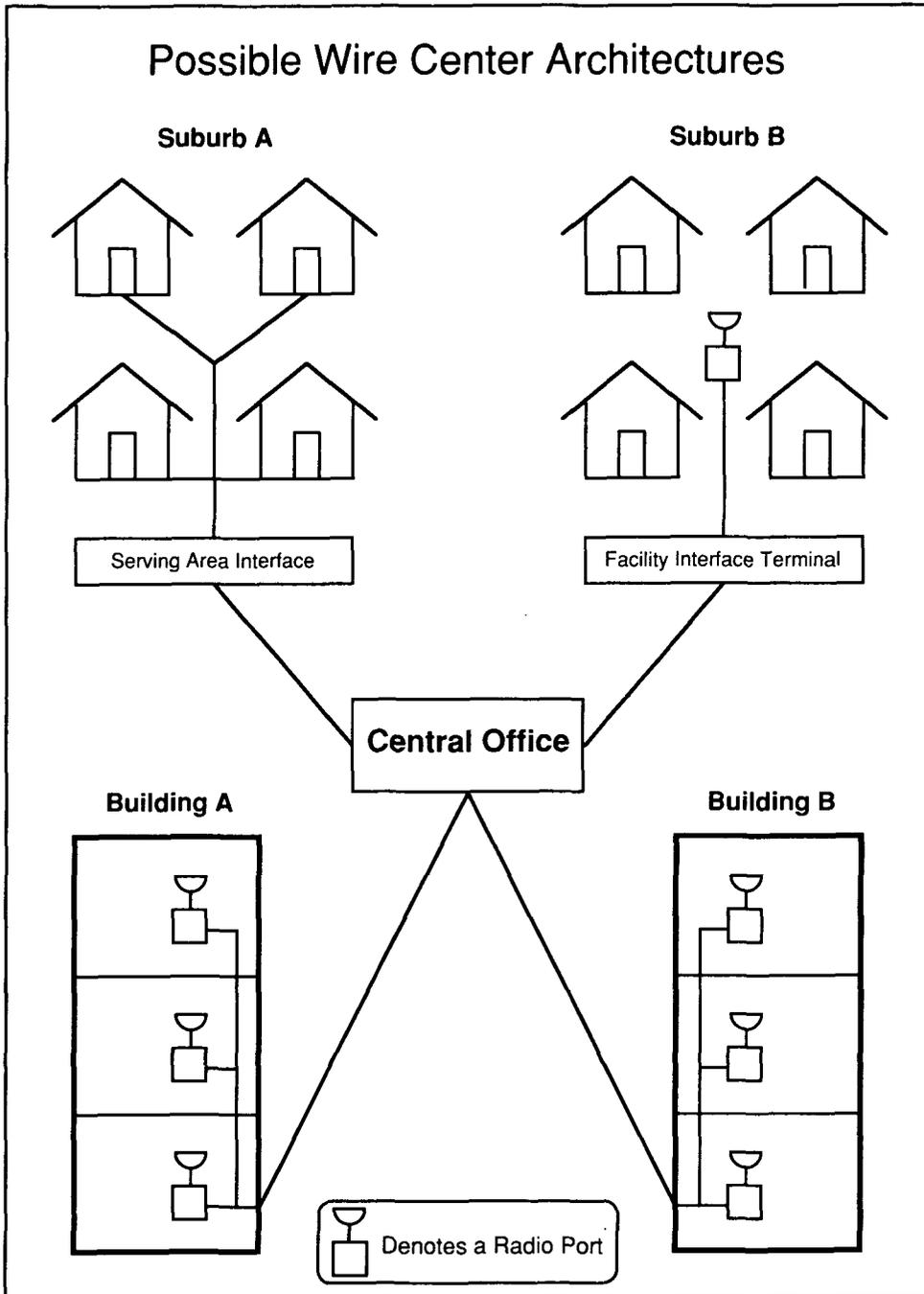
One of the attractions of PCN is the ability to contact an individual anywhere on the network as long as that subscriber is within range of a PCN radio port. With a "smart card," which the user inserts into the wireless handset, he is able to signal to the network that he is available to place or receive calls. An individual could contact his spouse at work or at home without knowing their exact location, for example, simply by dialing their spouse's personal telephone number. Under this type of system a telephone number has evolved from designating a physical location to identifying an individual.

III. IMPLICATIONS FOR EXISTING SUBSTITUTE SERVICES

The following diagram shows how these wireless technologies may exist within the current telephone network. While the F.C.C. might require a PCS provider to construct a network separate from the existing landline system, personal communications could also be provided on the current telephone network.¹² As can be seen from the following diagram, a residential area could be served by a tethered network (Suburb A) and/or a wireless system (Suburb B). Under this scenario different service providers (i.e., the traditional telephone and wireless operators) use the Local Exchange Carrier (LEC) switch to offer telecommunications.

It may also be possible to offer wired and wireless business communications within the existing network. A structure could have telephone service from a traditional wired network (Building A) or a wireless architecture (Building B). The key point from this illustration is that a wireless communications operator might be able to offer service without the expense of constructing a large infrastructure. With very little capital investment (i.e., a radio port), a PCS provider may be able to quickly enter (or exit) a market whenever it seems profitable.

12. A requirement that PCN providers build a wholly different network, of course, may forfeit any joint economies in production that may be present. The Commission has expressed a general interest in preserving such joint economies where they exist. *See, e.g., In re Separation of Costs of Regulated Telephone Service from Costs of Nonregulated Activities*, Report and Order, 2 F.C.C.R. 1298, at para. 111 (1987) [hereinafter "Joint Cost Order"].



As can be seen from the previous section, CT-2 and PCN offer many features currently offered by the present telecommunications system as well as several new options. Competition from such services could have

a significant impact on the existing telephone system. CT-2 will probably first appear in locations that generate large volumes of traffic—the same areas that generate a large portion of the revenue from traditional pay telephone service. This could reduce income from traditional pay service, a source of revenue that currently helps to lower rates charged for ordinary local service.¹³

In addition to causing the possible loss of revenue from public telephones, PCN will also compete directly with local telephone service. As witnessed by the dramatic growth in cordless telephones, consumers desire portability. PCN networks, which will probably first appear in large buildings, will eventually expand to serve most business districts and selected residential areas. As with CT-2 competition with public telephone service, PCNs can be expected to initially serve those areas that generate the most profit for the provider.¹⁴

Traditional cellular operators will also experience competition from these new personal communications networks. Although PCS is technically unable to provide wireless communications from moving vehicles, these new systems offer potentially more capacity and smaller handsets than the current form of cellular service. Thus, PCS represents a viable option to traditional wired and wireless communication.¹⁵

IV. AN ANALYTIC FRAMEWORK FOR DISCUSSING THE REGULATION OF PCS

This section uses a systematic set of questions to determine whether the introduction of PCS should lead to regulation. Based on a decision tree put forth by Ronald Braeutigam, this section addresses such topics as market definition, ease of entry considerations, market demand characteristics, and essential facilities concerns.¹⁶

13. The rates for basic local exchange service, or "plain old telephone service" (POTS), are regulated at the state level by the various state public utility commissions. Generally, the regulation of these rates is a part of standard rate of return regulation which puts legal limits on the rate of return a telephone company may earn on its rate base. Basic local exchange service is often priced via *residual pricing*, which means that whatever residual revenue requirement exists after all other services have been priced will be recovered via rates for basic local exchange service. This has traditionally meant that other services "benefited" basic local exchange service.

14. Some market research studies have shown that a long-term potential market of about half of the local exchange subscribers exist for PCN. For example, Joanne Fraser asserts that, "30% to 40% of U.S. households will subscribe to PCS within ten years from the time the service is licensed, assuming it costs \$40. or less per month per line." See JOANNE FRASER, SRI INT'L, PERSONAL COMMUNICATIONS SYSTEMS IN THE UNITED STATES 5 (1991); Comments of BellSouth Corporation, (F.C.C. 1990) (GEN. Docket No. 90-314) (filed on October 1, 1990), at 7.

15. Cellular providers may be able to provide most of the features on PCS by switching from analog technology and placing more transmitters in their networks.

16. Ronald R. Braeutigam, *Optimal Policies for Natural Monopolies*, in 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1289, 1290 (Richard Schmalensee & Robert D. Willig eds., 1989).

A. Definition of the Market After Service Introduction

Without reliable quantitative measurements of the cost and demand curves for a market, the first step in determining the appropriate form of regulation for PCS after its introduction is to qualitatively define the resulting market *using economically relevant criteria*. The basic question is: what will comprise the relevant telecommunications market after the introduction of a new technology service? This is normally a first step in any exercise where regulatory or antitrust issues are relevant.¹⁷ Because it is markets, not necessarily just firms or services, that should be the subject of economic regulation, this first question is a necessary precursor to the more germane one: After the new service is introduced, should the market that results be regulated in some way?

Since a great deal of information has not yet been determined regarding how wireless communications services such as CT-2 and PCN will be provided in the United States, a market definition exercise can only be performed in a cursory fashion. Technically, PCS does not yet exist in the U.S., so it is not possible to engage in the formal market definition exercise used pervasively in the courts. However, a simple market definition is nonetheless useful since it sheds a great deal of light on how policymakers could structure analyses of markets that may change due to the introduction of new services like PCS. This article does not recommend that regulatory proceedings emulate the protracted debates of market definitions performed by the courts. Since such discussions would merely serve to make regulation an extremely slow-moving process, a brief conceptual analysis of market definition issues is necessary to prevent public policy from going astray in the regulation of markets that are affected by new service introduction.

Although it seems to be a simple concept, market definition has been a battleground in both legal and economic circles. As noted by the American Bar Association:

While a broad market tends to minimize the competition between firms that already compete, it can also have the effect of finding firms making different products to be competitors. Narrow markets, conversely, can result in high market shares for those found to be competitors in such a market, but they can also create a situation

17. Several courts have either stated or implied that market definition is a necessary element. William Blumenthal, *Three Vexing Issues Under the Essential Facilities Doctrine: ATM Networks as Illustration*, 58 ANTITRUST L.J. 855, 856 (1990). Blumenthal cites these four cases: *Consul, Ltd. v. Transco Energy Co.*, 805 F.2d 490, 493-94 & n.11 (4th Cir. 1986), *cert. denied*, 481 U.S. 1050 (1987); *Laurel Sand & Gravel, Inc. v. CSX Transportation, Inc.*, 704 F. Supp. 1309, 1323 (D. Md. 1989), *aff'd*, 924 F.2d 539 (4th Cir. 1991), *cert. denied*, 112 S. Ct. 64 (1991); *City of Chanute, Kan. v. Williams Natural Gas Co.*, 678 F. Supp. 1517, 1531-32 (D. Kan. 1988), *aff'd*, 955 F.2d 641 (10th Cir. 1992); *cf. United States v. Realty Multi-List, Inc.*, 629 F.2d 1351, 1372 & n.39 (5th Cir. 1980).

whereby firms making closely related products are not deemed to be in competition.¹⁸

Economic regulation should be applied to markets, not necessarily just to firms or specific services. Given this framework, the question becomes: What *market* would require regulation if PCS were introduced? To answer this question, one needs to have an idea of what the relevant market would look like after the introduction of the services in question.

Four paradigms used in merger analysis attempt to identify a market as a group of products (and corresponding geographic area):

- (1) within which cross-elasticity of demand (and perhaps of supply) is high, or (2) which has historically been insulated in the sense that little flows in or out or (3) within which prices tend toward equality or (4) within which a hypothetical monopolist would be able to raise prices profitably.¹⁹

Technically, a market definition has both a product dimension and a geographic dimension, although at this point it is not really possible to address the geographic dimension for PCS.

The fourth paradigm listed above is useful when attempting to define the potential market that would exist if PCS were introduced. In essence, this method examines what would happen if a hypothetical grouping of firms (assumed to comprise collectively the "market") serving their various customers were to increase prices in unison by a certain percentage for a given period of time. If so many buyers would shift to alternatives that this grouping of firms acting as a monopolist would find the increase unprofitable, then this arrangement of firms and corresponding products is too narrow to constitute a "market." The analysis would need to be repeated with an expanded grouping of firms and/or products until the hypothetical analysis identifies a cluster of firms and products for which such price increases are likely to be profitable.²⁰ This process identifies a market dimension, outside of which (1) products are not likely to be substitutes for those inside the market, and (2) the ability of outside firms to supply the market is negligible.

Applying this analysis to PCS, assume that the geographic dimension is held constant because there are no existing suppliers whose behavior can be observed. If PCS were added to telecommunications as it now exists, what "market" would such new services be a part of if the analysis outlined above were performed? Stated another way, if *all the firms* that offer cellular services, traditional landline services at tariffed

18. ABA ANTITRUST SECTION, ANTITRUST LAW DEVELOPMENTS 150 (2d ed. 1984). *See also* ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY 62 (1986) (market definition has been characterized as "an analytical construct enabling us to compensate for our inability to measure market power directly").

19. ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY 89-90 (1986).

20. *Id.* at 105-106.

prices, coin telephone services, an assortment of data services, and PCS were to raise their prices all at once (acting as a hypothetical "monopolist") to some transitory level, could they expect to increase their profits? The answer is probably yes.

As a check on this admittedly simplistic approach, one can ask what would happen if this hypothetical consortium of firms did not supply basic local exchange service. The increase in prices in this scenario would probably not be profitable because users of other services could simply switch to the basic local service. Similarly, suppose PCS were deleted from the hypothetical service grouping. Again, the hypothetical consortium of firms probably could not profit from the increase because users would quickly switch to PCS. The only way the consortium could profit would be if basic local exchange service, certain data services, public telephones, cellular service, and PCS were included simultaneously in the hypothetical service grouping, which therefore constitutes the "market," at least from the product and firm dimension.

Thus, to keep the conceptual discussion about the market definition as focused as possible, PCS should be evaluated in the context of the market defined above. Rather than focusing narrowly on the "market" for PCS or landline communications, it should be recognized that such services will be one of many options consumers can use to transmit their voice, image, or data. The question of how PCS, in isolation, should be regulated is too limiting. The relevant question is how PCS affects the need for regulation of the market of which it will be a part. As can be seen from the preceding section, PCS will not only affect "traditional" telephone services, but will also be limited by the existing communications alternatives. The "market" under consideration should therefore include the LECs, cellular providers, alternative network vendors, and other sellers of communications technologies that compete for voice/data traffic.

B. Competition Within the Market Will Be Possible

Once a conceptual definition of the market has been determined, analysis should focus on the economic issue of whether competition within the market will be possible after PCS is introduced. The outcome of this investigation will define what type of regulation is appropriate for PCS by seeking to determine if the market can sustain a single producer in a natural monopoly, or a small number of producers of minimum efficient scale (i.e., those that can take advantage of all available economies of scale) in a natural oligopoly. Generally, this is not decided by the number of firms wishing to enter the market, but rather by the cost characteristics of the firms that could service the market. Thus, the analysis should next determine the underlying cost structure likely for

firms that serve the market which includes PCS. This, admittedly, is a technical question.

To discuss a new telecommunications technology, and the regulation of the services it makes possible, it is necessary to acknowledge the role of costs in optimal market structure. For the most part, market structure is determined by the interactions between the determinants of *firm size* and the *size of the market*. Firm size depends on the cost conditions of the firms which serve the market. The size of the market is determined by market demand conditions. The interaction of these two determinants places bounds on the structure of the industry.²¹

Given technological cost conditions and market demand conditions, a market is structurally competitive if a "large" number of firms servicing the market leads to a division of output that yields the lowest possible total industry costs. At the opposite extreme, a structural natural monopoly exists if having only one firm service the market yields the lowest possible total industry costs. In between these two extremes, it is possible that only an oligopoly can lead to total industry cost minimization.

The most basic economic rationale for the regulation of the prices of a multi-product firm is the extreme of natural monopoly. The definition of natural monopoly, stated simply, is a firm with a cost function that is said to be "subadditive," allowing it to produce its service at costs lower than any other firm or collection of firms.²² If the cost condition of subadditivity prevails, then a market consisting of only a single provider is the most efficient industry structure. This alone is not objectionable from a public policy standpoint because this type of industry structure is the most efficient available. The public policy concern is that such single firm supply can result in monopolistic pricing. The role of regulation is to permit the most efficient industry structure while prices are maintained at a level necessary to simulate the economic outcome of a competitive market, if competition were feasible. Thus, a natural monopoly may require regulation of some type, such as price-level constraints combined with entry restrictions.

Three other economic concepts are useful to this discussion: industry configuration, a feasible industry configuration, and an efficient industry configuration. An *industry configuration* is the number of firms, and the associated levels of sales for each firm, such that all the firms, in total, would supply market demand at the prevailing prices. If there is

21. John C. Panzar, *Technological Determinants of Firm and Industry Structure*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 3, 33 (Richard Schmalensee & Robert D. Willig eds., 1989). See also KENNETH E. TRAIN, OPTIMAL REGULATION: THE ECONOMIC THEORY OF NATURAL MONOPOLY 5-8 (1991).

22. SANFORD V. BERG & JOHN TSCHIRHART, NATURAL MONOPOLY REGULATION: PRINCIPLES AND PRACTICE 21 (1988).

just one firm that supplies all the market demand for a given product, that industry configuration is monopolistic. For example, if there are 100 firms each of which supplies a correspondingly small share of the market, the industry configuration is competitive.²³

An industry configuration is termed *feasible* if the firms involved in the industry can at least break even. An industry configuration is termed *efficient* if that configuration supplies the output the market demands at minimum cost.²⁴

The concept of industry configuration is then used to determine minimum efficient scale. Essentially, *minimum efficient scale* (MES) is the smallest level of output at which the average cost per unit of production is minimized. The relationship of MES to the overall industry demand curve defines the best market structure for a given industry. For example, if there were one firm for which MES coincided with total market demand, and that firm supplies this market demand at least cost, then the most efficient industry configuration is natural monopoly, for no collection of two or more firms could supply the industry at lower cost. Alternately, if there were 100 firms, all of which exhibit MES of just 1% of total industry demand, and these firms collectively supply the industry at least cost, then the most efficient industry configuration is a competitive market. It is possible that industry demand could be satisfied most efficiently by one large firm with a relatively large MES, in combination with several smaller firms whose efficiencies are exhausted at much smaller levels of output.

There are several reasons why the concept of MES is necessary to determine whether regulation is needed for high technology telecommunications services such as PCS. First, it is not inevitable that increasing the number of sellers of personal communications will automatically lead to earnest competition on the merits. If the most efficient industry configuration requires far fewer firms, there may be little point in fostering open entry policies.²⁵ Although a policy designed to increase the number of PCS suppliers for its own sake might lead to more choices between suppliers, and price decreases for some, but not all, customers, such a policy could not decrease total industry costs. Policies designed to foster large numbers of PCS suppliers (in the interests of increased consumer choices and the low prices that competition yields)

23. Panzar, *supra* note 21, at 33-38.

24. *Id.*

25. One could legitimately ask how open entry policies can really harm anything, since it is quite possible the market would "sort itself out," with the most efficient firms surviving. If, however, the most efficient firms in the industry are limited in downward pricing flexibility, have common carrier obligations, and have incurred large sunk costs attributable to regulatory obligations, then allowing entry may do more harm than good. This is the case of an *unsustainable* monopoly.

should only be pursued if they can lead to a reduction in total industry costs.

Similarly, if one or more "large" market participants exhibit natural monopoly characteristics (as sole supplier or acting in combination), then such suppliers should not be precluded from supplying the market. This is the cost characteristic that makes efficient industry supply possible. Concerns about monopolistic pricing can be addressed through regulation if necessary. Entry restrictions on *efficient* suppliers, however, are a strictly inefficient method of ensuring that competition within the market can take place.²⁶ Without efficient market participants, the low consumer prices that "competition" is expected to yield will not materialize

Strictly speaking, there is no reliable evidentiary standard that determines whether a firm is a natural monopoly. The true test of natural monopoly is whether, at a given output level, a sole supplier's costs are subadditive, meaning that at the given output level, the natural monopolist can supply the industry at lower cost than any other combination of firms.²⁷ It is not enough to examine cost characteristics such as scale economies or scope economies, because for a multi-product firm, the existence of both scale economies and scope economies still does not merit a conclusion of subadditivity. In fact, the cost conditions of a natural monopoly are sufficiently complicated that no regulatory agency can ever be certain that the firm it is charged with regulating is a true natural monopoly.

Thus, determining if subadditivity is likely to be present, in theory, entails examining the cost function of the PCS providers, though in reality such analysis cannot be expected to yield a reliable indication of whether or not a natural monopoly is present. Therefore, a formal examination of the cost characteristics of firms supplying PCS cannot be recommended, due to the significant costs of such studies and their inability to provide policy makers with a useable determination of whether a firm supplying PCS exhibits the technical cost characteristics of a natural monopoly.²⁸

26. Restricting the entry of a firm that exhibits economically efficient ability to supply PCS, simply because that firm is "large" or feared to be "dominant," is economically inefficient public policy because it prevents the cost effectiveness of such firms from yielding lower prices to consumers. If the efficient industry configuration truly was natural monopoly, for example, then precluding entry by the natural monopolist in preference to a "large" number of firms that will all "compete" with each other is inefficient, for it leads to total industry supply costs that exceed those of the natural monopolist. Hence, such a public policy could not lead to the lowest prices to consumers.

27. The cost condition of subadditivity as a determinant of natural monopoly was first proposed by William J. Baumol in lieu of simple analysis of scale economies. William J. Baumol, *On the Proper Cost Tests for Natural Monopoly in a Multiproduct Industry*, 67 AM. ECON. REV. 809 (1977).

28. Several studies have been performed regarding telecommunications cost characteristics. In addition to being costly and complicated, these studies typically require

One key piece of information on the profitability of firms in the cellular services market may provide some insight to this discussion about natural monopolies. Cellular technology is similar to the proposed PCS technologies now being tested in trials in several markets. According to Standard and Poor's, on average a cellular company with just a 1% customer penetration (which is virtually the same as market share) can be profitable.²⁹ While observation certainly is not a measure of subadditivity, it sheds light on what the efficient industry structure may look like. Standard and Poor's analysis shows that the minimum viable scale (MVS) for a cellular company is likely to be quite small, just 1% of the market. MVS is simply the total sales at a given price that a new entrant would need to achieve to earn an acceptable profit. If MES is also low,³⁰ one could reasonably expect the PCS industry, which is likely to be very similar to the cellular telephone industry, to be best served by policies fostering competition.³¹

The above arguments suggest that the automatic regulation of PCS simply because some firms supplying PCS may be termed "large" (or may supply PCS by way of vertical integration with other services, such as the cable companies or the LECs) should be avoided. Unfortunately, present regulatory policy ignores considerations of costs and industry structure. For example, in federal regulation of long distance services,

a large number of simplifying assumptions to make the problem tenable. The results of these studies have been mixed as to whether subadditivity is generally present, though most conclude that companies such as AT&T or Bell Canada have scale economies. Out of necessity, most of these studies aggregate a telephone company's many outputs into just two or three categories, such as local service or long distance. An important survey of these studies is presented in M. A. Fuss, *A Survey of Recent Results in the Analysis of Production Conditions in Telecommunications*, in *ECONOMIC ANALYSIS OF TELECOMMUNICATIONS: THEORY AND APPLICATIONS* 3-26 (Léon Courville, Alain de Fontenay & Rodney Dobell eds., 1983). A more recent survey may be found in Ferenc Kiss & Bernard Lefebvre, *Econometric Models of Telecommunications Firms: A Survey*, 38 *REVUE ECONOMIQUE* 307 (1987). See also David S. Evans & James J. Heckman, *Multiproduct Cost Function Estimates and Natural Monopoly Tests for the Bell System*, in *BREAKING UP BELL: ESSAYS IN INDUSTRIAL ORGANIZATION AND REGULATION* 253 (David S. Evans ed., 1983); WILLIAM W. SHARKEY, *THE THEORY OF NATURAL MONOPOLY* 197-205 (1982); JAMES C. BONBRIGHT ET AL., *PRINCIPLES OF PUBLIC UTILITY RATES* 602-606 (1988); Panzar, *supra* note 21, at 51-55; Lars Röller, *Proper Quadratic Cost Functions with an Application to the Bell System*, 72 *REV. ECON. & STAT.* 202 (1990).

29. Rosemary Avellis-Abrams, *A RATING CRITERIA FOR THE HIGH-RISK CELLULAR INDUSTRY*, STANDARD & POOR'S CREDIT REVIEW: TELECOMMUNICATIONS, Jun. 24, 1991, at 4.

30. If MVS for cellular is low, then MES (Minimum Efficient Scale) is also quite likely to be low.

31. AT&T contends that since the technology and economics of radio-based services differ from those of the landline network, a natural monopoly will not result in the provision of mobile services. Unlike landline wires that are dedicated and may be idle most of the time, radio waves are a shared resource. The embedded costs are therefore smaller for radio services and the economies of scale may be exhausted sooner for providers of these services. *AT&T Response to Comments and Objections Relating to the Proposed LATA Configurations* at 26-27, *United States v. Western Electric Co., Inc.* (D.D.C.) (Civil Action No. 82-0192) (Nov. 23, 1982).

entry has been deregulated, but pricing has not, resulting in an asymmetric regulatory regime that places greater regulatory oversight on incumbent telephone companies than on new entrants.³² The "Catch-22" of this situation is that pricing has not been deregulated because regulators fear that the incumbent telephone companies are natural monopolies; yet the only way to find out if such companies are natural monopolies is to deregulate their pricing and see what industry structure results after competition has taken place for a time.³³

Given the above discussion of costs and industry structure, and the low MVS observed in the cellular market, it is probably safe to assume that the development and offering of PCS will not preclude competition within the market of which it will be a part. Regulators should not fall into the trap of blindly regulating the market so as to create another Catch-22 situation.

C. Service Introduction and Ease of Entry

The most important analysis for regulatory issues emanating from PCS is likely to focus on ease of entry. Generally, if there are significant entry barriers to a market, a *de facto* monopoly may exist, which would result in the ability of a firm to exert market power. Entry barriers are a necessary condition for market power, as they allow a firm to block or deter other firms from entering the market if prices are raised above competitive levels. Thus, an examination of ease of entry is likely to be important for a number of reasons, most compelling of which is that if barriers are present, they may require regulation. Determining whether regulation is necessary depends on several other considerations as well, including the state of the market at the point when entry barriers are raised and the demand side of the market. The key underlying question is whether entry barriers exist, and if so, whether these barriers allow the maintenance or exercise of market power. Absent considerations of market power, entry barriers in and of themselves are not relevant to public policy.

In the analysis of PCS regulatory issues, the ease of entry issue may be considered by some to be subordinate to larger or more substantive issues. The concept is not often talked about in major dockets before the FCC,³⁴ and the true economic value of such analysis appears largely unrealized in such proceedings. In antitrust, however, entry barrier analysis is considered a powerful tool in merger cases and in predatory

32. See generally ANDREW D. LIPMAN, TELECOM DEREGULATION (1987).

33. Alfred E. Kahn & William B. Shew, *Current Issues in Telecommunications Regulation: Pricing*, 4 YALE J. ON REG. 191, 191-193 (1987).

34. A notable exception to this is the recent order on interstate long distance competition. *In re Competition in the Interstate Interexchange Marketplace*, Report and Order, 6 F.C.C.R. 5880 (1991).

pricing cases. The courts and the Federal Trade Commission have made the examination of entry barriers a fundamental and potentially dispositive step in the evaluation of mergers, and ease of entry can also dispose of monopolization cases under Section 2 of the Sherman Act, and rule of reason cases under Section 1.³⁵ In addition, most of the existing state statutes designate ease of entry as an important criterion in determining whether a telecommunications service is "subject to significant competition."³⁶ Thus, if prospective suppliers of PCS have "ease of entry" into the market, this would have important ramifications for the regulatory handling of such services. Analysis of ease of entry to the PCS market requires consideration of the costs associated with spectrum reallocation, the possible need for alteration of the business practices within the existing telephone system, the sunk costs of entry for new providers, issues of scale and scope economies, and access to so-called "essential facilities."³⁷

1. DEFINITION OF AN ENTRY BARRIER

The courts have offered little guidance on what is, or is not, an entry barrier. Those courts that have wisely chosen to give considerable weight to the criterion of entry barriers have not always adhered to sound economic principles.³⁸ To add to the confusion, the economics literature

35. Janusz A. Ordovery & Daniel M. Wall, *Proving Entry Barriers: A Practical Guide to the Economics of New Entry*, 2 ANTITRUST 12, 12 (1988) ("Economics was the basis of cost-based tests for detecting predatory pricing. Now there is a growing consensus that such cases should be dismissed at the threshold if the structure of the market, especially ease of entry, makes it impossible to predate successfully."). Several court decisions have held that predatory pricing cannot take place unless entry barriers are present. See *C.A.T. Indus. Disposal, Inc. v. Browning-Ferris, Inc.*, 884 F.2d 209, 211 (5th Cir. 1989); *Rebel Oil Co., and Auto Flite Oil Co. v. Atlantic-Richfield Co.*, 133 F.R.D. 41, 44 (D. Nev. 1990); *C.A.T. Indus. Disposal, Inc. v. Browning-Ferris, Inc.*, 704 F. Supp. 120, 121 (W.D. Tex. 1989), *aff'd*, 884 F.2d 209 (5th Cir. 1989); *McGahee v. Northern Propane Gas Co.*, 658 F. Supp. 189, 194-195 (N.D. Ga. 1987), *rev'd*, 858 F.2d 1487 (11th Cir. 1988), *cert. denied*, 490 U.S. 1084 (1989).

36. See, e.g., COLO. REV. STAT. ANN. §§ 40-15-207, 40-15-305 (West 1990); MICH. COMP. LAWS ANN. § 484.103b (West Supp. 1991); MINN. STAT. ANN. 237.59 (West Supp. 1991); OR. REV. STAT. §§ 759.202, 759.030 (Supp. 1989); UTAH CODE ANN. § 54-8b-3 (Supp. 1991); WASH. REV. CODE ANN. § 80.36.320 (West 1991); W. VA. CODE § 24-2-3c (Supp. 1991); WIS. STAT. ANN. § 196.195 (West Supp. 1990).

37. Neither the courts nor the economics literature has produced either a technical definition, or a consensus as to what an essential facility is. As a working definition, however, this Article will define it here as a productive input that a firm provides to its own competitors, and from which it potentially could withhold access so as to inflict antitrust damages on its rivals. It almost goes without saying that virtually every aspect of this working definition is open to interpretation.

38. For example, in ruling on entry barriers in antitrust cases, the courts have often failed to recognize the distinction between sunk costs and fungible costs, a distinction discussed in more detail in Section IV-C-2-c. This was evident in one antitrust case involving the telecommunications industry: in its decision in *Southern Pac. Comm. v. AT&T Co.*, 740 F.2d 980, 1002 (D.C. Cir. 1984), *cert. denied*, 470 U.S. 1005 (1985), the court ruled that the need for large capital outlays and lengthy construction programs, and the

offers an embarrassment of riches on the subject of entry barriers.³⁹ Economists over the last 35 years have disagreed on the true definition of

need to overcome brand preference constituted barriers to entry for purposes of determining whether AT&T had monopoly power under sections 2 and 15 of the Sherman Act. This, however, is economically specious reasoning, as the distinction between sunk costs and fungible costs has been ignored. It is generally accepted that merely "high" capital costs for entering an industry are not, in and of themselves, considered an entry barrier, for the key consideration is whether prospective entrants can draw on a capital market that enables them to purchase entry capital (no matter how "high" the costs). To illustrate, note the experience of MCI several years ago when entering the long distance market after the FCC's *Specialized Common Carriers* order in 1971 made wide scale entry lawful. One could easily make a prima facie case that at that time, MCI faced significant entry barriers, yet in 1972, MCI raised \$33 million in an initial public offering and obtained a \$64 million line of credit to commence construction of its nationwide network—the largest start-up financing in Wall Street history. Roger Parloff, *How MCI's Lawyers Invented a Market*, AM. LAW., Nov. 1990, at 44, 46. See also *In re Establishment of Policies and Procedures for Consideration of Application to Provide Specialized Common Carrier Services in the Domestic Public Point-to-Point Microwave Radio Service and Proposed Amendments to Parts 21, 43, and 61 of the Commission's Rules, First Report and Order*, 29 F.C.C.2d 870 (1971) (establishing an overall policy concerning new entry to the private line market by what were designated as "specialized common carriers" and ruling that the local exchange carriers must, upon request, permit these carriers to interconnect with their facilities).

For examples of economic requirements or conditions the courts have considered as entry barriers, see *California v. American Stores Co.*, 872 F.2d 837, 843 (9th Cir. 1989) (citing amount of capital necessary to become competitor in market, availability of capital, availability of technological advancements, number and size of firms already operating in marketplace, and structure and nature of industry), *rev'd*, 495 U.S. 271 (1990); *McGahee v. Northern Propane Gas Company*, 858 F.2d 1487, 1495 n.11 (11th Cir. 1988) (citing trade secrets, patent, licenses, capital outlays required to start a new business, existence of excess capacity by existing sellers, pricing elasticity, and difficulties which buyers may have in changing suppliers), *cert. denied*, 490 U.S. 1084 (1989); *Kelco Disposal, Inc. v. Browning-Ferris Indus. of Vt., Inc.*, 845 F.2d 404, 408 (2d Cir. 1988) (citing cost of entering the market and high minimum viable scale combined with low absolute level of profits for prospective entrants), *aff'd*, 492 U.S. 257 (1989); *Phototron Corp. v. Eastman Kodak Co.*, 842 F.2d 95, 100 (5th Cir.) (citing advertising), *cert. denied*, 486 U.S. 1023 (1988); *Allen-Myland, Inc. v. International Business Machines Corp.*, 693 F. Supp. 262, 279 n.35 (C.D. Pa. 1988) (citing level of employee skill required for firm to be in a market successfully); *Consolidated Gas Co. of Fla., Inc. v. City Gas Co. of Fla.*, 665 F. Supp. 1493, 1520 (S.D. Fla. 1987) (citing the costs and delays imposed by the regulatory process), *vacated*, 111 S. Ct. 1300 (1991); *Laidlaw Acquisition Corp. v. Mayflower Group, Inc.*, 636 F. Supp. 1513, 1520 (S.D. Ind. 1986) (citing insurance costs, lengths of contracts, high capitalization costs, performance bond requirement, experience requirements, and other bid specification requirements).

39. See, e.g., Ioannis N. Kessides, *Advertising, Sunk Costs, and Barriers to Entry*, 68 REV. ECON. & STAT. 84 (1986); John T. Wenders, *Excess Capacity as a Barrier to Entry*, 19 J. INDUS. ECON. 14 (1971); William J. Baumol & Robert D. Willig, *Fixed Costs, Sunk Costs, Entry Barriers and Sustainability of Monopoly*, 96 Q.J. ECON. 405 (1981); Richard Schmalensee, *Brand Loyalty and Barriers to Entry*, 40 S. ECON. J. 579 (1974); A. Michael Spence, *Notes on Advertising, Economies of Scale, and Entry Barriers*, 95 Q.J. ECON. 493 (1980); Yale Brozen, *Is Advertising a Barrier to Entry?*, in ADVERTISING AND SOCIETY 79 (1974); Harold Demsetz, *Accounting for Advertising as a Barrier to Entry*, 52 J. BUS. 345 (1979); Richard Schmalensee, *Economies of Scale and Barriers to Entry*, 89 J. POL. ECON. 1228 (1981); and Philippe Aghion & Patrick Bolton, *Contracts as Barriers to Entry*, 77 AM. ECON. REV. 388 (1987).

barriers to entry, but all definitions focus on cost differentials between incumbent firms in the market and prospective entrants.

The first work in this area was completed in 1956 by Joe Bain, who specified three types of entry barriers: absolute cost advantages of incumbent firms, economies of scale, and product differentiation advantages of incumbent firms. In general, Bain defined an entry barrier as anything which in the long run allows an incumbent firm to charge supracompetitive prices without inducing new entry.⁴⁰

The next important definition of entry barriers was provided by George Stigler in 1968. Stigler took a more narrow view of entry barriers by arguing that the definition should center on only those factors that give the incumbent firm a long-term differential in production costs. The important definition of entry barriers given by Stigler holds that a barrier to entry into a market is a cost of production for an entrant that is not incurred by already established firms.⁴¹ Stigler and the "Chicago School," then, argue that the only barriers which antitrust law should consider are advantages of incumbency which result in long-term cost differentials in production costs. These advantages allow the incumbent firm to raise prices above marginal costs without attracting entrants to the market. The classic Stiglerian entry barrier consists of absolute cost and demand advantages enjoyed by the incumbent firm.⁴²

Christian Von Weizsäcker developed a more modern and economically refined view of entry barriers. His model has a Stiglerian basis, but considers the concept of economic welfare and the effects entry barriers can have on it. "A barrier to entry is a cost of producing which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry and which implies a distortion in the allocation of resources from the social point of view."⁴³ The von Weizsäcker definition of entry barriers is, essentially, a production cost borne by entrants, but not by incumbents, which results in social welfare losses.

Practically applied, this definition indicates that not every requirement of producing, distributing, or marketing a product that imposes differential costs on entrants should properly be considered an entry barrier. One need only consider those requirements that impose differentially higher costs on entrants, given that all cost factors would otherwise be equated between incumbent and entrant.⁴⁴ For example, a

40. JOE S. BAIN, *BARRIERS TO NEW COMPETITION* (1956).

41. GEORGE J. STIGLER, *THE ORGANIZATION OF INDUSTRY* 67 (1968).

42. Ordober & Wall, *supra* note 35, at 12.

43. Christian von Weizsäcker, *A Welfare Analysis of Barriers to Entry*, 11 *BELL J. ECON.* 399, 400 (1980).

44. Robin C. Landis & Ronald S. Rolfe, *Market Conduct Under Section 2: When Is It Anticompetitive?*, in *ANTITRUST AND REGULATION: ESSAYS IN MEMORY OF JOHN J. MCGOWAN* 135 (Franklin M. Fisher ed., 1985).

firm that develops a cost-reducing innovation not available to entrants may appear to enjoy an entry barrier. Indeed, in the standard Bainsian analysis of entry barriers, it would. Yet because cost reductions can benefit consumer welfare (in the form of lower prices), engaging in cost-reducing innovation does not necessarily raise entry barriers in the von Weizsäcker framework.⁴⁵

The entry barrier analytic framework of von Weizsäcker is important to public policy applications for two reasons. First, von Weizsäcker's rigorous mathematical economics approach shows that barriers to entry, as defined by Stigler, cannot always be shown (as a mathematical theorem) to lead to economic inefficiencies. Given this, he suggests two ways to handle the concept of entry barriers: either stick to the Stiglerian definition and be careful not to draw any welfare or policy conclusions from it, or revise the definition, as von Weizsäcker preferred, to require the existence of certain inefficiencies as an attribute of entry barriers.

Second, von Weizsäcker shows that Bainsian entry barriers do not always conform to his revised definition (which incorporates welfare effects). Essentially, the Bainsian and Stiglerian entry barrier definitions assume that entry barriers will lead to economically inefficient markets. However, the definition derived by von Weizsäcker implicitly performs a more penetrating analysis by showing that some economic conditions formerly considered entry barriers (and hence automatically assumed to lead to allocative distortions or other economic inefficiencies) are not always inefficient when welfare effects are examined. For these reasons, this article employs von Weizsäcker's definition of entry barrier and recognizes the role of sunk costs in analyzing entry barriers. This approach has important implications for discussing entry barriers such as capital requirements, and scale and scope economies.

2. POTENTIAL BARRIERS TO ENTRY

This section discusses spectrum allocation, numbering plan constraints, and sunk costs in the context of ease of entry. It also discusses capital costs and scope economies as areas of interest to policy makers, even though the von Weizsäcker definition combined with a recognition of sunk costs does not include them as true entry barriers. The overall conclusion is that there are likely to be minimal or no entry barriers requiring regulation of PCS.

45. *Id.* at 143-144 n.1.

a) *Spectrum Allocation*

As with most new radio services, spectrum allocation is the key factor in determining the conditions for offering wireless telecommunications service. Since 1934, the FCC has had responsibility for regulating the use of radio spectrum.⁴⁶ Although the Commission is not empowered by the Communications Act of 1934 to enforce either the Clayton Act or the Sherman Antitrust Act⁴⁷ and may even ignore the policies embodied within these Acts,⁴⁸ the FCC and the industry may approach the analysis of PCS, and the resulting spectrum allocation decision, with largely the same conceptual market definition methodology used by the courts in resolving anticompetitive complaints.

The FCC is empowered to regulate who can use a given frequency allocation, the purpose of this allocation, and the engineering conditions of the applicant's use. In the context of PCS and entry barriers, the key questions are, (1) whether the need to allocate spectrum to these services will somehow create a long term cost differential between some set of incumbent firms and prospective new entrants, and (2) whether this long term cost differential will injure the competitive process or allow the maintenance of market power for some firm or set of firms. Stated another way, the question is whether spectrum constraints, if they exist, will create what are known as "first mover advantages" for early entrants to the market, and then preclude entry by other efficient firms.⁴⁹

The desired frequency allocation for PCN appears to center on the 1.7-2.3 GHz range. Although this portion of the spectrum seems to be technically suitable for wireless telecommunications, it is already in use by meteorological satellites, fixed radio services, mobile communications and space research.⁵⁰ Further complicating the use of this spectrum is that certain portions of this allocation are controlled solely by the FCC, others are controlled solely by the National Telecommunications and Information Agency (NTIA), and still others are jointly controlled by the

46. The Communications Act of 1934 (codified as amended at 47 U.S.C. § 303 (1988)) [hereinafter "the Act"]. It is important to note that the Commission only has control over one-half of the spectrum available for use within the United States. Section 305 of the Act exempts from the FCC's jurisdiction all "radio stations belonging to and operated by the United States." 47 U.S.C. § 305 (1988). The allocation of spectrum between governmental bodies is controlled by the National Telecommunications and Information Administration (NTIA), a division of the Department of Commerce. Because of this dual jurisdiction, it has been pointed out that "[a]t least in part, the scarcity of frequency space for commercial broadcasting is man-made and its dimensions are initially defined by the Executive Office of the White House." HARVEY L. ZUCKMAN ET AL., *MASS COMMUNICATIONS LAW* 367 (1983).

47. *United States v. Radio Corp. of Am.*, 358 U.S. 334, 344 (1959).

48. *Federal Communications Comm'n v. RCA Communications, Inc.*, 346 U.S. (1953).

49. If early entrants to a market are able to avoid costs that later entrants must incur, then first mover advantages are said to have accrued to the early entrants. Stated another way, the later entrants face entry barriers to the market.

50. NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, U.S. DEP'T OF COMMERCE, *UNITED STATES FREQUENCY ALLOCATIONS: THE RADIO SPECTRUM* (1987).

FCC and NTIA.⁵¹ Potential PCN providers and the FCC will also have to address the issue of how this technology will coexist with current users of the spectrum. The FCC, for example, may determine that it is possible for this service to be offered in the same frequency with existing users, although this may entail greater cost than would occur if the spectrum was assigned solely for wireless applications.

Alternatively, the FCC may determine that PCN should operate in a spectrum set aside primarily for tetherless communications. If this spectrum is determined to be the 1.7-2.3 GHz range currently under discussion within the industry, the existing users of the spectrum will expect to be compensated for moving to another radio frequency. Although cost estimates for relocating existing spectrum users are not currently available,⁵² it should be noted that for Southwestern Bell alone this process would entail buying new radio equipment for approximately 145 fixed-point microwave towers. The question the FCC would then have to grapple with is who should pay for the expenses associated with the start-up of PCS, including the cost of moving existing users to another frequency.

Despite these concerns, it appears that so long as costs, and hence prices to consumers, can be reduced through a competitive framework for PCS suppliers, there is enough available spectrum to allow the provision of PCS. The desired allocation for PCS centers on the 1.7-2.3 GHz range, although recent research has concluded that only 170 MHz of this 600 MHz range is necessary to provide PCS for the *entire* world population. Moreover, by using a technology known as Code Division Multiple Access (CDMA), PCS providers can largely use the same frequency allocation to offer wireless service.⁵³ Although a slight increase in spectrum allocation is necessary to accommodate more providers, it appears that the Commission can allocate enough spectrum using CDMA technology so that any provider can theoretically serve the entire market. It appears that the FCC could reallocate at least 170 MHz to PCS and then authorize several providers who would then be regulated by competitive

51. The NTIA has recently noted that 59.5 percent of the more desirable spectrum (i.e. below 30 GHz) is controlled by the FCC and the NTIA. Of the remainder, 7.5 percent is controlled exclusively by the NTIA while 33 percent is under the authority of the FCC. See memorandum from Janice Obuchowski, *National Telecommunications and Information Administration Comprehensive Policy Review of Use and Management of the Radio Frequency Spectrum*, at 9-5 (Dep't of Com.) (Billing Code 3510-60) (released on Dec. 4, 1989).

52. Not only are cost estimates not available for reallocating the users within this radio band, the FCC also asks in the PCN notice how many users are currently in this range. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, 5 F.C.C.R. 3995 (1990), at 11.

53. For a more detailed discussion of CDMA, see MARVIN K. SIMON, JIM K. OMURA, ROBERT A. SCHOLTZ & BARRY K. LEVITT, 3 SPREAD SPECTRUM COMMUNICATIONS (1985); GEORGE CALHOUN, DIGITAL CELLULAR RADIO (1988).

forces. Hence, spectrum constraints will not create a "window of opportunity," beyond which prospective entrants will face entry barriers.

b) *Telephone System Constraints*

In addition to the difficulties associated with allocating frequency space for PCS, the creation of a wireless network compatible with the landline network would also force both the local and interexchange carriers to reconfigure their systems. One of the key features of CT-2 or PCN is telephone number portability. Because of the nature of these wireless networks, customers will be able to transmit or receive calls from a single network address regardless of their physical location. Changes will therefore be necessary in numbering, routing, and billing of calls to provide these capabilities within the present and future telephone network.

The concept of making a telephone number portable when it is associated with a fixed location is a contradiction. All telephone numbers within the United States currently fall under the geographically based North American Numbering Plan (NANP).⁵⁴ Under the NANP, a telephone number is divided into three distinct portions to denote a desired location:

| | | |
|----------------------------------|--------------------|--------------------|
| <u>Numbering Plan Area (NPA)</u> | <u>Office Code</u> | <u>Line Number</u> |
| NXX | NXX | XXXX |

Where:

N is any number from 2 through 9; and

X is any number from 0 through 9.

Both the NPA (which represents a large geographic division) and the office code (which denotes a central office inside a NPA) refer to a specific location within the telephone network. The telephone system is currently designed to determine the correct transmission, signaling, routing, billing, and operations associated with each call by using the NANP number.

The advent of portable telephone service, which is not linked to a specific location, creates significant expense for both the wired and wireless telephone networks. For example, virtually all billing within today's telephone network is designed around the assumption that the

54. For a more detailed discussion of the telephone numbering plan, see BELL COMMUNICATIONS RESEARCH, NOTES ON THE BOC INTRA-LATA NETWORKS-1986, § 3 (TR-NPL-000275). See also AT&T BELL LABS, ENGINEERING AND OPERATIONS IN THE BELL SYSTEM, (2d ed. 1983). Please note that the NPA example of NXX will go into effect on July 1, 1995. With this planned conversion to interchangeable NPAs, the number of possible area codes will increase from 152 to 792.

NPA-NXX combination or the NXX determines the location of a serving central office. The cost of a call is calculated by the distance between the originating and terminating central office. When a portable network is established, telephone numbers based upon the NANP guidelines lose their ability to be used in billing.

Routing also becomes a problem with wireless networks. The network must be capable of sending a call to the NPA in which the PCN receiver is currently located rather than the area code that is traditionally associated with that number. Both the local exchange companies and the interexchange carriers will have to modify their switches to route a call correctly either originating or terminating at a PCN device. Therefore, the formation of PCNs will force the landline network to incur additional expense and investment to successfully link with the personal communications networks. The FCC will have to determine whether the PCN providers, the landline operators, or some other entity will incur the cost of reconfiguring the current telecommunications system.

In the context of PCS and entry barriers, one concern is that PCS suppliers might quickly exhaust the available quantity of telephone numbers, creating an entry barrier for prospective entrants relative to those firms entering the market before number exhaustion. Numbering constraints will not be an entry barrier to PCS suppliers in the future, however, for the conversion to interchangeable NPAs in 1995 is expected to lead to a more than sevenfold increase in possible ten-digit telephone numbers.⁵⁵ While it is expected that a change in the numbering plan (e.g., an increase in the number of digits or change in the switching logic within the network) will also add to the expense of offering personal communications services, this cost is not one that will be borne solely by new entrants, indicating that there are no entry barrier problems with the NANP or potential numbering constraints.⁵⁶

c) *Sunk Costs of Entry*

This section discusses the role of sunk costs in the pragmatic use of the entry barrier concept when analyzing market power. A sunk cost is a cost that is unavoidable in the short or "intermediate" run, even if there is

55. Beginning in 1995, the NANP will have a new 792-area code capacity (versus the 152-code capacity now available), which will be capable of handling more than 6.2 billion phone numbers. This should be adequate until at least halfway through the 21st century. Thus, PCS will not contribute to the exhaustion of the NANP capacity, nor will numbering constraints be an entry barrier.

56. It should be noted that the United States Telephone Association (USTA) asserts that the current numbering plan can accommodate personal communications services. *Comments of the United States Telephone Association, In re Amendment of the Commission's Rules to Establish the New Personal Communications Services* (F.C.C. 1990) (GEN Docket No. 90-314) (release date Oct. 1, 1990).

a complete cessation of output.⁵⁷ A recognition of the importance of sunk costs has much influence on what is (and what is *not*) considered an entry barrier.

Some production costs imposed on entrants are likely to be non-recoverable, market-specific costs that are sunk when incurred. The prospective entrant must incur sunk costs to become an established firm, and so some economists have considered sunk costs as an entry barrier.⁵⁸ In the analysis of Baumol and Willig, for example, sunk costs are viewed by prospective entrants as incremental to the decision to enter the market. The lower sunk costs are projected to be, the more likely a firm is to enter a new market. These costs are therefore an incremental cost (with correspondingly incremental risk) which must be recovered with post-entry revenues by entrants. The incumbent firm also must cover its own sunk costs to yield a good financial performance for its stockholders, but these costs are not considered when assessing its prospective business decisions, since by definition sunk costs cannot be avoided anyway.

This article considers sunk costs to be relevant to the question of entry barriers, but does not consider just any non-zero amount of sunk costs to be an entry barrier, as the pure theory of costless entry put forth by Baumol, Panzar, and Willig would require. It stands to reason that most American industries require at least some sunk costs to be incurred by new entrants, and so the theory of costless entry is not usually applicable. As William Shepherd has pointed out:

virtually all production requires specific assets which cannot be transferred or sold costlessly. This applies to physical equipment, advertising, R & D, expert skills, and the other commitments needed to establish entry. Fixed and sunk costs commonly overlap and are sizable. Zero sunk cost is therefore a doubtful, counterfactual assumption for a general theory.⁵⁹

Instead, if capital costs are required for entry, and a "high" proportion of these are sunk costs for entrants, then entry barriers could exist. This dovetailing of the concepts of sunk costs and entry barriers is not inconsistent with the von Weizsäcker definition of entry barriers.

The key issue then is whether prospective suppliers for a given telecommunications market are required to incur significant sunk costs to enter the market. Sunk costs that are high in proportion to other costs can create significant asymmetries between incumbent firms and new

57. See WILLIAM J. BAUMOL ET AL., *CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE* 280 (1983).

58. William J. Baumol & Robert D. Willig, *Fixed Cost, Sunk Cost, Entry Barriers and Sustainability of Monopoly*, 95 Q.J. ECON. 405 (1981). See also BAUMOL ET AL., *supra* note 57, at 290-92.

59. William G. Shepherd, "Contestability" vs. Competition, 74 AM. ECON. REV. 572, 581-84 (1984). See also A. Michael Spence, *Contestable Markets and the Theory of Industry Structure: A Review Article*, 21 J. ECON. LIT. 981, 986-7 (1983).

entrants. The high proportions of sunk costs are no longer part of the forward-looking expenses of the incumbent firm, whereas the prospective entrant, in deciding whether to enter the market, must consider it an outlay. The salvage value of sunk investment is zero, or in any case below its initial cost. Therefore, the new entrant must be certain that the expected revenue from entering the market will more than offset the risk of losing the unrecoverable fraction of investment that sunk costs represent.⁶⁰

Hence if new entrants must incur "large" proportions of sunk costs to enter the market, entry barriers may exist that require some form of regulation. The issue then becomes whether the high proportions of sunk costs translates into unreasonable market power for one or more firms in the prospective market.

Although no standards or equipment have been firmly established for providing PCS, it is expected that a network similar to the current cellular architecture will be necessary for these services. This network will consist of hand-held terminals linked by radios and antennas to a switch that will have access to computers providing operations support. As with the cellular system, personal communications services will be provided within defined geographic regions known as "cell sites." Even though these new wireless technologies will cost significantly less per cell site than traditional cellular because of lower power use and greater frequency reuse, these qualities also result in a significantly greater need for radio ports. To provide PCN service for an area currently served by cellular, for example, it has been estimated that a PCS wireless network would require a one to two fold increase in the number of cell locations.

These new wireless technologies use equipment that can be redeployed for other applications. Computers can obviously be used in industries other than communications, while switches may be moved to provide traditional wired or cellular communications. Likewise, radios and antennas may be modified for use in other frequencies, although this redesign would probably cost more than just buying the appropriate equipment. If a Common Air Interface is adopted in the United States as in the United Kingdom, then the hand-held devices used for PCN will also be salvageable because these sets may be used by other PCN providers with no modification. Thus, it appears that a relatively minor proportion of the major equipment used by these new types of wireless communications will require sunk investment.⁶¹

60. ALEXIS JACQUEMIN, *THE NEW INDUSTRIAL ORGANIZATION* 100-101 (1987).

61. While this section has discussed sunk costs as entry barriers, it should not be confused with the concept of high levels of capital costs as an entry barrier. The absolute dollar amount of investment required to enter a market says little about entry conditions, as does the absolute dollar amount of sunk costs. See Ordover & Wall, *supra* note 35, at 16-17. As stated in Landis' and Rolfe's analysis,

d) *Scope Economies and Cost Advantages*

The final issue to be considered in connection with entry barriers is the existence of scope economies, that is, the cost savings that may result from having a variety of related products produced by a single firm rather than by a multiplicity of firms. For example, it is expected that scope economies could exist for the LECs in providing PCN. This may also be true for cable companies choosing to enter this area of telecommunications. This means that there may be firms operating in this market in the future that are extremely cost efficient in providing wireless communications due to their concurrent involvement in industries using similar technology. This could stimulate infrastructure development, encourage the diffusion of advanced technologies, and benefit consumers in the long run.

The key question is whether scope economies are an entry barrier. Under the von Weizsäcker definition of entry barriers, the answer to this question is "no." Those clinging to the Bainsian view of the world may consider scope economies *prima facie* entry barriers, even though Bain himself never discussed them.⁶² The classic Stiglerian entry barrier is an absolute cost and demand advantage enjoyed by the incumbent firm, which could stem from better access to scarce resources, ownership of a patent, or even advantageous standing under government regulation. The Stiglerian entry barrier appears to be absent from the market for wireless communications, even though scope economies may be present. This does not mean that scope economies somehow conform to the Stiglerian view. Productive efficiencies derived from scope economies do not constitute entry barriers, even if such efficiencies make it challenging for entrants to compete with incumbents.⁶³

High capital requirements . . . do not, by themselves, constitute entry barriers. By definition, an entry barrier exists when would-be entrants face higher costs than incumbent firms. Incumbent firms may have had to meet the same (or higher) capital requirements as would-be entrants. Would-be entrants may, in fact, be able to enter more cheaply if technological change has lowered the capital requirements. Unless the cost of capital of would-be entrants is higher than that of the incumbent firm, the capital requirements do not impose differential costs and hence do not raise entry barriers. A correct comparison of capital costs would also take into account differences in risk among the borrowers. Differences in capital costs that merely reflect differences in riskiness are wholly consistent with perfect capital markets and hence ought not to be viewed as barriers to entry.

Landis & Rolfe, *supra* note 44, at 135.

62. The term "economies of scope" was first introduced in 1975, so Bain never considered scope economies in his work on entry barriers. See John C. Panzar, *Technological Determinants of Firm and Industry Structure*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 16 n.11 (Richard Schmalensee & Robert D. Willig eds., 1989).

63. Even if incumbent firms enjoyed absolute cost advantages that precluded entry, regulation would not be justified if the cost advantage was due to productive efficiency. DANIEL F. SPULBER, REGULATION AND MARKETS 42 (1989). "[A] barrier to entry only exists when an incumbent firm can *refrain* from competing without inducing entry." FRANKLIN M. FISHER, JOHN J. MCGOWAN & J.E. GREENWOOD, FOLDED, SPINDLED, AND MUTILATED: ECONOMIC ANALYSIS AND U.S. vs. IBM 165 (1983) (emphasis in original). With regard to

Both incumbent companies, such as LECs and cellular companies, and new entrants would be starting largely on a level playing field. All such firms would have to make capital investment to provide wireless communications, but as discussed earlier, minimum viable scale (MVS) is not expected to be high. If MVS is high, then economic cost conditions such as scale and scope economies are often considered entry barriers. However, if MVS for PCS mirrors what has been observed for cellular service, which is similar technically to PCS, MVS is likely to be quite low for new entrants to the PCS market. In other words, potential entrants will not have to garner high levels of market share before profits can be made.

Thus, scale or scope economies in and of themselves are not entry barriers. While scale or scope economies, combined with high MVS and the requirement that new entrants incur substantial proportions of sunk costs, may be a formidable barrier to entry, it is the sunk costs themselves that are the entry barrier. The scale and scope economies merely exacerbate the sunk cost requirement, and are otherwise irrelevant.⁶⁴

D. The Effect of Existing Substitutes on Market Power

Even if the provision of wireless communications alone were determined to have significant barriers to entry, leading to a natural monopoly, these concerns may be overcome by the demand side of the market. The existing substitutes to PCN may be priced so low as to make it impossible for any provider of PCN to set prices in excess of competitive levels for significant periods of time. Given that flat rate basic local exchange service can be purchased for \$10–\$14 per month with unlimited usage, coin telephone service is usually \$0.25 per call, and cellular mobile services are arguably competitive, it is highly unlikely that wireless communications providers would be able to set rates at amounts

scope economies as a cost advantage for an incumbent firm, the reason that such efficiencies are not entry barriers is probably best explained generically by Fisher, McGowan, and Greenwood:

Not all "advantages" possessed by an incumbent result in barriers to entry. In order to be a barrier the "advantage" must be one that cannot be reproduced by an entrant with effort or expenditure comparable to that expended by the incumbent. Thus, not everything that makes entry by a new firm costly or beyond the reach of some or even many firms constitutes a barrier to entry. The fact that entry into a business requires some investment of money, time, skills, and other intangibles may make entry difficult, but does not mean that there are barriers.

Id. at 165–166. Further, note that in the von Weizsäcker framework for entry barriers, scope economies may enhance consumer welfare. von Weizsäcker, *supra* note 43.

64. The validity of sunk costs (or large proportions thereof) as an entry barrier is what makes Bainsian entry barriers like scale economies (and their cousin, scope economies) a moot issue. If MVS is relatively high due to the existence of scale or scope economies, entry barriers may be present if entrants must incur significant amounts of sunk costs to surmount the high MVS. The key point is that it is the sunk costs that create the reluctance of new entrants, not the scale or scope economies (or resulting high MVS).

exceeding "just and reasonable" levels.⁶⁵ Market power is defined as the ability of a firm (or group of firms) to raise prices above competitive levels for a significant period of time, without inducing new entry or expansion by existing competitors. In other words, market power is the ability of a firm or group of firms acting jointly to raise prices above the competitive level without losing so many sales that the price increase is unprofitable and must be rescinded.⁶⁶

The market definition has a large bearing on determining the level of market power for wireless communications. By placing economics-based bounds on the market to be analyzed, a distinction is made about what products will be influenced by the introduction of a new service. Using the admittedly cursory market definition outlined in this article, it appears that traditional telephone and cellular service will have a cross-elastic effect with services like CT-2 or PCN, although as of this writing no one knows the nature or magnitude of that cross-elasticity. For example, a price increase for PCN should result in a migration of some PCN subscribers to either cellular or standard landline telephone service.

If consumers view services like CT-2 or PCN as merely discretionary services, then this impact will probably be large enough to mute the ability of the wireless communications provider to increase prices above just and reasonable levels. It is possible that many of the potential customers for PCN will consider it a discretionary service. This assessment of services like CT-2 or PCN, combined with the availability of low priced substitutes, is likely to lead to a relatively high price elasticity for PCN and other wireless communications services.⁶⁷ Given this expectation, there is little to be gained by regulating the prices of services like CT-2 or PCN, since providers of these services should have limited ability to exercise market power in selling these services. Further, if PCS proves to be a discretionary service, the traditional questions of economic regulation are moot because there is little public interest to

65. A BellSouth spokesman stated that regarding CT-2, the alternative to pay phone service that is now being tested in market trials, "we're finding it may not be a great business because of our excellent pay phone system in the U.S." *RHC Strategies Discussed: Foreign Cellular Growth Seen Mushrooming, but Doubts Raised on CT-2*, 11 COMM. DAILY 6 (Jan. 22, 1991).

66. See William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937 (1981); see also ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY (1986).

67. As of this writing, at least one CT-2 company has proposed rates that will be 80% below cellular rates. American Cordless Technologies (ACT) announced plans to offer rates in New York that are 80% below Nynex's cellular rates, and that in fact are comparable to coin telephone rates. The price of 32 CT-2 calls (at 2.5 minutes each) would be \$11.20, compared to 40 coin telephone calls for \$10.00. The addition of paging service makes CT-2 a better deal than coin service, for the pay phone paging option is priced at \$22.50 versus \$7.50 for CT-2. Cellular service would cost customers \$57.60 for 32 calls (at 2.5 minutes each), plus a \$35.00 monthly access charge. *CT-2 Company Proposes Rates That Will Be 80% Below Cellular*, COMM. DAILY, Jan. 29, 1991, at 4.

protect. Regulation is not warranted unless consumers are paying prices above just and reasonable levels for important services "vested in the public interest" that they cannot get elsewhere.

E. The Relationship of Firms in the Market for Essential Inputs

The final economic question to be addressed is whether prospective competitors will require "essential" facilities from other market participants. If the answer is no, then policy makers can move on to the spectrum allocation questions. If the answer is yes, several questions must be addressed. Regarding essential facilities, regulation has been complex, and judicial decisions leave many "gray areas."

Before asking whether the provision of PCS will require the use of an "essential" facility, this term must be defined. The definition is not simple since it overlaps the ease of entry issue, and as Phillip Areeda points out, the essential facilities doctrine "is less a doctrine than an epithet, indicating some exception to the right to keep one's creations to oneself, but not telling us what those exceptions are."⁶⁸ Indeed, Areeda points out that although the so-called "essential facilities doctrine" is a pervasive topic in deregulation, most Supreme Court cases invoked in support of this doctrine do not speak of it and can be explained without reference to it.⁶⁹

It is generally true that,

[u]nder the doctrine of 'essential facilities,' most courts would impose a duty to deal upon a monopolist in two circumstances: (1) where a single monopolist who competes with the facility user in other markets unilaterally controls the facility; (2) where a monopolistic consortium of firms who are competitors jointly controls the facility.⁷⁰

Under the essential facilities doctrine, a monopolist that denies a competitor access to an input considered to be an essential facility violates section 2 of the Sherman Act.⁷¹ Essential facilities are those for which lack of access would impede their users' ability to gain access to a market.⁷² From the economic perspective, one can generalize that essential facilities must have three salient characteristics: (1) it must be unique; (2) it must be centrally located in the users' path of production;

68. Phillip Areeda, *Essential Facilities: An Epithet in Need of Limiting Principles*, 58 ANTITRUST L.J. 841, 841 (1990).

69. *Id.* at 841. Areeda points out *United States v. Griffith*, 334 U.S. 100 (1948), *Otter Tail Power Co. v. United States*, 410 U.S. 366 (1973), and, *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*, 472 U.S. 585 (1985) as cases frequently cited in support of the essential facilities doctrine, but which do not use the terminology "essential facilities." *Id.* at 847.

70. David J. Gerber, Note, *Rethinking the Monopolist's Duty to Deal: A Legal and Economic Critique of the Doctrine of "Essential Facilities"*, 74 VA. L. REV. 1069 (1988) (citations omitted).

71. Gregory J. Werden, *The Law and Economics of the Essential Facility Doctrine*, 32 ST. LOUIS U. L.J. 433, 433 (1987).

72. Gerber, *supra* note 70, at 1072.

and (3) it must be essential to the users' business.⁷³ From a legal perspective, "legal findings that facilities are 'essential' typically turn on how badly refusals to deal harm competitors and competition."⁷⁴

The "MCI test" is the most significant means of determining whether market entrants require access to "essential facilities." This test emanates from the Seventh Circuit's decision in *MCI Communications v. American Telephone & Telegraph Co.*⁷⁵ The opinion in this case set forth a relatively clear set of conditions for the application of the essential facilities doctrine, fortunately, and has its basis in the telecommunications industry. As delineated by William Tye, the relevant criteria from this case for making "essential facilities" available generally to competitors are:

1. Control of the facility by a monopolist or a group of competitors with monopoly power.
2. The foreclosed competitor's inability practically or reasonably to duplicate the facility or its economic function.
3. The denial of the use of the facility or the imposition of restrictive terms ... with the consequence of substantial harm to competition in a relevant market in which the monopolist competes (or would be forced to compete with the plaintiff(s) absent the practice).
4. The absence of a "valid business reason."⁷⁶

Admittedly, the first two items of the "MCI test" require as rigorous a market definition as possible for the input suspected of being "essential," and at this stage in the development of the technology required to provide PCS, this is not yet possible. The first item requires an assessment of monopoly power, which in itself requires a reliable market definition for the productive inputs being examined as potentially "essential." The second is simply another way of asking if there are substitutes for the service, which again requires the same rigorous market definition regarding the facility.⁷⁷

73. Gerber, *supra* note 70, at 1073. Another condition was also cited by Gerber: the facility must remain unique while its output is widely distributed, which is to say that in all markets, the facility must be unique. This Article views this condition as being a part of the first condition. See also Daniel E. Troy, Note, *Unclogging the Bottleneck: A New Essential Facility Doctrine*, 83 COLUM. L. REV. 441, 463 (1983) (the definition of an essential facility requires that three requirements be met: (1) the facility is necessary for entry into a market; (2) the duplication of the facility is beyond the standard cost of entry into the foreclosed market; (3) without access to the facility, the plaintiff cannot commercially exist).

74. Gerber, *supra* note 70, at 1075.

75. 708 F.2d 1081 (7th Cir. 1983), *cert. denied*, 464 U.S. 891 (1983); Werden, *supra* note 71, at 445.

76. William B. Tye, *Competitive Access: A Comparative Industry Approach to the Essential Facility Doctrine*, 8 ENERGY L.J. 337, 346 (1987). See also Blumenthal, *supra* note 17, at 857-858.

77. Blumenthal, *supra* note 17, at 858.

Despite these problems the "MCI test" can still be applied to PCS to provide some insight on the essential facilities issues. The question is whether some suppliers of PCS will require essential facilities from other competing suppliers as productive inputs. The first element of the "MCI test" (control of the facility by a monopolist) could be governed by traditional Section 2 market definition standards applied to the service in which the firm controlling the facility, and firms potentially subject to exclusion, compete. If the firm controlling the facility may reasonably be characterized as a monopolist under these standards, the analysis would proceed to the second element of the MCI test.

The second element of the MCI test (practicality of duplication) looks at whether or not substitutes are economically impracticable. Alternatives to inputs in the production of wireless communications ought not be merely inconvenient, costly, or troublesome for competitors to obtain; such competitors must be largely precluded from obtaining the needed facility.⁷⁸ Thus, in the MCI case itself, as well as in other telecommunications cases,⁷⁹ courts have determined that establishing a nationwide telephone network is not a "standard" cost of entry for providing telephone service, and have required interconnection with this essential element of the infrastructure. A discussion of the regulation of PCS must therefore ask whether some providers of PCS will need essential productive inputs from other providers.

Applying the first step of the MCI test in cursory fashion, the key technical question is whether the ability to locate radio ports required for transmission of PCS is controlled by a monopolist or a group of competitors with monopoly power. It is unlikely, however, that the location of these ports will be controlled by a monopolist. Although LECs are able to offer these services, they are not the only firms that can. The ability to place radio ports could be offered by other firms employing rights of way, such as the electric utilities or cable companies.

Another input to PCS which may raise questions of essential facilities is access to what is known as an intelligent network. Besides portability, PCS is expected to also offer access to and control of such services as voice mail, call forwarding, call waiting, and other enhanced features. Interconnection to an intelligent network by a PCS provider is therefore considered critical in order to manage these services. Essential facilities concerns may be raised by this issue since the LECs are frequently thought of as being the only owner of an intelligent network.

78. *Id.* at 860. Blumenthal suggests, for antitrust purposes, defining the facility as a market for purposes of merger analysis under section 7, 15 U.S.C. § 18, if alternatives to the facility are inconvenient, costly, or troublesome. *Id.* at 860 n.14.

79. *Mid-Texas Communications Sys., Inc. v. American Tel. & Tel. Co.*, 615 F.2d 1372 (5th Cir.), *cert. denied*, 449 U.S. 912 (1980); *United States v. American Tel. & Tel. Co.*, 524 F. Supp. 1336, 1360 (D.D.C. 1981), *aff'd*, 460 U.S. 1001 (1983).

Yet this is not the case. A consortium composed of an interexchange carrier, a cable company, and a PCS provider could offer personal communications services with minimal interconnection to an LEC's intelligent network. In this case, it is the interexchange carrier providing the network intelligence. Thus, the requirement of an intelligent network as a productive input should not raise issues of essential facilities that presumably only LECs can provide.

At this point in the evolution of PCS it is not at all clear that even step one of the MCI test will be satisfied. For example, cable companies have asserted that the LECs do not have an advantage over them in general, despite the LECs existing infrastructure. The contention is that the LECs can use existing infrastructure for only limited forms of PCN with little roaming capability; advanced PCN requires high-speed circuits unavailable in local telephone company areas, so "this would be a new technology for everyone."⁸⁰ If this is the case, distribution services are not likely to be supplied by a monopolist or a consortium of firms acting as one.

Even if the first step of the MCI test were satisfied, and there is monopoly control over some essential facility, such as a suitable intelligent network, the second step remains to be satisfied: the facility must not be reasonably subject to duplication. This does not appear to be the case. As a key example, the cable companies apparently believe they are capable of duplicating such facilities. This means that the presence of "essential" facilities that could only be provided by the LECs or other firms appears to be absent.

From this point, a discussion of the third element of the MCI test is moot. If there are multiple viable suppliers of network distribution for PCS, including cable companies (which themselves are discussing the possibility of becoming PCS providers), the issue of whether LECs or other suppliers could deny the use of the facility (and in so doing, harm competitors) is not of interest. Thus, at this writing it appears that there is no need to have regulation to handle concerns with essential facilities.⁸¹

80. *PCN Said to Add Issue of Cable Entry into Telephony to Telco-Cable Debate*, COMM. DAILY, Jan. 18, 1991, at 10. See also Edmund L. Andrews, *Cable TV in Phone Challenge*, N.Y. TIMES, Feb. 28, 1991, at C1. ("[T]he cable companies would use their cable networks to tie together scores of low-powered radio towers scattered throughout a town or a city. The towers would resemble those that currently are used for cellular service, but would be far more numerous and capable of receiving the faint signals that small [PCS] telephones transmit.").

81. Regarding regulation of essential facilities, the FCC required open access to certain network facilities in its *Computer Inquiry III Order*. *In re* Amendment of Section 64.702 of the Commission's Rules and Regs. (Third Computer Inquiry), *Report and Order*, 60 Rad. Reg. 2d (P & F) 603 (1986) [hereinafter *Computer Inquiry III Order*]. Enhanced services were ordered subject to what was termed Comparably Efficient Interconnection and eventually Open Network Architecture (ONA). Enhanced services are a computerized form of telecommunications service that allows electronic information to be modified as well as

F. Issues of Radio Spectrum

Beyond questions of essential facilities, the next significant area of discussion regards spectrum and its allocation for PCS. The key question is whether there is enough spectrum available to allow the projected market structure to yield efficient PCS costs and prices to consumers. For example, if MES for PCS is "small" and a competitive market would best serve the public interest, then free and open entry should be encouraged, and public policy should provide a spectrum allocation that fosters this market structure. If the spectrum allocation does not allow a "large" number of firms to compete within the market, care must be exercised to allocate at least the minimum spectrum required for the number of competitors necessary to produce a competitive outcome in terms of prices to consumers. This minimum number of competitors would therefore also have to be determined.

Although the Commission has previously ordered various reallocations and sharing of spectrum in response to new market forces, the possibility of moving existing users of the proposed PCS allocation to other portions of the spectrum is hindered by many financial and technical constraints.⁸² For example, the National Aeronautics and Space Administration (NASA) has stated that the cost of replacing their telecommunications that currently use the proposed PCS allocation will be over \$5.5 billion.⁸³ Further complicating this issue is that many of their space systems cannot be easily altered to use a different portion of the spectrum.⁸⁴ Projects such as the Hubbell Space Telescope would probably have to be abandoned and the space shuttle would have to be grounded indefinitely while enabling technology is developed for the vehicle's communications.⁸⁵

Similar concerns have also been expressed by private users of the proposed spectrum. Union Pacific Railroad, for example, has stated that

transmitted. *Id.* But see *California v. FCC*, 905 F.2d 1217 (9th Cir. 1990) (vacating the FCC's *Computer Inquiry III Order*). For a further discussion of ONA, see Walter Saprnov, *Open Network Architecture (ONA): An Overview*, in *A PRIMER ON TELECOMMUNICATIONS LAW AND REGULATION* (Walter Saprnov ed., rev. ed. June 1990).

82. See, e.g., *In re Further Sharing of the UHF Televisions Band by Private Land Mobile Radio Services*, 101 F.C.C.2d 852 (1985) (allows licensees to unilaterally alter the type of service provided in UHF channels 50-59); *Spectrum for Land Mobile Services*, 19 Rad. Reg. 2d (P & F) 1663 (1970) (reallocating UHF channels 70-83 for use by land mobile communications services); *Land Mobile Spectrum Allocations*, 23 F.C.C.2d 325 (1970) (permitting land mobile communications services to "share" UHF channels 14-20 within fifty miles of the ten largest markets); *Engineering Standards Concerning the Television Broadcast Service*, 41 F.C.C. #148, 154-58 (1952) (allocating channels 14-83 for use by UHF television).

83. *In re Amendment of the Commission's Rules to Establish New Personal Communications Services*, Notice of Inquiry, Comments of National Aeronautics and Space Administration (filed on Oct. 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

84. *Id.*

85. *Id.*

a direct expenditure of \$130 million will be required to modify its microwave systems in the planned PCS band.⁸⁶ This task is further complicated by Union Pacific's estimate that this conversion process would take at least twelve years to complete.⁸⁷

Another issue that needs to be addressed is where in the spectrum the displaced users will be placed so that their communications are technically equivalent to their present system. For example, various public safety organizations, such as the Associated Public-Safety Communications Officers (APCO) and the Los Angeles County Sheriff's Department, have commented that there is no suitable option available for their current microwave systems.⁸⁸ Because of higher frequency propagation characteristics (such as path length and attenuation) and the unavailability of alternative landline links, several users may not be able to use their current communications systems if they are displaced for PCS. In addition to dealing with the issues of compensating current users for the expense and time of converting their communications systems, the Commission will also have to make a value judgment about whether the current or proposed users of spectrum are more important to the nation's telecommunications infrastructure.

As discussed in the section on entry barriers in this article, it appears that so long as the underlying cost characteristics of PCS are conducive to the competitive market structure, there is enough spectrum to allow the provision of PCS if this market structure is fostered through open entry policies. The desired allocation for PCS centers on the 1.7-2.3 GHz range. Recent research has concluded that only 170 MHz is necessary to provide PCS for the entire world population. Using CDMA technology, discussed in section IV-C, PCS providers can largely use the same frequency allocation to offer wireless service. Although it would require a slight increase in spectrum allocation to accommodate more providers, it appears that by reallocating at least 170 MHz to PCS, the Commission can allocate enough spectrum so that any provider can theoretically serve the entire market.

86. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, Response of Union Pacific Railroad Company and Missouri Pacific Railroad Company to Notice of Inquiry (filed on Oct. 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

87. *Id.*

88. *In re* Amendment of Section 2.106 of the Commission's rules to allocate Spectrum for a Personal Communications Network, Comments of APCO, (filed on October 1, 1990) (RM-7175); *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, Comments of the Los Angeles County Sheriff's Department, (filed on October 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

V. ANALYSIS

Economic efficiency is the key criterion in determining how new services made possible by advanced technology should be regulated. Because of the limited nature of the resource necessary for offering these wireless services (i.e., spectrum), the Commission should provide a regulatory framework that ensures that spectrum is used effectively and with a minimum of waste. At the same time, the Commission should avoid any unnecessary regulation in order to foster competition on the merits. Not only should the FCC structure a system in which customers are protected from monopolistic rates (if this protection is likely to be needed), it should provide incentives for the PCS providers to operate in a manner that promotes cost minimization, enhances infrastructure development, and fosters the innovation and diffusion of new services.

As long as industry cost conditions are conducive to policies fostering entry and price competition among numerous suppliers, the ability of such competition to provide these benefits cannot be understated. As pointed out by John Wenders, "[c]ompetition is valued not as an end in itself but because it is the most efficient mechanism yet devised for improving economic efficiency."⁸⁹ Besides promoting price minimization, such competition also increases the incentives to operate efficiently. Rival firms will seek to exploit any advantage over their competitors by reducing price, improving quality, and lowering costs. By allowing a firm to exploit any weakness in its competitor's business, regulators can be assured that customers will receive the lowest possible prices.⁹⁰ Although PCS is a product from a traditionally regulated industry, the FCC should avoid regulation unless the economic characteristics of the market strongly dictate that it is needed.

A. CT-2

It appears that this cordless one-way technology can be offered with no regulation. The conditions surrounding CT-2 do not prevent competition within the market. Based on the discussion above, it seems reasonable to assume that the provision of CT-2 will not lead to a natural monopoly in the voice and data communications market. No firm appears to have a cost advantage in the provision of this service that

89. JOHN T. WENDERS, *THE ECONOMICS OF TELECOMMUNICATIONS: THEORY AND POLICY* 11 (1987).

90. This was stated quite elegantly by Wenders when he wrote that "[i]t is worth pointing out that competition not only promotes cost-based pricing but will promote *minimum* cost-based pricing. Prices will tend to move toward the minimum cost of production *at the margin*, and any firm that does not produce in the most efficient way will be eliminated by the competitive process in the long run. This, of course, lies behind the often stated rule that the role of public policy should be the promotion of competition not the protection of competitors." *Id.* at 204.

would result in natural monopoly, and even if one did, policy makers would probably not have any way of determining its existence until after entry into the market was allowed.

At this point, it appears that the regulation of CT-2 would not serve the public interest. First, no entry barriers are anticipated. Second, the existence of low-priced substitutes will probably mute any market power that entry barriers would produce if they did exist. For example, the regulated price of a call from a public pay telephone (usually 25 cents) dampens the ability of a CT-2 provider to raise the price of his one-way telephone service. Similarly, anyone desiring personal communications services may switch to traditional cellular service if the price of CT-2 were raised above a given rate. Furthermore, no regulation due to essential facilities concerns would be necessary.

Finally, the FCC will need to determine how many providers may offer this service, and where in the spectrum they can offer it.⁹¹ Although this Article offers no proposal on where in the spectrum this product should be offered, it appears that multiple CT-2 providers are possible within the market. By the very nature of this service, the provision of CT-2 requires a minimal investment. Absent any spectrum constraints, any firm with the investment capital could enter this business.

B. PCN

As with CT-2, it appears that PCN can be offered without regulatory control. Except for concerns about the allocation of spectrum, the FCC's regulatory role should be limited to monitoring the performance of the market.

The initial question in this article's analytic framework is whether the introduction of PCN will create a market for telecommunications services that will sustain only one producer of optimum low-cost size. Because every firm will have access to the same technology and may merely need to just interconnect with the local exchange network, we believe that no firm will have a cost advantage in the provision of this service.

In addition, there do not seem to be any barriers to entry for any possible PCN provider. Stripped to its essence, PCN could be provided by merely attaching a radio port to the existing wired network, an investment that would be quite nominal. If competition in a given area leads to income losses, the PCN provider is able move his operations to a

91. It should be noted that the FCC needs to determine under what rules this service should be made available to the public. The Commission may decide that this technology should best be provided under Part 15 rules similar to today's CT-1 service. Designation of CT-2 under Part 15 would mean that this service would be subject to the possibility of interference from other users within the spectrum. Although this is a key issue to CT-2, we do not believe it has a bearing on the thrust of this article.

more profitable area. Further, there appear to be virtually no sunk costs for this technology. Even if policy makers consider sunk costs to be entry barriers, ease of entry and exit are largely assured.

As with CT-2, any possible concerns about market power could be policed largely by the demand side of the market, as prices could not be raised far above those of existing substitutes without substantially affecting demand. Traditional cellular and wired telephone service will reduce the ability of a PCN provider to charge a price above competitive levels for an extended time. Any price increase in PCN can be expected to lead to an increase in cellular and telephone subscribers. In addition, PCN will compete in the same market with standard flat-rate basic local exchange service of the LECs, which is often characterized as being priced below its cost in order to foster the goal of universal service. If this is the case, such low priced basic service should dampen the effect on any PCS supplier's market power.⁹² Finally, this Article concludes that the use of CDMA technology will facilitate a competitive industry structure for PCN.

C. How to Determine Who Should Provide PCS

Because the PCS providers will necessarily displace other users of the radio spectrum, a market mechanism should be established to determine how the spectrum should be reallocated, and consequently to determine who will provide PCS. To compensate the current users of the spectrum and to guarantee the most efficient allocation of resources, this Article proposes that the Commission use auctions to determine which firms will be the providers of PCS. As noted by Evan Kwerel and Alex Felker, spectrum auctions are efficient than lotteries and comparative hearings for which costs and processing time are very high.⁹³ An auction

92. The scrutiny of the courts has not necessarily produced evidence that this is the case. See, e.g., *California v. FCC*, in which the court stated that "We are also unpersuaded by the [FCC's] new-found faith in *Computer III* that political and regulatory forces in the states will exert pressure on the BOCs to 'minimize rural, residential, and small business local exchange rates, even to levels below cost,' thereby 'limit[ing] the BOCs' ability to shift costs to regulated [basic] services.'" 905 F.2d 1217, 1236 (9th Cir. 1990) (vacating the FCC's *Computer III Order*, which changed the way the FCC would regulate so-called "enhanced services," a computerized form of telecommunications service that allows electronic information to be modified as well as transmitted); *In re Amendment of Section 64.702 of the Commissions Rules and Regs. (Third Computer Inquiry)*, *Report and Order*, 60 Rad. Reg. 2d (P & F) 603 (1986).

93. Evan Kwerel & Alex D. Felker, *Using Auctions to Select FCC Licensees* (Federal Communications Commission, OPP Working Paper Series #16) (1985). Auction mechanisms are also in favor with major policy makers and President Bush as well. *Spectrum Reallocation Legislation Unveiled by Administration*, COMM. DAILY, Mar. 8, 1991, at 1; COMM. DAILY, Mar. 14, 1991, at 6 (discussing the opinions of NTIA Director Janice Obuchowski on spectrum auctions); Kathleen Killete, *Bill: Auction Communications Licenses*, COMM. WEEK, Mar. 18, 1991, at 53; *NTIA Wants "Pragmatic" Spectrum Auction*, COMM. DAILY, Feb. 28, 1991, at 4; *Bush's Economic Advisors Urge Pro-Competitive*

typically costs only 15% of the cost of either hearings or lotteries, while the processing time for an auction is three months, compared to twelve months for a lottery and eighteen months for comparative hearings.⁹⁴

The auction mechanism advocated in this article is a sealed second-bid format.⁹⁵ Each participant in this auction submits a closed bid of the most they are willing to pay for the PCS right. Unlike the traditional sealed bidding process in which the bidder has to estimate both his value for the item and how much his competitors will offer for the contested good, a contestant in a second-bid auction only reveals to the auctioneer how much he is willing to spend for the item. Although the winning bidder may have the highest bid, the actual price paid by the winning bidder is only equal to the second highest bid. Besides providing protection from collusion (i.e., the use of sealed bids) and a reduction in costs associated with bidding (knowledge of competitor's value for the good is not necessary), this auction mechanism also brings one of the advantages of an open auction in which a price is found that only one competitor is willing to pay.⁹⁶ In short, a sealed second-bid auction offers consumer safeguards, cost minimization, and efficient prices.⁹⁷

The auction for the right to sell PCS would have as a minimum price the direct cost of compensating existing users for moving to other portions of the spectrum. If no bidders came forward to offer this minimum price, this would reveal that it would not be economically efficient to offer the new service, at least not in that particular region of the spectrum. Any amount over this compensation price could be retained as a transfer payment from the bidder to the Federal government.

D. PCS Should be Supplied via Multiple Providers

As long as cost conditions are expected to bring reductions in total industry costs by fostering a competitive market structure, the public

Telecommunications Policies, COMM. DAILY, Feb. 14, 1991, at 5; *FCC: PCS Rules Still a Year Away*, TELEPHONY, Nov. 26, 1990, at 14 [hereinafter *PCS Rules*].

94. *PCS Rules*, *supra* note 93, at 17.

95. For a further discussion on this type of auction, see Terrence J. Schroepfer, *Allocating Spectrum Through the Use of Auctions*, 14 HASTINGS COMM. & ENT. L.J. 35, 41-42 (1991). See also William Vickrey, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, 16 J. FIN. 8 (1961); Paul Milgrom, *Auctions and Bidding: A Primer*, 3 J. ECON. PERSPECTIVES 3 (1989).

96. For a comparison of different formats, see Schroepfer, *supra* note 95, at 35.

97. Several recent studies have shown the benefits to consumers of this type of bidding, which is sometimes called "franchise bidding." See Mark A. Zupan, *The Efficacy of Franchise Bidding Schemes in the Case of Cable Television: Some Systematic Evidence*, 32 J. L. & ECON. 401 (1989); Michael A. Crew & Mark A. Zupan, *Franchise Bidding for Public Utilities Revisited*, in COMPETITION AND THE REGULATION OF UTILITIES 173 (Michael A. Crew ed., 1990); Kwerel & Felker, *supra* note 93. But see, Oliver E. Williamson, *Franchise Bidding for Natural Monopolies—in General and with Respect to CATV*, 7 BELL J. ECON. 73 (1976).

interest is best served if multiple participants are allowed to provide PCS. If the rapid deployment of advanced technologies is one of the underlying policy goals of the FCC, then these goals may be furthered by a LEC set-aside which would reserve a portion of spectrum for local exchange carriers to provide PCS. There are other compelling reasons that favor a LEC set-aside. First, PCS offers the LECs the opportunity to expand and enhance service to rural areas, since it promises to be a more cost-effective way of providing access. By providing another means of service, PCS can also be helpful in furthering universal service objectives. The LECs also are well qualified to provide PCS because of their technical expertise, resources, existing distribution networks, and long history of providing telephone service in the United States. As was pointed out above, much of the necessary infrastructure is already in place, enabling PCS to be rapidly deployed by LECs well before the end of the decade.

If the FCC's ultimate policy does not include a LEC set-aside, the LECs should be allowed to participate in any selection process that is used, (e.g., auctions). In any event, the FCC must balance the advantage a large number of firms brings to providing a competitive market with the recognition that each additional market participant forces a slightly higher spectrum allocation with CDMA. Even though this article agrees that more firms in the market increase competition, it is not yet possible to make a judgment regarding the point at which the benefits of an increased number of competitors are outweighed by the increased spectrum demands. From a public welfare perspective, it is not yet clear what the optimal number of competitors is, i.e. the number of competitors that would equate the marginal increase in public welfare (due to competition) with the marginal social cost of spectrum. This article argues that without more information about the benefits and costs of each additional PCS provider, the authors cannot decide the ultimate number of PCN and CT-2 participants.

Certainly, no firm should be precluded from participating in competing for the right to provide PCS simply because it has so-called "deep pockets." This is an argument that is sure to be leveled against the LECs and other large incumbent carriers in telecommunications. Opponents will argue that: Auctions, as a means of determining which firms should provide PCS, favor large firms that have large cash reserves or other considerable financial resources, and disadvantages other efficient providers that lack such financial resources. This reasoning may lead to some very inefficient policies if it is followed. The reasoning is specious for the same reason that high capital costs in and of themselves are not barriers to entry. If efficient capital markets are available to participants choosing to bid on the right to provide PCS, then a firm with "deep pockets" possesses no advantage over other participants. Thus, the FCC should not preclude any bidders for PCS simply because they are

cash rich or financially healthy. Similarly, the FCC should not grant some sort of "handicap" to firms that would find it difficult to raise the financial resources necessary to engage in a spectrum auction. This type of handicapping merely encourages inefficient entry by marginal firms that cannot improve the public interest by being a market participant.⁹⁸

E. The Pervasive Regulatory Concern of Predatory Pricing

This article has not specifically discussed the familiar and oft-heard concern of large, well established industry suppliers cross-subsidizing CT-2 or PCN with revenues from other services (and proposes no explicit regulatory safeguards against this alleged practice). This article's recommendation regarding this concern is to rely wholly on the antitrust laws, primarily on Section 2 of the Sherman Act, or on the applicable state antitrust laws, if necessary. If policy makers wish to encourage the diffusion of advanced technologies like PCS, it is in the public interest to avoid regulation requiring such services to pass potentially onerous cost-based tests designed to prevent predatory pricing. There are several reasons the application of seemingly plausible cost-based predation rules are likely to do more harm than good.⁹⁹

First, it should be recognized that antitrust courts have lately eschewed cost-based tests in favor of more economically advanced approaches to the predation question.¹⁰⁰ Antitrust courts have recognized that a cost-based test imposes an onerous burden of proof on defendants, and is usually unnecessary to determining whether predatory pricing is a viable and rational economic practice. Thus, it would be a mistake to require too much regulatory scrutiny of PCS costs. Such regulations merely make it easy for competitors to forestall the legitimate competitive responses of firms required to produce cost-based tests. If PCS costs are scrutinized before prices can be set or changed flexibly, this process should not take place in an asymmetric fashion where it is applied only to LECs but not to other PCS providers. The best policy for a service like PCS is to have no price floors at all.¹⁰¹

98. See *supra* note 4 and accompanying text.

99. See, Alexander C. Larson & Mark E. Meitzen, *Recent State Legislation for Telecommunications Regulation: Brave New World, or Bad Public Utility Law?*, 14 GEO. MASON U. L. REV. (forthcoming 1992).

100. See *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986); *Cargill Inc. v. Monfort of Colo., Inc.*, 479 U.S. 104 (1986); *A.A. Poultry Farms, Inc. v. Rose Acre Farms, Inc.*, 881 F.2d 1396 (7th Cir. 1989), *cert. denied*, 494 U.S. 1019 (1990).

101. Alexander C. Larson & William E. Kovacic, *Predatory Pricing Safeguards in Telecommunications Regulation: Removing Impediments to Competition*, 35 St. Louis U. L.J. 1 (1990). It is often thought that predatory pricing by an LEC or other large regulated firm goes beyond the simple pricing of services below their costs. A common, though largely anecdotal and economically dubious scenario involves one in which the LEC can hide the cost of developing a service like PCS within its complicated accounting system. The cost of a service like PCS would then be recovered through rate regulation of basic local exchange

This latter point is especially strong for services like PCS. When scope economies exist in the production of services subject to rapidly changing technology (and available to a wide variety of competing firms), it is virtually impossible to distinguish allegations of predatory pricing from lawful responses to competitive pressures. It is best not over-regulate competition in such markets out of fear of price predation, especially when in similar situations such concerns have often been found to lack substance.¹⁰² The lack of entry barriers in the PCS market combined with a high supply capability of firms competing with the LECs should make anticompetitive cross-subsidization economically senseless since it could not be expected to reduce competition in the long run. As long as prices are going down for the services in question, infrastructure development is implicitly encouraged and the diffusion of advanced technology is improved, both resulting in benefits for consumers.¹⁰³

service. This scenario is unrealistic and largely baseless from an economic perspective. First, the trend is for basic local exchange rates to go down in the future, not up. The trend afoot for incentive regulation in the various states usually involves a freeze or cap on basic local exchange rates, making it difficult to orchestrate a predation strategy. See, e.g., *In re Southwestern Bell Telephone Company's Proposal for Network Modernization, Rate Stability and Pricing Regulation a/k/a "TELEKANSAS,"* Docket No. 166,856-U, Order (Feb. 2, 1990). Second, regulatory lag also makes predation strategies rather senseless, since it prevents the regulated firm from recouping the losses it must incur in the markets in which predation allegedly would take place. See W. A. Brock & David S. Evans, *Predation: A Critique of the Government's Case in US v. AT&T*, in *BREAKING UP BELL: ESSAYS ON INDUSTRIAL ORGANIZATION AND REGULATION* 55-56 (David S. Evans ed., 1983). Third, it is not true that a regulated firm can incur losses in one market, and make up the difference dollar-for-dollar in another regulated market such as the one for basic local exchange service. While rate of return regulation theoretically makes this possible, regulatory lag and other real world considerations make this quite remote. Under price ceiling regulation, there is only one set of profit-maximizing prices, and this set of prices cannot include prices that are set below the relevant costs. Thus, a predation strategy under price ceiling regulation makes a loss of profits a certainty, and makes recouping of these losses virtually impossible. Fourth, predation under rate of return regulation can only take place if the allowed rate of return exceeds the market rate of return, a rather unlikely occurrence. Janusz A. Ordover & Garth Saloner, *Predation, Monopolization, and Antitrust*, in 1 *HANDBOOK OF INDUSTRIAL ORGANIZATION AND REGULATION* 570-573 (Richard Schmalensee & Robert D. Willig eds., 1989). Fifth, if PCS were to be offered under a LEC's separate subsidiary, the issue of predation through basic local exchange rates is moot, though important scope economies may be lost in the process. Finally, regulated firms are not necessarily exempt from the antitrust laws by virtue of their rates being set by a regulatory agency.

102. See the analysis of Wesley S. Liebler, *Whither Predatory Pricing? From Areeda and Turner to Matsushita*, 61 *NOTRE DAME L. REV.* 1052 (1986) (Not a single real predatory pricing case has emerged in the courts from the inception of the Areeda-Turner test in 1975 to the time of the Matsushita case; most alleged cases of predatory pricing brought before the courts could have been disposed of in summary judgment under the standards set in the Matsushita case.)

103. The case of PCS may be a case in which the game-theoretic strand of the predatory pricing literature has something to offer. Basically, the message of the game-theoretic predatory pricing "literature is that it is rational for firms to use past market experience to forecast future market experience, and therefore it is rational for existing firms to price

VI. CONCLUSION

The future telecommunications industry will boast more and more new services made possible by advanced technologies. The rate at which these new advanced technologies and services will be developed is expected to increase. A key question is how to regulate the advanced technology which makes the new services possible. This article asserts that the object of the analysis should be *markets* and not specific firms or services in isolation. Policy makers applying public utility law should focus on how existing markets will be affected by the introduction of a new service, and how this market should be regulated prospectively after the new service becomes a part of it.

This approach ensures the rapid diffusion of advanced technologies and encourages new service development, enhancing the basic telecommunications infrastructure. This process also obviates the unnecessary regulation of new services, and ensures that the overall regulation of the relevant market takes place in integrated fashion, as opposed to piecemeal service-by-service regulation.

This article provides an implicit analytic framework for determining whether and how to regulate new high technology services, and applies it to a service that will emerge later in this decade, personal communications services. The analytic framework requires the analyst to examine the overall market of which a new service would be a part, and consider ease of entry and its implications for market power, demand considerations emanating from substitutes for the new service, essential facilities issues, and other related issues (e.g., spectrum constraints). While this analytic framework does not provide a road map for the

aggressively and take other actions that, even if they are not profitable in their own right, may be profitable when the response of the competitors (exit or delayed or deterred entry) is taken into account.

The game theoretic theories predict that such so-called predatory strategies are most likely to be effective when used by a large competitor against a long sequence of smaller competitors, because the smaller competitors will be less likely to be willing to sustain a fight for market share and because the value of building a reputation is greatest when it is used more often. Consequently, the social consequences of predation are most worrisome in markets with rapid new product introduction. Yet these are the very same markets in which intense market share battles and falling prices might be seen for other reasons." See letter from Paul Milgrom, Director, Stanford Institute for Theoretical Economics, to Alex Larson, (April 17, 1990) (on file with authors).

Thus, it makes no sense to examine predation in such markets (or to use cost-based tests if it is decided to examine predation anyway). Further, it makes no sense to expect a predation safeguard to filter predatory behavior from earnest competition on the merits, or to expect a predation remedy necessarily to have less social costs than the predation itself. See Paul Milgrom & John Roberts, *Informational Asymmetries, Strategic Behavior, and Industrial Organization*, 77 AM. ECON. REV. 184 (Papers and Proceedings) (1987); John Roberts, *Battles for Market Share: Incomplete Information, Aggressive Strategic Pricing, and Competitive Dynamics*, in *ADVANCES IN ECONOMIC THEORY: FIFTH WORLD CONGRESS* 157 (Jean-Michel Grandmont & Charles F. Manski eds., 1987).

regulatory handling of new services, and hence does not provide a specific list of recommended evidentiary standards in support, it does offer a way to examine important underlying regulatory issues and avoid unwise policies. This, of course, is often the primary role of economics in both regulatory and antitrust issues. A failure to employ the principles involved in this implicit framework may lead to overly burdensome regulation of new high technology services and unduly impede the development of such services.

The main conclusion of this article is that PCS should not be regulated. This conclusion is based on the assumption that there are no expected entry barriers into the submarket for PCS (i.e., sunk costs, the North American Numbering Plan, and spectrum allocation do not appear problematic) and that many existing, low priced telecommunications services would provide significant competition for PCS, no matter which firm or firms offer it. It is also contended that issues of essential facilities will probably not require any overt regulatory policies, since no one firm or group of firms is expected to completely control key productive inputs that its own competitors will require.

This article recommends using sealed second-bid auctions for the allocation of radio spectrum to PCS. There appears to be enough spectrum available for PCN and CT-2 competition. Through the use of CDMA technology, the FCC has the ability to authorize multiple PCS providers to use the same frequency to offer their service. Besides setting up a mechanism to compensate current users for moving to other portions of the spectrum, this process will allow the FCC to determine the true value of the spectrum.

However, it is not a foregone conclusion that fostering a large number of vendors of PCS will automatically produce the low prices and high quality levels associated with a truly competitive market structure. Open entry policies do not automatically foster a competitive market result in the sense that total industry costs are automatically minimized. A competitive industry structure is only efficient if the cost characteristics of the firms in that industry dictate that total industry supply costs can be minimized by having several firms supply industry demand. This could reasonably be expected to be the case with PCS. If so, it would be a sound policy to allocate enough spectrum to allow several competitors to service the market. The optimal number of firms depends on the form of

competition that is expected, and the opportunity cost of displaced spectrum.

