The FCC's informal complaint data confirms the EMCI data. The FCC's own records show relatively few complaints have been received about cellular service. The following chart shows the distribution of informal complaints about cellular service both among the petitioning states, and nationwide, received from June 1993 through July 1994.

FCC Informal Complaint Log

	AZ	CA	CT	HI	LA	NY	OH	WY	50 States
Celco. Interst. Rates	0	3	1	0	0	2	0	0	26
Celco. Intrast. Rates	3	7	1	0	1	10	1	0	89
Celco. Quality	1	11	1	0	1	4	3	0	98
Celco. Gen'l	0	0	1	0	0	0	0	0	4
Celco. Roam Rates	1	1	0	0	1	1	1	0	28
Total	5	22	4	0	3	19	5	0	245

Source: FCC Common Carrier Bureau, Enforcement Division, Informal Complaints

The 245 cellular-related informal complaints received by the FCC over the past thirteen months can be contrasted with the 5,993 formal cable television rate complaints which were filed with the FCC for 1993, and the 9,000 informal cable television rate complaints which had been filed with the FCC by the February deadline for pre-September 1993 rates.[66] Similar comparisons may also be made with the complaint records of other services.

The Promise and the Pull of the Mobile Marketplace

This is all the more important because the potential of this broad wireless marketplace is so great that a legion of would-be providers are eagerly seeking to enter or expand their presence in it. Current wireless companies, broadcast and cable television companies, landline telephone companies, interexchange carriers, energy utilities and companies or investors from dozens of related fields are eager to play a role in the new wireless marketplace.

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[66] *See* "Cable TV Industry Seeks Rate Cut Accord; FCC Eyes Enforcement," *FCC Report*, April 7, 1994.

Companies like Pacific Telesis Group consider the potential of the wireless marketplace to be so great that divestiture of their cellular subsidiaries is preferable to exclusion or restriction based on the degree of their incumbency.[67] And the reentry of such experienced players guarantees strong competition. As Phil Quigley, Chairman and CEO of Pacific Telesis, declared: "We're determined to offer our customers a full array of telecommunications options, including wireless, to meet their mobile communications needs."[68]

Even companies which once exited the cellular and paging business because of perceived limits to their wireless opportunities have reconsidered, recognizing the vast potential of the wireless market. For example, MCI sold its cellular and paging licenses in the mid-1980s because it felt that its holdings "did not constitute a critical mass in the national market" for wireless services, but it has since sought to re-enter the market via several vehicles.[69]

In seeking to re-enter the wireless market, MCI first sought to persuade the FCC to establish a nationwide PCS license, and then tried to form a nationwide consortium with small local exchange carriers, before investing some $ 1.3 billion in NEXTEL.[70] While MCI has withdrawn from the NEXTEL deal, it nonetheless has re-affirmed its faith in the technology underlying NEXTEL's service, and its interest in the wireless marketplace.[71]

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[67]"Pacific Telesis Returns to Cellular Business," *Telecommunications Alert*, July 15, 1994 (announcing that Pacific Telesis would create a new wireless unit, Pacific Bell Mobile Services, to replace the AirTouch Cellular unit divested earlier in the year).

[68]"Pacific Telesis Earnings Reflect Cost-Cutting Efforts, Improving State Economy," *Business Wire*, July 20, 1994.

[69]*See MCI Annual Report to Stockholders, 1985*, at p.2. *See also* Elizabeth Tucker, "MCI Sells Cellular Radio Units," *The Washington Post*, August 13, 1985, at p.E1a.

[70]*See* "MCI Goes for 'Now' Wireless Technology for Nationwide Network," *Communications Daily*, March 1, 1994 ("For MCI, deal is a decided move away from piecing together nationwide wireless network through patchwork of PCS licenses it would have had to buy up during FCC's pending spectrum auctions. . . . Before FCC made final decision on how it would allocate spectrum, MCI made big PR splash, announcing that it had signed in principal some 150 companies that had pledged to work with it in designing and deploying nationwide wireless network.").

[71]Edmund L. Andrews, "MCI Severs Negotiations With Nextel: Motorola Disagreement Unravels Wireless Deal," *The New York Times*, September 2, 1994, at p.D4.

Entrepreneurial investors with experience in the wireless industry also have a keen interest in bidding on PCS licenses. As Steven A. Zecola, President and CEO of Columbia PCS (since renamed GO Communications Corp.), declared:

> The FCC has recognized the vision, creativity, talent and drive that entrepreneurs bring to the market -- and consumers will be grateful for the competition that we will bring to the cellular, local telephone and long distance industries.[72]

While some analysts are focusing on specific niche applications as strategies for entry, the spectrum is essentially fungible, and both current and potential providers view the licenses as opportunities to enter or expand their presence in a broad and effectively unitary market.[73] ESMRs like NEXTEL offer integrated packages of services over "SMR spectrum," while analysts like Dale Hatfield of Hatfield Associates have observed that narrowband PCS spectrum could be used to provide:

- Duplicates of current paging services;
- Advanced paging, including acknowledgment paging and digital voice messaging;
- Two-way messaging, "comparable to RAM Mobile, ARDIS and cellular digital packet data offerings;"
- Narrowband advanced mobile phone service (NAMPS); and
- Paging integrated with cellular and ESMR.[74]

And potential broadband PCS licensees, from American Personal Communications to Time Warner Telecommunications have described the possibilities of the PCS marketplace both in providing new competition for existing licensees and enhanced services for consumers.

Setting aside the occasional arguments for the deliberate design of distinct product markets and the assignment of market share as incompatible with the antitrust laws, the pleadings filed in the FCC's PCS proceeding by and large illustrate

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[72]"Columbia PCS Applauds FCC PCS Decision," *PR Newswire*, June 29, 1994.

[73]Indeed, providers of services to wireless companies recognize this unity. Comsearch recently merged its Mobile Transmission Planning and PCS Departments to create a Wireless Communications Division for development of PCS, ESMR and cellular systems. "Comsearch," *Land Mobile Radio News*, July 8, 1994.

[74]*See* "Paging Companies Consider Anteing Up for PCS Auctions," *Land Mobile Radio News*, June 24, 1994. *See also* Dale Hatfield, "Forging Your Identity in 900 MHz Narrowband PCS," *Business Radio*, July/August 1994, at pp.13-16.

a deep interest and faith in the rich potential of the wireless marketplace.

American Personal Communications, for example, declared that the Commission's broadband PCS decision:

> will permit PCS to compete vigorously with existing wireless services, provide competition to the local loop monopoly, create a wireless on-ramp to the emerging electronic superhighway, create 300,000 good new jobs, energize the telecommunications economy, and permit U.S. industry to leap to the forefront of a breathtaking international market for PCS.[75]

The Role of Mobile Data Demand

In fact, other shifts in the marketplace are also helping companies to redefine their mission. For example, the future of wireless communications is increasingly being defined as digital data transmission. And this is reshaping the wireless industry into a unitary market in which paging, SMR, cellular and other providers are competing directly in the delivery of wireless data services.[76]

Charles Nahebedian, Vice President of Product Planning for RAM Mobile Data, recently stated that in the wireless market *"Most of the competition today is voice communications. RAM offers a data-only service. People are finding that they can communicate much more effectively with data-only communications."*[77]

Analysts concur, concluding that the wireless data market is a vast potentiality, as they observe hundreds of would-be providers and current providers rapidly implementing networks and signing agreements to deliver wireless service.

For example, Qualcomm's OmniTRACS two-way mobile satellite communications system provides data capabilities with real-time communication

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[75]American Personal Communications Opposition to Petitions for Reconsideration, GEN Docket No. 90-314, filed December 30, 1993, at p.i.

[76]Dwight B. Davis, "Marrying Wireless Communications to Mobile Computing; Electronic Industry Looks to Radio- and Microwave-based Wireless Communications," *Electronic Business*, May 1993.

[77]Anne Lindstrom, "RAM Maps Out Wireless Future, *CommunicationsWeek*, August 1, 1994, at p.37.

between drivers and dispatchers.[78]

Likewise, Metricom Inc., which develops, manufactures and market products supporting regional data communications networks, using frequency-hopping, spread spectrum technology, plans to operate through its Wireless Services Division "low-cost, high-speed public wireless data communications networks for use in a broad range of personal computer and commercial applications."[79]

Metricom's Ricochet service, MTEL's Destineer (formerly Nationwide Wireless Network), the RAM Mobile Data network, ARDIS, Cellular Digital Packet Data, Racotek's SMR data services, and dozens of other networks and applications offer a wide range of choices to consumers of wireless data services.[80]

As *En Route Technology* has observed: *"The specialized mobile radio (SMR) industry long has been considered perfect for offering data services because of its dispatching applications. Last year was a significant turning point because of the*

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[78]*See* "Manfredi Motor Transit Co. Purchases OmniTRACS Services for its Fleet; National Liquid Bulk Carrier Selects Qualcomm's Satellite Communications System," *Business Wire*, August 9, 1994. See also "Anderson Trucking Converts to the OmniTRACS System; International Dry Van Carrier Selects Qualcomm's Satellite Communications System," *Business Wire*, May 26, 1994.

[79]"Metricom Awarded $7-Million Contract Extension by Southern California Edison," *Business Wire*, January 19, 1994. *See also* "Loring Wirbel, "Metro-Area Network Uses Unlicensed Radio-Technology; Wireless 'MAN' Services Bridge LAN, WAN," *Electronic Engineering Times*, July 5, 1994.

[80]Vernon P. Essi Jr. "Wireless Data: Where's the Technology Headed?" *Wireless Business & Finance*, August 9, 1994. *See also* "Two-way is the Way Ahead for U.S. Paging Operators," *FinTech Mobile Communications*, August 16, 1994; "Sprint Launches Wireless Data Services," *Reuters Business Report*, June 22, 1994 (announcing SprintNet services); "Racotek to Develop Mobile Data Services for AirTouch CDPD and Cellular Network; New CellSmart Feature to Access CDPD & Cellular Networks," *Business Wire*, June 22, 1994; Nathalie Welch, "Regional Wireless Network Goes Live," *MacWEEK*, June 22, 1994 (announcing launch of Metricom's Ricochet Micro Cellular Data Network using unlicensed frequencies in the 902 to 928 MHz band); "Motorola Seeks to Expand Data Experience Through ARDIS Network," *Land Mobile Radio News*, July 29, 1994; "CDPD (Cellular Digital Packet Data) Forum Created; Wide Range of Companies Joining Together to Guide CDPD Industry, *Business Wire*, June 28, 1994.

development of digital systems by Motorola."[81] *En Route Technology* also noted that defense contractors Westinghouse and Rockwell International have entered the wireless data market, and SMR companies like Geotek and cellular companies are all positioning themselves to offer wireless data.[82]

The development of advanced paging devices, personal digital assistants (PDAs) like the Simon and Newton, and Motorola's "Unicator" MIRS-based multifunction unit, provide a vast array of supply substitutes for the wireless marketplace.[83]

John Caner, Director of Wireless Data Development for NEXTEL, spelled out the benefits of a multifunction unit over a year ago:

> The beauty of MIRS is that it lets people using the voice system to do data also as an incremental application. A dedicated data system can be expensive and sometimes difficult to justify. In addition to sending data messages, customers value the ability to call ahead to their customers to clarify issues. Providing integrated voice and data allows that.[84]

And the response of cellular companies like L.A. Cellular and AirTouch Cellular to the NEXTEL subscriber unit testifies to their awareness of the competition. This past March, L.A. Cellular said it would introduce a "personal digital assistant that will function as a cellular phone, fax machine and electronic scratch pad" while AirTouch Cellular (then PacTel Cellular) announced plans to "offer voice mail-for cellular phones and a 'one number' service that will ring a call through to a customer's cellular phone, pager or home or office phone."[85] As Maggie Wilderotter, President of the California-

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[81]"Year End Review: Verticals Remain Slow, But SMRs Show Promise; OmniTRACS Booms," *En Route Technology*, January 17, 1994.

[82]*Id.*

[83]Michael Putzel, "Pager's Popularity Soars As Prices Fall," *The Boston Globe*, May 11, 1994. *See also* Will McClatchy, "Central California Cellular Phone Service Expected to Advance Rapidly in '94," *The Fresno Bee,* March 7, 1994 (noting NEXTEL entry, and capabilities of cellular and paging company offerings); "Motorola Seeks to Expand Data Experience Through ARDIS Network," *Land Mobile Radio News*, July 29, 1994, at p.4.

[84]John T. Mulqueen, "Fleet Call Shores Up Its Specialized Mobile Radio Network Offerings," *CommunicationsWeek*, March 19, 1993, at p.35.

[85]Michelle Vranizan, "NEXTEL to Offer Cellular Service in Los Angeles, Orange County, Calif.," *The Orange County Register*, March 13, 1994. *See also* "AirTouch Makes Cellular Phones More Versatile; New Service Gives Customers More Message

Nevada region of Cellular One declared: "There are no products and services that NEXTEL can offer that we don't."[86]

How Large A Market?

As CTIA observed in the study "PCS Predictions and Prescriptions: Highlights from 32 Studies and Reports On the Prospects for PCS," various analysts attribute different market shares to companies under the rubric of "PCS," "cellular," or "ESMR" -- but all agree that the vast wireless market is rapidly expanding.

For example, MCI projects that "within 10 years, a minimum of 10 to 20 percent of phone users, both consumer and business, 'will migrate to a complete wireless service.'" As *Mobile Data Report* observed, "Today's 160 million cordless phone users are prime candidates for such services. 'We believe wireless cordless telephony is a dynamite strategy,'" says Richard Liebhaber, MCI's chief strategy and technology officer.[87] This estimate is consistent with the projections of various analysts, such as Donaldson, Lufkin & Jenrette, which project ten percent of the population will subscribe to "wireless" or PCS by 2003.[88]

Within this broad marketplace, some analysts suggest ESMR companies like NEXTEL will grow by acquiring 15 percent of new "cellular-like" wireless subscribers, at the same time that PCS companies grow by acquiring 35 to 43 percent of similar wireless subscribers.[89] Others, including Merrill Lynch analysts Lynda Runyon and Sandra Birch, have adopted 20 percent as their base case growth figure for ESMRs -- a figure which they concede may be conservative "if ESMR emerges as a strong competitor to cellular."[90]

Options and Control," *Business Wire*, May 26, 1994.

[86]Mary Lynne Vellinga, "Wireless Communications Giants to Battle in California," *The Sacramento Bee*, March 1, 1994.

[87]"MCI to Play Off of Cellular's Flaws in Selling NEXTEL Services," *Mobile Data Report*, June 20, 1994.

[88]"One in 10 Americans Will Subscribe to PCS by 2003," *FinTech Mobile Communications*, August 16, 1994.

[89]"One in 10 Americans Will Subscriber to PCS by 2003, *FinTech Mobile Communications,* August 11, 1994.

[90]Merrill Lynch, *SMR in the United States: A Window of Opportunity*, October 1993, at p.5

It is irrelevant what market share any particular service provider had in past submarkets, since those segments are now submerged in the larger wireless market. These services are now substitutes for each other in the eyes of providers and consumers.

Racotek's 1993 Annual S.E.C. 10-K Report observed that:

> The Company believes that seven to nine million of the estimated 38 million mobile workers in the United States are in field service and transportation industries that involve regular use of vehicles and that those workers are the principal potential market for Racotek's mobile data transmission services. However, the market for mobile data services is new and undeveloped. Mobile workers who currently have wireless communications facilities communicate using private dispatch radio, paging systems, private data systems on dedicated frequencies, cellular telephone and SMR voice services. A number of mobile workers have no wireless communications facilities at the present time.[91]

Market Share in the Wireless Marketplace

As Drs. Besen and Burnett observed in their antitrust analysis of the mobile telecommunications marketplace, the effective capacity of providers in the wireless marketplace is the appropriate measure of market share.

The study concluded that:

- Market definition from the perspective of technology is too narrow -- as technologies converge, it is no longer appropriate to think of openly competing services as distinct products in distinct markets.

- For firms operating in multiple areas, Basic Trading Areas are not relevant geographic markets for antitrust purposes as long as companies are not able to discriminate on the basis of price among different geographic areas.

Using the Department of Justice's and Federal Trade Commission's Horizontal Merger Guidelines, Drs. Besen and Burnett found that: **"Even in the most highly concentrated market structure possible under pending PCS rules, the Merger Guidelines would not bar, and might not even warrant investigation of, significant acquisitions of capacity by incumbent cellular operators."**[92]

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[91] *Racotek Annual 10-K Report* at p.2.

[92] Drs. Besen and Burnett, *op cit.* at p.4.

The Merger Guidelines use the Herfindahl-Hirschman Index (HHI) to measure market concentration, based on summing the squares of the individual market shares of all of the market participants. Thus, in a market with 10 firms, each with a market share of 10 percent, the HHI would be 1000. A market composed of seven firms, with two firms having shares of 25 percent each and the remaining firms having shares of 10 percent each, would have an HHI of 1750. (Each firm with 25 percent contributes 625 ($25^2 = 625$), and each firm with 10 percent contributes 100, hence $625 + 625 + 5(100) = 1750$.) In unconcentrated and moderately-concentrated markets HHI increases of 100 points are necessary before competitive concerns may be raised, and in highly-concentrated markets HHI increases of 50 points are necessary before competitive concerns are raised.

The Merger Guidelines generally conclude that post-merger measures of HHI below 1000 indicate an unconcentrated market, with adverse competitive effects being unlikely. Post-merger HHIs between 1000 and 1800 indicate moderate concentration. Mergers producing HHI increases of less than 100 are unlikely to have adverse competitive effects. Neither of the foregoing examples would require further analysis under the guidelines. Mergers producing increases of more than 100 points may raise competitive concerns, depending on other conditions.

Post-merger HHIs of above 1800 indicate that a market is highly concentrated, although mergers producing an increase in the HHI of less than 50 points are unlikely to have adverse competitive effects. Mergers producing increases of more than 50 points may raise competitive concerns, depending on other conditions. Mergers producing increases in the HHI of more than 100 points are presumed to enhance market power or its exercise, although the presumption may be overcome by other factors making such exercise unlikely.

Drs. Besen and Burnett calculated the HHIs for the mobile telecommunications marketplace under scenarios in which cellular companies do not acquire additional MHz, as well as ones in which they acquire 10 MHz or 15 MHz. The scenarios also included entry by SMRs. While the scenarios were based upon both the Commission's original and CTIA's proposed licensing schemes, and not the revised plan which allocated 30 MHz to a BTA license, the results are still indicative of an unconcentrated market.

The basis of these calculations is the *effective capacity* of the spectrum available for mobile telecommunications service. While the 170 MHz of bandwidth available for PCS and cellular (120 MHz and 50 MHz, respectively) *could* be used to produce measures of potential market share, a simple measure of bandwidth is not a meaningful measure of the power any individual firm has in the wireless market.

Although each cellular provider does have 25 MHz of spectrum in the markets in which it operates, FCC rules require cellular operators to accommodate their current analog customers. Because cellular carriers will therefore be unable to convert all their spectrum to digital, their spectrum has less *effective capacity* than spectrum that can be used exclusively to provide more spectrum-efficient digital services.[93]

However, even under the Commission's revised allocation plan, and with one SMR in the marketplace (with 10 MHz of spectrum), the following chart shows that the effective capacity of cellular companies would be only 16.33 percent -- far below the 35 percent market share the Merger Guidelines consider the threshold for antitrust inspection.[94]

Merger Guidelines - HHI Index Example

If two celcos each had 10 MHz of PCS spectrum, and one SMR has a total of 10 MHz of spectrum, the HHI index indicates that the resulting market concentration would be moderate.

Firms	Bandwidth	Capacity	Share (%)	HHI
Celco1	35	160	16.33	266.67
Celco2	35	160	16.33	266.67
PCS-A	30	180	18.37	337.46
PCS-B	30	180	18.37	337.46
PCS-C	30	180	18.37	337.46
PCS-D	10	60	6.12	37.43
SMR-1	10	60	6.12	37.43
Total	180	980	100	1620.58

Assumptions: That the celcos maintain 10 MHz of bandwidth to serve analog cellular customers, and that digital enjoys a 6-to-1 capacity relationship with analog.

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[93]The precise advantage of digital over analog depends in part on the technology involved, and increases in capacity may range from a multiple of 2 to 18. The study relied upon a multiple of 6, and assumed 10 MHz of a cellular operator's bandwidth would remain devoted to analog customers. Besen and Burnett Study at p.37.

[94]The calculations assumed that each firm served all customers within the geographic market.

In fact, as there is more than 10 MHz of SMR spectrum available, and more than one SMR carrier per market, the market concentration may be even less than projected above. For example, if there are four SMR providers in the marketplace, sharing 21 MHz of spectrum, a cellular/PCS company would have 15.3 percent of the market's effective capacity.

Merger Guidelines - HHI Index Example

If two celcos each had 10 MHz of PCS spectrum, and four SMRs have a total of 21 MHz of spectrum, the HHI index indicates that the resulting market concentration would be moderate.

Firms	Bandwidth	Capacity	Share (%)	HHI
Celco1	35	160	15.3	234.1
Celco2	35	160	15.3	234.1
PCS-A	30	180	17.2	295.8
PCS-B	30	180	17.2	295.8
PCS-C	30	180	17.2	295.8
PCS-D	10	60	5.7	32.5
SMR-1	10	60	5.7	32.5
SMR-2	4	24	2.3	5.3
SMR-3	5	30	2.9	8.4
SMR-4	2	12	1.1	1.2
Total	180	1046	100	1435.5

Assumptions: That the celcos maintain 10 MHz of bandwidth to serve analog cellular customers, and that digital enjoys a 6-to-1 capacity relationship with analog.

Taking factors other than market concentration into account when considering the competitiveness of the wireless telecommunications market still suggests that the market would continue to function competitively. As the preceding sections indicate, it would be difficult for companies to raise prices anti-competitively because of the rapidly changing nature of wireless services. Similarly, as technologies converge and once-distinct technologies enter into direct competition with other services, the market will only become more competitive with new providers and new services entering all the time.

And as the antitrust analysis demonstrates, the shares possessed by cellular companies -- even after any hypothetical acquisition of PCS spectrum -- fall below the market share threshold for concern under the Department of Justice's Merger Guidelines.

Conclusion

Summing it all up, as Peter Bernstein, Vice President of Research at Probe Research and Editor of *Wireless for the Corporate User*, has stated: ***"I don't believe there is a purchaser of communications services who believes there isn't a choice in wireless."***[95]

In fact, the information submitted by such petitioners as the Louisiana Public Service Commission does not testify to any significant number of customer complaints, compared to the total volume of cellular subscribers. Indeed, the activities which the Louisiana P.S.C. claims it performs on behalf of consumers appear to have resulted in (1) the imposition of higher charges upon consumers, and (2) the reduction of competition through the exclusion of potential service providers.[96]

Likewise, such actions as the prohibition of service and equipment packaging (which the Commission, the Department of Justice, and the Staff of the Federal Trade Commission all concluded was pro-competitive and beneficial to consumers), hardly testify to the advantages state regulation renders consumers. Consumers appear to pay both higher service rates and higher equipment rates as a result of such state action.

It is ironic that some states have advanced the proposition that the consumer is or will be helped by the reduction of choice (among carriers, as well as among rate plans) through tariff and entry regulations. Regimes have been suggested which are inconsistent with a competitive marketplace, threatening to limit entry, delay technological progress and disrupt service innovation.

The Commission should reject these proposals, and instead recognize and foster wireless competition by preempting state regulation of the Commercial Mobile Radio Services.

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[95]Jamie Wexler, "AT&T/McCaw Restrictions a Mere Formality," *Network World*, July 25, 1994, at p.33.

[96]*See e.g.*, Petition on Behalf of the Louisiana P.S.C., filed August 9, 1994, at pp.15-16 (rate plan applications) and pp.20-21, 32 (exclusion of companies from operating in Louisiana).

Congress and the Commission have acted to ensure the establishment of a competitive telecommunications environment, by allocating new resources to the industry and mandating regulatory parity.

This study has demonstrated that (1) the services and products at issue are substitutes for each other in the eyes of both providers and consumers, (2) entry into the marketplace is increasingly easy, (3) providers and prospective providers are numerous, and (4) no one firm has a large market share based upon its effective capacity.

This situation conforms with the economic definition of a competitive market structure -- it should not be distorted by the imposition of unnecessary state rate and entry regulations.[97]

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[97]*See* Besen, "The Cellular Service Industry: Performance and Competition," November 1992, at p.4, n.9 ("Economists call a market structure competitive when entry is easy, firms are numerous, and no firm has a large market share.").

Affidavit of Professor Jerry A. Hausman

1. My name is Jerry A. Hausman. I am the MacDonald Professor of Economics at the Massachusetts Institute of Technology in Cambridge, Massachusetts, 02139.

2. I received an A.B. degree from Brown University and a B.Phil. and D. Phil. (Ph.D.) in Economics from Oxford University where I was a Marshall Scholar. My academic and research specialties are econometrics, the use of statistical models and techniques on economic data, and microeconomics, the study of consumer behavior and the behavior of firms. I teach a course in "Competition in Telecommunications" to graduate students in economics and business at MIT each year. Mobile telecommunications, including competitive and technological developments in cellular, ESMR, satellite, and PCS, are some of the primary topics covered in the course. I was a member of the editorial board of the Rand (formerly the Bell) Journal of Economics for the past 13 years. The Rand Journal is the leading economics journal of applied microeconomics and regulation. In December 1985, I received the John Bates Clark Award of the American Economic Association for the most "significant contributions to economics" by an economist under forty years of age. I have received numerous other academic and economic society awards. My curriculum vitae is attached.

3. I have done significant amounts of research in the telecommunications industry. My first experience in this area was in 1969 when I studied the Alaskan telephone system for the Army Corps of Engineers. Since that time, I have studied the demand for local measured service, the demand for intrastate toll service, consumer demands for new types of telecommunications technologies, marginal costs of local service, costs and benefits of different

types of local services, including the effect of higher access fees on consumer welfare, demand and prices in the cellular telephone industry, and consumer demands for new types of pricing options for long distance service. I have also studied the effects of new entry on competition in paging markets, telecommunications equipment markets, exchange access markets, and interexchange markets and have published a number of papers in academic journals about telecommunications. Lastly, I have also edited two recent books, Future Competition in Telecommunications (Harvard Business School Press, 1989) and Globalization, Technology, and Competition in Telecommunications (Harvard Business School Press, 1993).

4. I have been involved in the cellular industry since 1984. I participated in PacTel's purchase of Communications Industries in 1985 and have provided testimony on previous occasions on cellular competition and regulation to the California PUC, the North Carolina PSC, and the Connecticut PUC. I also previously submitted testimony to the FCC on questions of cellular regulation, including the question of whether cellular companies should be allowed to bundle cellular CPE with cellular service, whether the FCC should forbear from regulation of mobile service providers, and whether the FCC should require equal access obligations on CMRS providers. During the PCS proceedings I have filed 6 affidavits which considered eligibility questions for LECs, the presence of economies of scale and scope in providing PCS, the design of an appropriate auction framework for PCS spectrum, spectrum allocation and band size, eligibility for in-region cellular companies, and the appropriate framework for pioneer preferences. I spoke at the FCC Task Force meeting on PCS held on April 11, 1994. I also have done significant academic research in mobile telecommunications and it is one of the primary topics in my graduate course, "Competition in Telecommunications", which I teach each year at MIT.

5. I am also submitting affidavits on behalf of AirTouch Communications and Bell Atlantic Mobile in this proceeding. Some of the material is common to more than one affidavit.

I. Summary and Conclusions

6. I have been asked by the Cellular Telecommunications Industry Association (CTIA) to consider the question of whether state regulation of cellular prices benefits consumers. I have collected data from the majority of cellular providers in the U.S. regarding their cellular prices for the period 1989-1993. I analyze these data in this affidavit.

7. Econometric analysis using these data demonstrates that regulation of cellular service prices leads to higher cellular prices on the order of 5%-15%. This econometric analysis accounts for population, commuting time and other economic factors which can be expected to affect cellular prices. The econometric analysis demonstrates that regulation is the most important single factor explaining the high cellular prices in regulated states.

8. New York and California, both of which are petitioning the FCC to be allowed to continue regulation, have the highest cellular prices in the U.S. for larger MSAs. California is also the only state which requires a fixed margin between wholesale rate and retail rates for cellular. Overall, I estimate that the anti-competitive regulation of the California Public Utilities Commission (CPUC) currently costs California cellular customers approximately $250 million per year.

9. Cellular regulation also leads to significantly lower penetration of cellular in MSAs. Protection of resellers, a goal of the CPUC does not lead to greater penetration. However, higher prices do lead to lower penetration because of a significant demand elasticity for cellular service. Thus,

regulation is also leading to decreased usage of the scarce spectrum and the cellular network infrastructure.

II. Cellular Prices are High in Regulated States

10. The goal of regulation should be high quality service and competitive prices for consumers. Regulation has failed to achieve these goals. In Table 1 I list monthly service prices in 1994 for the least expensive plan for average usage of 160 minutes per month (80% peak) for up to a 1 year contract:

Table 1: Average Cellular Prices in the Top 10 MSAs: 1994
160 minutes of use (80% peak)[1]

MSA No.	MSA	Monthly Price	Regulated
1.	New York	$110.77	Yes
2.	Los Angeles	99.99	Yes
3.	Chicago	58.82	
4.	Philadelphia	80.98	
5.	Detroit	66.76	
6.	Dallas	59.78	
7.	Boston	82.16	Yes
8.	Washington	76.89	
9.	San Francisco	99.47	Yes
10.	Houston	80.33	

The fact that regulation goes along with higher monthly service prices is evident from Table 1. Every regulated price in Table 1 is greater than every unregulated price in Table 1.[2] The average price of regulated MSAs is $98.10 while the average price of unregulated MSAs is $70.59, which is a difference of $27.51 per month or 39%. Thus, cellular customers in New York and California as well as Massachusetts are paying a large extra amount each month

[1] This usage, 160 minutes per month, is the approximate average usage of cellular customers.

[2] The probability that every regulated price would exceed every unregulated price if the prices had no relationship to regulation is 0.00002.

for their cellular service.[3]

11. Now an obvious objection to this comparison is that some of the unregulated cities are relatively expensive, e.g. the CPUC in its pleading has pointed to Philadelphia which is $80.98 per month (CPUC, p. 46). Yet even using "data mining" (i.e. pick your favorite example), the CPUC is left to explain why Philadelphia is still $18.49 per month less expensive than San Francisco.[4] Presumably, the CPUC would have even more difficulty explaining why Chicago is $40.65 less expensive than San Francisco (or Los Angeles), and why Detroit and Dallas are again at least $35 per month cheaper than San Francisco. Of course, New York City is the most expensive MSA of all--it is 88% more expensive than Chicago, an unregulated MSA. Thus, Chicago has enjoyed significant advantages over New York both in the quality of its basketball team and its cellular prices, equally important ingredients in a contented urban lifestyle.

12. A somewhat more serious potential objection is that other economic factors aside from regulation explain the higher cellular prices in regulated states. Thus, I have run a regression on cellular prices in the top 30 MSAs which accounts for MSA population, average commuting time, average MSA income, and whether the company is Block A or Block B. The results are given in Appendix 1. The coefficient of the regulation variable is 0.15 which means that regulated states have cellular prices that are 15% higher, holding other economic factors equal. The coefficient is estimated very precisely (standard error = 0.052) and the finding is highly statistically significant (t statistic = 2.88). Thus, states which regulate do have significantly higher

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[3] I understand the Massachusetts DPU has decided to end regulation of cellular, and it has not petitioned the FCC.

[4] While the CPUC claims incorrectly that Philadelphia has "among the nation's highest [cellular rates]" (CPUC p. 46), it fails to explain why Philadelphia rates are lower than every regulated MSA in Table 1.

cellular prices in large MSAs.[5] Now in the top 30 MSAs overall, regulated prices are 23.6% higher. Thus, other economic factors explain about 9% of the higher prices and regulation explains 15%. Thus, regulation is the major factor associated with the higher prices.

13. In Appendix 2 I repeat the econometric analysis using data reported to me by the companies in each of the top 30 MSAs for 160 minutes of use for the years 1989-1993. First note that regulation leads to a higher price of 14.2% which is again estimated quite precisely (standard error = .029) and is very statistically significant (t statistic = 4.9) Also, the yearly indicator variables (1993 is the left out year) demonstrate that CPI deflated cellular prices have decreased by 17.3% between 1989 and 1993. Thus, using data over a 5 year period again demonstrates that cellular prices are higher in regulated states.

14. I then did a similar econometric analysis, but I used prices in the top 30 MSAs for 250 minutes per month for a typical "high usage" customer. My estimate of the effect of regulation on price is 15.0% higher, which is again extremely statistically significant (t statistic = 6.52). Note that CPI adjusted cellular prices for 250 minutes of use have decreased by 15.9% over the 5 year period.

15. Lastly, I did a similar econometric analysis for 30 minutes of monthly usage--a very light user of cellular. Here the estimated effect of regulation is even larger. The coefficient estimate is 18.4% and it is highly statistically significant (t statistic = 4.2) Again real prices have decreased, but not by as large an amount--here 10.0%. Thus, econometric analysis demonstrates that in large MSAs for average usage of 160 minutes per month, for high usage of 250 minutes per month, and for low usage of 30

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[5] I do not find an effect of regulation on cellular prices in smaller MSAs.

minutes per month that regulation is associated with higher prices of about 15%. Thus, regulation leads to higher prices, and it harms consumers.

16. I repeated the econometric analysis for RSAs in Appendix 3. I again find a significant effect that regulation leads to higher prices. For average usage of 160 minutes regulation leads to prices which are higher by 18.6% (t statistic = 8.1) For heavy usage of 250 minutes regulation leads to higher prices of 15.9% (t statistic = 6.6), and for light usage of 30 minutes per month regulation leads to higher prices of 12.4% (t statistic = 4.1). Thus, I once again find that regulation leads to significantly higher prices in regulated states than in unregulated states. The estimated effect of regulation is quite similar to the effect that I estimate in the top 30 MSAs.

17. Why does regulation lead to higher prices? First, regulation causes your competitors to know in advance what your prices are going to be. Indeed, if your competitor does not like your proposed prices (presumably they are too low) the competitor protests the prices to the state commission, e.g. the CPUC. The resellers in California have protested discount plans proposed by the cellular carriers numerous times. Last year, Nextel, the new ESMR carrier in Los Angeles, protested rate reductions proposed by LACTC (the Block A carrier). The CPUC has not yet resolved these protests regarding the lower priced contracts; and in principle, resellers and Nextel could sue for damages in the future. Furthermore, the carriers expended significant resources in answering the protests. Thus, these protests have a "chilling effect" on competition. Also, regulation restricts the ability of cellular companies to set company specific rates to cause greater usage of cellular. Regulatory commissions such as the CPUC also restrict the use of multi-year contracts, by imposing significant restrictions on their terms, which would allow for lower prices. Regulation also imposes significant costs on cellular carriers in terms of meeting all the regulatory requirements on filings, data systems, and other regulatory reports.

18. Cellular prices have decreased in recent years. For instance, in Los Angeles the minimum price for average minutes of usage has decreased by $11.25 per month or about 10.1% in the past two years. However, if I compare price changes in regulated and non-regulated states, non-regulated states again do better. From 1985-1994 prices in the top 30 MSAs decreased by 4% in regulated states (7% in California) while prices decreased by 17% in non-regulated MSAs. This difference is once again statistically significant. If I compare real (CPI adjusted) cellular prices, I find the same result (as must happen). In regulated states the CPI cellular price decreased by 27% over the 1985-93 period while it decreased by 37% in non-regulated states.[6] Thus, not only are prices higher in regulated states, they are decreasing less rapidly. Regulation of cellular prices does not benefit consumers.

19. Similarly, if I use the company data over the time period 1989-1993 I find that prices decreased more in unregulated states. For 160 minutes of usage for the top 30 MSA, prices in unregulated states decreased by 8.0% more (t statistic = 2.2) than in regulated states. For 250 minutes of usage prices in unregulated states decreased by 8.3% (t statistic = 1.8) more than in regulated states. Lastly, for 30 minutes of use prices in unregulated states decreased by 20.2% (t statistic = 2.0) more than in regulated states. Thus, a comparison of the change in prices for all three usage levels demonstrates that prices decreased more rapidly in unregulated states than in regulated states.

III. Cellular Penetration is Lower in Regulated States

20. Some regulators for cellular, e.g. the CPUC, have claimed that their regulation has protected resellers and led to higher cellular penetration. First, presence of resellers has no noticeable effect on

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[6] For this comparison I used prices up through the end of 1993 because of the unavailability of the CPI.

competition. For instance, in the Chicago MSA, where resellers have an insignificant presence, cellular prices are quite low. Indeed, in Los Angeles where the CPUC has attempted to protect resellers by enforcing a markup of retail prices over wholesale prices, cellular prices for 160 minutes of use are 69.7% higher than they are in Chicago. For 30 minutes of use Los Angeles is 64.6% more expensive than Chicago, and for 250 minutes of use Los Angeles is 51.9% more expensive than Chicago. Very similar results arise if San Francisco is used to compare to Chicago.

21. Cellular penetration is also higher in unregulated MSAs.[7] In Table 2 I give penetration relative to New York.[8]

Table 2: Cellular Penetration in the Top 10 MSAs: 1994

New York is used as basis: New York = 1.0

MSA No.	MSA	1989 Penetration	1993 Penetration	Regulated
1.	New York	1.00	1.00	Yes
2.	Los Angeles	1.42	1.30	Yes
3.	Chicago	2.04	2.92	
4.	Philadelphia	1.45	1.61	
5.	Detroit	1.72	1.74	
6.	Dallas	1.71	2.06	
7.	Boston	1.79	2.35	Yes
8.	Washington	2.47	2.39	
9.	San Francisco	1.37	1.40	Yes
10.	Houston	1.45	1.98	
	Average Regulated	1.29	1.30	Yes
	Average Unregulated	1.82	2.19	

[7] This finding is contrary to the claim in the CPUC petition that cellular penetration is highest in California. (CPUC Petition, pp. 26) The CPUC gives no data source, and my data, collected from the companies, contradicts the CPUC claim.

[8] Subscriber data are highly confidential data. Thus, I have estimated penetration and used New York as my basis. Otherwise, given that a cellular carrier in a given MSA knows its own subscriber count, knowing the overall MSA penetration would allow it to calculate its competitor's number of subscribers.

Thus, 1993 penetration is highest in Chicago, an unregulated MSA. Penetration is also high in Washington (unregulated), Boston (regulated), Dallas (unregulated), and Houston (unregulated). Overall, 1993 penetration is higher in unregulated states with an index of 2.19 while penetration in regulated states has an index of 1.30. Also, growth is higher in unregulated than in regulated states. Growth in penetration in unregulated states averaged 32.6% while growth in regulated states was 28.2%. Both the higher penetration and the higher growth rates in unregulated states are consistent with the lower prices in unregulated states and the greater decrease in prices since 1989 in unregulated states.

22. In Appendix 4 I do an econometric analysis of cellular demand. Here the left hand side variable is the number of subscribers and the right hand side price variable is the log of price for 160 minutes along with variable for log of income, log of population, log of commute time, regulation, and year. The estimate of the price elasticity is -0.40 (t statistic = 2.6). This elasticity estimate explains the results, at least in part, of why penetration is higher in unregulated states with their lower prices. Note that the population variable estimate is 0.95, which is not statistically different from 1.0, as would be expected. A significant effect of commuting time in the MSA is also found to be important.

23. Also, in Appendix 4 I reestimate the demand model using instrumental variables. This estimation methodology takes account of possible joint endogenity of price and demand. When I use instrumental variables on the model, I estimate the demand elasticity to be -0.50 (t statistic = 2.9). Thus, I find a somewhat higher elasticity estimate than before which would yield a larger effect of higher prices in regulated states on reducing demand for cellular. When I do a Hausman specification test, I do not reject the elasticity estimate from the initial model. Note that the parameter estimate for the other variables, e.g. population, remain virtually the same.

24. The price elasticity estimates -0.4 to -0.5 are inconsistent with claims that the cellular carriers in each MSA are behaving like a "shared monopoly". Basic theory in economics states that a monopolist always finds it to be profit maximizing to raise price until the price elasticity exceeds 1.0 (in magnitude). Here the magnitude of the price elasticity estimate between 0.40 and 0.50 is far different than 1.0. Indeed, a t test rejects the hypothesis that the price elasticity could be as high as 1.0 (t statistic = 3.87). Thus, the demand equation estimates demonstrate that the cellular duopolists are not setting prices consistent with monopoly behavior.

25. Another interesting result arises from the regression results in Appendix 4. Note that the effect of regulation is to lead to lower cellular demand by 16.1% (t statistic 2.5). Thus states like California which restrict the terms of long term contracts, restrict the terms of special company specific contracts, and restrict the terms of promotions cause cellular demand to be lower, even after holding population and cellular price constant. Given the scarcity and economic value of the spectrum used for cellular, this added negative effect of regulation harms consumers and leads to less use of the spectrum than in unregulated states.

IV. Conclusion

26. Prices are higher in large MSAs which are regulated. Price decreases are lower in large MSAs which are regulated. Penetration is lower in large MSAs which are regulated. Demand for cellular is decreased in large MSAs which are regulated because of higher prices. Demand for cellular is decreased in large MSAs, even beyond the price effect, because of other restrictions on cellular promotions and contracts. All of these effects demonstrate that cellular regulations harms consumers. Yet the goal of regulation should be to help consumers. Thus, it is time the FCC pre-empted regulation and stopped state regulators in California, New York and other

states from causing further harm to cellular customers.

Jerry Hausman

Subscribed and sworn to before me
this 14th day of September 1994.

Notary Public
My commission Expires 7/3/98