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**COMPETITIVE ISSUES IN  
THE MOBILE TELECOMMUNICATIONS MARKET**

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Prepared for:

FEDERAL COMMUNICATIONS COMMISSION  
PANEL DISCUSSIONS ON PCS ISSUES

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April 7, 1994

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Regulatory and technological changes will significantly alter the structure of the mobile telecommunications market in the next few years. Mobile services are today provided primarily by two cellular operators in each of the nation's cellular service areas. In the future, however, largely as the result of the Federal Communication Commission's Personal Communications Service (PCS) proceedings and through the development of Enhanced Specialized Mobile Radio (ESMR) (and eventually, perhaps, through the advent of mobile satellite services), this situation will change dramatically. The result will be a substantial reduction in industry concentration.

In establishing regulatory policies in and for this new environment, the FCC has a unique opportunity. By defining PCS very broadly, the Commission already has made a major break from past policies that placed major, if not insurmountable, barriers to the reallocation of spectrum assignment among alternative uses. Individual licensees will be free to change the uses to which their assignments will be put as technology changes and new information becomes available about market demands. In view of the considerable uncertainty about how mobile telecommunications markets will develop, the substantial flexibility that the Commission has permitted licensees represents a major improvement over past spectrum management policies.

For the same reason that the Commission has provided flexibility in spectrum use -- namely that neither the Commission nor anyone else can know precisely how this spectrum will be used -- the firms that provide mobile telecommunications services must be allowed flexibility in the amounts of spectrum that they can use. Transfers, combinations, and divestitures of spectrum should be permitted in order to take advantage of economies of scale and scope, or, more generally, to respond to the opportunities to accommodate uncertain and changing market demands and to promote efficient spectrum use.

At the same time, it is important that the Commission not permit the mobile telecommunications market to become so concentrated that competition is threatened. Preventing excessive concentration is not, however, the same as maximizing the number of competing firms. Because of the existence of scale or scope economies, consumer interests are likely to be better served if the number of rivals is determined by demand and cost conditions. And, indeed, the significant reduction in market concentration that will soon occur means that the Commission can permit combinations that it might otherwise wish to prevent in a more concentrated environment. Nonetheless, the Commission can, and should, consider the effects on market concentration of proposed spectrum acquisitions.

Along with my colleagues, I have undertaken an analysis of the effects on concentration of a number of proposed spectrum acquisitions, namely those involving acquisitions by incumbent cellular operators of a portion of the PCS spectrum either in the initial auctions or in the “aftermarket.” This analysis involved the definition of relevant antitrust markets, determination of the level of concentration in the absence of these acquisitions, and identification of the change in concentration that results from them. We concluded that: (1) both product and geographic markets should be defined broadly; (2) concentration levels in the absence of these acquisitions are not high; and (3) incumbent cellular operators can be permitted to bid for, or purchase, portions of PCS spectrum without increasing market concentration to a level that would offend the DOJ/FTC Merger Guidelines.

## What Is PCS?

As I discuss elsewhere,<sup>1</sup> PCS is not a well-defined term. Indeed, at least four different views have appeared in discussions of PCS. Some providers of cellular service have described PCS as the third phase in the evolution of cellular technology, following service to automobiles and portable telephones. A second view is that PCS comprises several kinds of communications services, based on digital technologies, that will become competitive alternatives to cellular telephone services--for example, CT-2 (second-generation cordless telephones) or ESMR. A third view is that PCS is simply a synonym for wireless or mobile telecommunications services, one of which is cellular radio. Finally, one commentator has suggested that PCS is "more spectrum for something else," namely any and every new wireless concept that is proposed.<sup>2</sup>

The Commission clearly recognized the difficulties in forecasting the future of PCS when it defined these services broadly as "a family of mobile or portable radio communications services which could provide services to individuals and business, and be integrated with a variety of competing networks."<sup>3</sup> The Commission has also indicated that it intends the term PCS "to encompass a family of services that would include services other than voice, such as data, imaging, and other new services."<sup>4</sup>

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<sup>1</sup> S.M. Besen, R.J. Lerner, and E.J. Murdoch, An Economic Analysis of Entry by Cellular Operators into Personal Communication Services, November 1992, pp. 11-16

<sup>2</sup> G. Calhoun, Wireless Access and the Local Telephone Network (Boston: Artech House, 1992), p. 573.

<sup>3</sup> Notice of Proposed Rule Making and Tentative Decision, In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, ET Docket No. 92-100, released August 14, 1992, para. 29. (Hereinafter, "Notice.")

<sup>4</sup> Notice, para. 12.

Because PCS is not a well-defined term, and because technologies are changing rapidly,<sup>5</sup> no one can predict with great confidence which new mobile services will be offered by the firms obtaining PCS licenses. As a result, it is difficult to analyze how alternative spectrum allocations will affect competition among providers of mobile telecommunications services. While cellular service will continue and ESMR is in its infancy as a commercial service, PCS is not yet commercially available in the United States, and there is still considerable uncertainty about the precise features and functions, as well as the costs of production and prices, of the various mobile telecommunications services that may be introduced. It is these attributes of PCS that ultimately will determine the nature of their relationships with cellular service, that is, whether cellular and a particular PCS are close or poor substitutes, independent goods, or even complements in demand. Moreover, it is because of these uncertainties that the Commission should allow firms the flexibility to adapt to changing market circumstances by increasing or decreasing the amount of bandwidth for which they are licensed.

#### Defining The Market

Elsewhere,<sup>6</sup> I explain why, under reasonable conditions, all firms licensed to provide wireless telecommunications services--including companies supplying cellular services, PCS, and ESMR services--should be considered to be competitors in the same antitrust market. The key to this conclusion is that providers of mobile tele-communications services are legally able to provide a range of services and will be able to move from one to another rapidly and at modest cost. If firms can easily offer any of a wide range of services, they are in the same market.

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<sup>5</sup> The FCC has authorized over 150 PCS experimental licenses in the past three years. Paragraphs 18 to 21 of the Notice provide an overview of these experiments.

<sup>6</sup> S. Besen and W. Burnett, An Antitrust Analysis of the Market for Mobile Telecommunications Services, December 8, 1993, pp. 16-24. (Hereinafter, "Besen and Burnett.")

Among the conditions that enable suppliers of mobile telecommunications services to shift from one service to another are: (1) the absence of legal or regulatory restrictions on the uses to which the spectrum licensed to any firm can be put; (2) the fungibility of bandwidth (portions of the electromagnetic spectrum allocated to the provision of mobile telecommunications services can be used to provide the same or substitute services and at about the same cost); (3) flexibility of provider equipment in providing alternative services; (4) absence of minimum spectrum requirements; and (5) flexibility of customer equipment. In addition, there is also likely to be significant substitutability in demand because users can substitute some mobile services for others.

Available evidence suggests that firms offering mobile services will be able to shift among a wide range of different services rapidly and at relatively low cost. The ability of firms to change the services they provide in response to price and profit opportunities ties virtually all of the various mobile telecommunications services into one broad market; narrow, relevant antitrust markets limited to specific services would be exceptional. To the extent that there is some limited class of services that have special requirements (very broad spectrum needs, for example), such services might constitute narrower markets and, therefore, require individual attention.

The scope of the geographic market for mobile telecommunications services depends on whether providers may charge different prices to customers in different regions. However, if price discrimination is barred, geographic markets generally will be broad, often as large as, and potentially larger than, Major Trading Areas. If price discrimination is permitted among, for example, Basic Trading Areas (BTAs), then narrow regions like BTAs may be relevant geographic markets

## Market Concentration

Within the broad market for mobile telecommunications services, the capacity to transmit information is the appropriate measure of market share. Bandwidth, however, is not necessarily an appropriate measure of capacity. The ability to transmit information within a given amount of spectrum is determined in part by the technology adopted, and newer, digital systems have a far greater capacity than do older, analog ones. Because existing cellular operators will, for some time, be required to continue to serve customers that have invested in analog equipment, they will have lower effective capacity and market share per unit of allocated bandwidth than will firms with licenses for the same amount of bandwidth that employ only digital equipment. Incumbent cellular operators will suffer this “analog handicap” for as long as they must continue to serve customers using the old technology. The share of the mobile telecommunications market held by cellular firms will thus be less than their share of assigned bandwidth and this factor must be taken into account in measuring market concentration and the effects of spectrum license acquisitions.

The decision by the Commission to award licenses to PCS providers, as well as the introduction of ESMR, will greatly expand the number of firms that supply mobile telecommunications services in each geographic area and will dramatically reduce the level of market concentration. Tables 1 to 6 illustrate some of the possible effects of new entry on concentration.<sup>7</sup> Table 1 is based on the assumption that the Commission will award PCS licenses to seven different suppliers, none of which is an incumbent cellular carrier. Following the award

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<sup>7</sup>The level of concentration in each table is calculated on the assumptions that, for a given amount of bandwidth, digital technology yields six times the effective capacity that analog technology does and that cellular operators will be devoting 10 MHz of their bandwidth to supplying services using analog technology. Additional calculations of HHIs appear in Besen and Burnett.

of these PCS licenses, the HHI is only 1,342, an indication of a moderately concentrated market according to the Horizontal Merger Guidelines of the U.S. Department of Justice and the Federal Trade Commission.<sup>8</sup> If the market also contains one ESMR provider with 10 MHz of capacity, the HHI would fall to 1,220 (Table 2). Even if the Commission were to award licenses for 10 MHz to each of the two incumbent cellular carriers (the maximum additional bandwidth for which they are eligible under the Commission's proposed rules for PCS licenses), the HHI would be 1,626 (Table 3), still well below 1,800, which the Merger Guidelines treat as the threshold for a highly concentrated market. And the addition of an ESMR provider to this scenario lowers the HHI to 1,470 (Table 4).

In fact, were one of the two cellular carriers to acquire an additional 5 MHz of bandwidth from a PCS supplier with 10 MHz, the HHI would rise from 1,470 to only 1,551 (Table 5). This effect on concentration is such that the acquisition is not likely to be challenged by the federal antitrust agencies. Even if both cellular carriers were to acquire an additional 5 MHz of bandwidth from the two smallest PCS providers, the HHI would rise to 1,633 (Table 6), still well below the threshold level for a highly concentrated market. Moreover, all of these potential market structures are far less concentrated than those that prevail today.

#### Other Factors That Affect Competition

In an industrial organization antitrust analysis, the number and size distribution of firms in a market are important initial indicators of the likelihood of competitive behavior. This follows from a belief that market participants can more easily coordinate their behavior when they are few in number.

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<sup>8</sup> U.S. Department of Justice and the Federal Trade Commission Horizontal Merger Guidelines, April 2, 1992. (Hereafter, "Merger Guidelines.")

Similarly, the costs of monitoring the behavior of others and enforcing any collusive arrangement by punishing “cheaters,” are lower when there are few industry participants.

The opening of the 2 GHz band for the provision of PCS, and recent developments in ESMR technology, will contribute to a substantial reduction in concentration in the provision of mobile telecommunications services. However, in this as in other markets, it is necessary to look beyond measured concentration in judging the extent of market competitiveness.

Other factors that are present in mobile telecommunications markets make concerns about anticompetitive behavior even less important than might be suggested by the number of firms and their respective market shares. These factors, which influence the strategies each firm pursues, and thus affect the extent of market competitiveness, include: (1) the rapid pace of technological progress in the industry; (2) the rapid growth in the demand for mobile services; (3) the wide array of service offerings; (4) the structure of costs; and (5) an expanding fringe.

Technological Progress. The rapid technological change in the provision of mobile telecommunications is manifested in a high degree of variability in the services offered and the prices of those services. As new services are offered, a collusive agreement is difficult to maintain because the price of each new service must be integrated into the existing price structure.<sup>9</sup> When firms are continually modifying, improving, and adding new products and services, reaching agreement on a collusive price is itself problematic. Moreover, as providers adopt new technologies, the introduction of new service packages offers opportunities to “cheat” on any putative anticompetitive agreement without provoking the “punishment” that might otherwise occur, in part because it is difficult for rivals to determine the appropriate price for a new service. As a result, new mobile services are likely to be

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<sup>9</sup>R.A. Posner, Antitrust Law: An Economic Perspective (Chicago, IL: The University of Chicago Press, 1976), pp. 59-60.

offered at competitive prices, because it is easier to deviate from a collusive agreement when products are changing.<sup>10</sup>

Market Growth. The mobile telecommunications industry, even when confined to mobile telephone service, has exhibited extraordinary growth during its relatively brief history. The rapid rate of technological innovation not only hinders the smooth functioning of a collusive pricing agreement in the mobile services market, but it also results in rapid market growth. Such growth may weaken the incentive for firms to participate in collusive agreements because, when markets are growing rapidly, demand may become more inelastic, so the gains from deviating from a collusive price are greater.<sup>11</sup> If the probability of detection is unchanged and the gains from deviation are increased, firms are more likely to price aggressively, to the benefit of consumers.

Service Heterogeneity. A third characteristic of the mobile services market that weakens industry cohesion, and thus the ability of firms to raise prices, is the heterogeneity of product offerings.<sup>12</sup> The absence of an obvious basis for comparing service prices increases the cost of monitoring and punishing deviations from any collusive agreement.<sup>13</sup> With the introduction of PCS, product heterogeneity will increase. As a result, the cost of monitoring a collusive agreement also will increase because price changes that reflect differences in service quality will be difficult to distinguish from those that undercut a tacit agreement.

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<sup>10</sup> F.M. Scherer and David Ross, op. cit., p. 285, observe that “the more rapidly producers' cost functions are altered through technical change and the more unevenly those changes are diffused throughout the industry, the more likely there will be conflict regarding pricing choices.”

<sup>11</sup> J.J. Rotemberg and G. Saloner, “A Supergame-Theoretic Model of Price Wars During Booms,” American Economic Review 76 (1986), pp. 390-407.

<sup>12</sup> This is distinct from the rapidity with which service offerings change, which was discussed above. Both factors are present here.

<sup>13</sup> K.W. Clarkson, and R.L. Miller, Industrial Organization: Theory, Evidence, and Public Policy (New York, NY: McGraw-Hill Book Company, 1982), pp. 335-336.

The Structure of Costs. An important factor that affects the ability of firms to coordinate their pricing decisions is the structure of their costs. In particular, collusive behavior is generally believed to be less likely in industries, like mobile telecommunications services, where a significant portion of a firm's costs must be incurred regardless of the level of its output, i.e., when fixed costs are high relative to variable costs. In such circumstances, the incentive of a firm to reduce prices if demand falls short of capacity is much greater than it is in situations in which output reductions result in larger reductions in costs.

Although the demand for mobile telecommunications services is expected to grow rapidly, it is also the case that much investment is both expected, and will have to be made, in anticipation of that demand growth. There are thus likely to be many situations or time periods in which some firms have substantial excess capacity, i.e., they will be able to increase their output while incurring relatively few additional costs. That is precisely the situation in which economic analysis indicates that vigorous price competition is most likely, and that collusion is unlikely.<sup>14</sup>

An Expanding Fringe and Future Entry. The calculations above show the importance of the expanding "fringe" in the mobile telecommunications services market. The increased ability of ESMR operators to offer a wider variety of mobile telecommunications services argues for including them in the market, and results in a reduction in measured concentration. Some additional entry can probably be expected from this source, which would reduce concentration below the levels described above.

In addition, entry is likely from the large number of planned mobile satellite ventures, many of which will target the United States market.<sup>15</sup> The proposed entrants are supported by major

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<sup>14</sup> Put differently, what drives competition in a high fixed cost-low variable cost industry is a discrepancy between capacity and demand, and that discrepancy can result either from a decline in demand or from rapidly growing capacity.

<sup>15</sup> S. Sugawara, "Battle in the Skies" (Washington Post, "Washington Business," October 18, 1993, pp. 1 and 14-15) describes nine such systems.

telecommunications firms, including Motorola, Sprint, GTE, Comsat, Hughes, McCaw, Loral, and Qualcomm. This forthcoming entry further reduces the significance of existing market shares as measures of the future competitiveness of the mobile services market.<sup>16</sup>

Summary. In sum, there are a variety of important market conditions that can be expected to inhibit the ability of firms offering mobile telecommunications services from either reaching or enforcing a collusive agreement. When such factors are present, even transactions that increase concentration beyond certain trigger levels, such as those in the Merger Guidelines, are less likely to lead to reduced competition.

### Efficiencies

While anticompetitive conduct from allowing incumbent cellular operators to acquire capacity in the 2 GHz band is unlikely, there appear to be efficiency advantages from permitting them to do so. For example, an FCC Office of Plans and Policy Working Paper<sup>17</sup> finds that there are strong economies of scope between cellular services and PCS that result from the Operations, Administration, and Maintenance Services, Switching, and Handsets components of the cost model it analyzes. The results, which indicate that there are cost savings of about \$65 per subscriber per year from combining cellular and PCS operations (assuming a 10 percent penetration of PCS and a 25 MHz spectrum allocation), are similar to the economies of scope found from combining cellular with either telephone or cable television operations.

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<sup>16</sup> ¶ 1.521 of the Merger Guidelines recognizes the importance of changing market conditions. It notes that "recent or ongoing changes in the market may indicate that the current market share of a particular firm either understates or overstates the firm's future competitive significance."

<sup>17</sup> D.P. Reed "Putting It All Together: The Cost Structure of Personal Communications Services," Federal Communications Commission, Office of Plans and Policy, November 1992, p. 43.

## Conclusion

The general policy prescription from this analysis is that the Commission should not, in the face of uncertain future demands and costs, impose unnecessary or overly restrictive limits on mobile telecommunications providers. The rules governing the structure of the market for mobile services, under the terms currently contemplated in the Second Report and Order, may prevent some merger and acquisition transactions that do not threaten to reduce competition or raise prices of mobile telecommunications services and that in fact promise significant efficiencies. A number of these transactions may be unobjectionable on purely structural grounds. The general policy, moreover, when considered in light of other factors that inhibit coordinated behavior and collusion, warrants a more flexible rule-of-reason approach.

**Table 1**  
**HHI Calculations for a Wireless Telecommunications Market with**  
**Two Cellular Carriers and Seven PCS Providers**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	25	100	10.9%	118
Cellular 2	25	100	10.9%	118
PCS3	30	180	19.6%	383
PCS4	30	180	19.6%	383
PCS5	20	120	13.0%	170
PCS6	10	60	6.5%	43
PCS7	10	60	6.5%	43
PCS8	10	60	6.5%	43
PCS9	10	60	6.5%	43
<b>Totals</b>	<b>170</b>	<b>920</b>		<b>1,342</b>

**Table 2**  
**HHI Calculations for a Wireless Telecommunications Market with**  
**Two Cellular Carriers, Seven PCS Providers and One SMR Provider**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	25	100	10.2%	104
Cellular 2	25	100	10.2%	104
PCS3	30	180	18.4%	337
PCS4	30	180	18.4%	337
PCS5	20	120	12.2%	150
PCS6	10	60	6.1%	37
PCS7	10	60	6.1%	37
PCS8	10	60	6.1%	37
PCS9	10	60	6.1%	37
SMR10	10	60	6.1%	37
<b>Totals</b>	<b>180</b>	<b>980</b>		<b>1,220</b>

**Table 3**  
**HHI Calculations for a Wireless Telecommunications Market with**  
**Two Cellular Carriers with PCS Licenses and Five PCS Providers**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	35	160	17.4%	302
Cellular 2	35	160	17.4%	302
PCS3	30	180	19.6%	383
PCS4	30	180	19.6%	383
PCS5	20	120	13.0%	170
PCS6	10	60	6.5%	43
PCS7	10	60	6.5%	43
<b>Totals</b>	<b>170</b>	<b>920</b>		<b>1,626</b>

**Table 4**  
**HHI Calculations for a Wireless Telecommunications Market with Two Cellular**  
**Carriers with PCS Licenses, Five PCS Providers and One SMR Provider**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	35	160	16.3%	267
Cellular 2	35	160	16.3%	267
PCS3	30	180	18.4%	337
PCS4	30	180	18.4%	337
PCS5	20	120	12.2%	150
PCS6	10	60	6.1%	37
PCS7	10	60	6.1%	37
SMR8	10	60	6.1%	37
<b>Totals</b>	<b>180</b>	<b>980</b>		<b>1,470</b>

**Table 5**  
**HHI Calculations for a Wireless Telecommunications Market with Two Cellular Carriers with PCS Licenses, Five PCS Providers and One SMR Provider**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	40	190	19.4%	376
Cellular 2	35	160	16.3%	267
PCS3	30	180	18.4%	337
PCS4	30	180	18.4%	337
PCS5	20	120	12.2%	150
PCS6	10	60	6.1%	37
PCS7	5	30	3.1%	9
SMR8	10	60	6.1%	37
<b>Totals</b>	<b>180</b>	<b>980</b>		<b>1,551</b>

**Table 6**  
**HHI Calculations for a Wireless Telecommunications Market with Two Cellular Carriers with PCS Licenses, Five PCS Providers and One SMR Provider**

**Ratio of Digital to Analog Effective Capacity / 6:1**  
**Cellular Operators Bandwidth Devoted to Analog:10 MHz**

Firms	Bandwidth	Effective Capacity	Market Share	HHI Contribution
Cellular 1	40	190	19.4%	376
Cellular 2	40	190	19.4%	376
PCS3	30	180	18.4%	337
PCS4	30	180	18.4%	337
PCS5	20	120	12.2%	150
PCS6	5	30	3.1%	9
PCS7	5	30	3.1%	9
SMR8	10	60	6.1%	37
<b>Totals</b>	<b>180</b>	<b>980</b>		<b>1,633</b>