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ANDREWS OFFICE PRODUCTS CAPITOL HEIGHTS, MD (K)

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 and whether the FCC should forbear from regulation of mobile service providers. During the PCS proceedings I have filed 5 affidavits which consider 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, and eligibility for in-region cellular companies. 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 have been asked by Pacific Bell to consider the filing by American Personal Communications (APC) and the affidavit filed by Professor Jack Gould and Dr. Gustavo Bamberger with respect to FCC policy toward pioneer preference

awards for PCS.

6. The Gould-Bamberger (GB) analysis of sunk costs is incorrect. An implicit assumption occurs in their analysis that costs are already sunk in the PCS industry. However this assumption is incorrect because the auctions for broadband PCS have not yet occurred. Firms have not yet make their decisions of whether to enter the PCS industry in a particular geographic location. If they do decide to enter and win a license and build a network, at that point their costs would be sunk. However, that entry decision has not yet been made.

7. Paul Samuelson in his textbook considers the entry decision by firms:

> [L]ong-run price must just cover (1) all labor, materials, equipment, taxes and other expenses; (2) all wages payable to the identical managers at the level determined competitively by the bidding in all industries for people of such talents and industriousness; and (3) the interest yield that any of them could get for the amounts of capital that they tie up here instead of investing it elsewhere. (P.A. Samuelson and W.D. Nordhaus, Economics, 12th ed., 1985, p. 480)

Once a firm has entered an industry, factor (3) disappears to the extent that the costs are truly sunk so that the assets cannot be resold or used in another industry.[1] The GB paper assumes that the costs are already sunk, but this assumption is contrary to the state of the PCS industry.

8. An award of free PCS licenses to APC, Cox, and Omnipoint is likely to lead to a distortion in economic efficiency in this situation. As GB state

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[1] Costs may be partially sunk to the extent that the assets can be resold for a lower economic price than the investment.

in their affidavit (para. 8), APC and the others would not be able to sell their licenses for 3 years or after a significant buildout of its network. Thus, the APC license, if granted, will not be part of the auction nor can it be re-sold by APC for a significant amount of time. Thus, the number of 30 MHz licenses in a given geographical region, e.g. the Washington D.C. area, will decreased from 3 to 2 licenses or -- from the perspective of companies that are not designated entities -- from 2 to 1.

9. This substantial decrease in the number of available licenses will cause the expected price of the remaining licenses to increase.[2] Thus, a potential PCS entrant will pay more for the license because the supply of available licenses has decreased. In doing the calculation on whether to enter the mobile telecommunications market, some firms that could well have offered PCS services will not be able to submit a bid high enough to make it worthwhile for them to enter the industry. This expected increase in the price of the licenses and its effect on potential entrants' investment decisions is likely to be quite important in the current situation where the amount of uncertainty over future profitability of PCS is significant.

10. In addition, giving a license away will impair economic efficiency. Auctions should lead to optimal allocation of resources -- those firms that can provide PCS services most highly valued by consumers and firms that can provide lower cost PCS service, because of economies of scale and scope, will bid the highest for the PCS licenses. Economic surplus is maximized by this outcome as is economic efficiency. Again to quote Samuelson: "Efficiency is a central (perhaps <u>the</u> central) concern in economics." (<u>ibid.</u> p. 28) Markets and auctions are designed to achieve this economically efficient outcome.

11. Decisions by government regulators are unlikely to achieve the goal

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[2]Overall proceeds to the U.S. government are still likely to be lower than if the preference recipients were required to pay for their licenses or required to bid for them.

of economic efficiency. One last quote from Samuelson makes this point quite clearly:

> It means that an omniscient planner could not come along with a computer and find a solution superior to the market outcome . . . . This concept of efficiency -- that you cannot make one person better off without making another one worse off -- is one of the central ideas of economics. (Ibid.)

The market allocation framework differs greatly from the traditional FCC decision process in which administrative decisions were used in place of market decisions to allocate scarce spectrum. Thus, the key phrase for the new FCC policy should be to "let the market decide."

12. The pioneer preference awards to APC, Omnipoint, and Cox are the outcome of the outmoded and economically inefficient former process of the FCC where an "omniscient planner" decided that these 3 companies should provide PCS service in their respective MTAs. An economically efficient outcome is unlikely given the many other companies who have the technological ability and expertise to provide mobile services. Indeed, the economically efficient outcome is even less likely to occur because these "pioneers" must utilize the technologies and services they pioneered. With the extremely rapid changes in technology in mobile telecommunications and changes in demand which will arise from entry of ESMR, narrowband PCS, personal assistants, etc., it is unlikely that 4 year old technology and plans (by the time of inception of network operation) will be economically efficient. Thus, the market for spectrum licenses should be allowed to decide the efficient outcome, not the decision of an "omniscient planner."

13. The economic inefficiency created by the award of the pioneer preference could extend well beyond the particular license area into other areas. Consider a company which planned to provide PCS service along the eastern seaboard from, say, Boston down to Washington. Because pioneers

preference in 2 of the MTAs will eliminate available licenses, the company might well decide to forego its planned network because of the higher cost of licenses in New York and Washington MTAs. Thus, consumers might not be able to use a "seamless PCS network" and they would be made worse off by the pioneers preference awards. Consumers throughout the northeast region would be adversely affected, not just consumers in the New York and Washington MTAs.

14. The pioneers could well decide to sell their licenses in 3 years time. GB claim that it will be in APC's interests to take actions that maximize the value of its PCS business during this time period. (GB p. 7, n.8) However, GB make a sunk-cost error here. Because the FCC requires minimum amounts of buildout, the pioneers will be required to build and operate a network, at least to minimum FCC standards. Assume in 3 years that a firm buys the license from a preference recipient, but that firm employs a technology that uses only a small amount of the sunk investment made by the awardee. It would have been economically more efficient for the successor firm to win the license initially and to build its network because much of the investment by the preference recipient will be "stranded investment" or sunk costs that will not be used after the initial 3 year period.[3]

15. Yet another form of economic inefficiency arises because, contrary to the claim by GB (para. 16), the preference recipient's actions will be affected by its pioneer license because it will be required to use the technology it pioneered; that technology may be obsolescent by the time the pioneer constructs its network.[4]

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[3]Given the rapid rate of change in technology, it is almost impossible for any firm to know who its future purchaser will be and the type of technology it will employ.

[4]A partial solution would be to eliminate all of the restrictions on resale and the build out requirement. The pioneers then would be free, upon receiving their licenses, to sell them to the highest value user on the open market; if their technologies proved inadequate, they would sell their licenses. Although that process would lead to efficient results, the net effect of the pioneers preference program would be to transfer wealth directly

16. Thus, I disagree with the implicit assumptions of GB based on the following 3 factors: (1) new PCS entrants have not yet won their licenses so their costs are not sunk and their entry decision could well be affected by the supply of PCS licenses (2) more efficient firms than the pioneers can well exist but the pioneers will provide service for 3 years and (3) the technology restriction on the pioneers is likely to lead to inefficient technology or inefficient services and could well lead to wasteful sunk investment that may not be useful if a more efficient firm subsequently purchases the pioneer's license. If any of these 3 factors hold true, economic efficiency is affected and so too, will competition. Thus, the GB claims that the pioneers license will "not have an adverse impact (or any impact) on competition" (para. 7) and that "it will have no effect on the competitive environment faced by potential bidders for broadband PCS licenses" (para. 18) are incorrect.[5]

17. Economic efficiency will be lower, competition will be affected and consumers will be adversely affected unless somehow it turns out that in <u>each</u> situation the firm awarded the pioneers preference would have been one of the 2 or 3 most efficient firms to provide PCS in the given MTA. Such an outcome would be extraordinary to say the least, especially given the rapidly changing technology and significant uncertainty with respect to PCS. The outcome would be even more unlikely because when the pioneers' licenses were awarded, FCC personnel did not have explicit goals of achieving economic efficiency or maximizing competition. Thus, the FCC personnel would have to be

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from the Federal Government to the pioneers. Instead of the licenses being sold to the highest value user by the FCC in a public auction that sends its proceeds to the U.S. Treasury, the licenses would be sold by the pioneers in private auctions. The proceeds would go into private rather than public hands. I doubt highly that the Commission intended such a result. On the contrary, its intent was to distribute licenses to innovators who would use the spectrum to put their innovation into practice. Consequently, the removal of resale and build-out restrictions does not, for policy reasons, seem a viable option.

[5]In fact, if GB's conclusion were correct, giving away <u>all</u> of the licenses for free would not impede competition either.

extraordinarily lucky to have picked the 3 most efficient companies.

18. A last argument considered by GB is to state that an "unstable 'third-world'" (p. 9) type outcome could occur if APC and the other pioneers have to bid for their licenses. Government credibility is important in policy matters. However, the pioneers and other firms applying for the pioneers preferences did not know what the scope of their award would be when they undertook their investment, e.g. they could have been awarded 10 MHz licenses in a cellular sized geographical area since the band size and the geographical decisions had not been made at the time they undertook their initial investment. As a result, giving them each a license for a 30 MHz MTA in the most valuable regions is extremely large compared to their investment and risk. Given the approximate value of other mobile companies such as ESMR, I estimate that the economic value of the Los Angeles MTA will be in the range of $500 million to $1 billion -- or perhaps more. The value of this license as a reward for the research and development undertaken by a pioneer, given that no pioneer knew what it would receive in return for that activity, is extremely large. A far more modest reward would maintain government credibility in light of the investment and risks undertaken.

19. In addition, current reward structure would lead to the maximum amount of economic inefficiency because it would use the largest band size (30 MHz) and the largest geographical areas (an MTA). If a license is to be granted to the pioneers despite the fact that they are unlikely to be the most socially efficient user, the smallest band size and smallest geographical area would likely lead to a significantly decreased amount of economic inefficiency from the current plan.

20. Note that the situation here is very different than the patent situation considered by GB since the patent system has long been in place while the pioneers preference policy is quite new. Furthermore, the

particular framework of the pioneers preference policy has always been extremely uncertain, and indeed APC has never been actually granted a license. Nor did the FCC ever promise that a license would be granted when it announced the pioneers preference program; instead, the FCC said that its objective was to reduce the risk and uncertainty that innovating parties face given the existing policy. Granting a 10% bidding credit would reduce the risk and uncertainty since the pioneer would be more likely to win the auction, to the extent that it had efficient technology and could provide a service that consumers highly value.

21. The Commission will likely seek to balance the competing policy goals of maximizing competition and consumer welfare (which is best achieved through a pure auction regime) and of meeting other social goals (such as protecting government credibility). Awarding the pioneers 30 MHz MTA licenses for free would be among the least desirable ways of meeting these goals. First, as mentioned above, it overcompensates the pioneers for their research and development. Second, it maximizes the undesirable effect on the efficient (and therefore socially desirable) allocation of spectrum. It ensures that the pioneers receive the licenses even if they value the licenses far less than other potential competitors; indeed, even if the pioneer can use the license only 10% as well as another potential bidder, it still will receive and use the license for three years.

22. One way to decrease these distorting effects is to require the pioneers to participate in the auction. To the extent that the Commission believes that compensation is appropriate, it can offer the pioneers a discount. The discount may cause some inefficiency and impair competition somewhat, but it will certainly have less of an effect than a free license. As explained above, auctions ensure effective competition because they allocate licenses to those parties that can most efficiently compete. A relatively poor competitor will not place the highest bid because its

inability to compete will prevent it from earning a good rate of return; a good competitor will pay more, expecting greater market success. If pioneers preference licenses are free, then the pioneers will accept them even if they are relatively poor competitors. If, however, the preference recipient is required to pay 90% of market value, for example, it will not bid enough to purchase the license unless it is within a reasonable range of being a good competitor; if it cannot compete, it could not justify the investment. Thus, requiring the preference recipient to pay ensures that licenses are not allocated to users that will not utilize them in an approximately economically efficient manner.

23. As an alternative, the Commission may wish to avoid placing the preference awardees in the auction process and instead offer them a "guarantee" of a license. In that event, the Commission should impose a license fee that is linked to the market value of the license. Without such a charge, even a preference recipient that cannot expect to use the license efficiently and competitively would accept the license. Requiring payment approximating market price ensures that the preference recipient will not accept the license unless it can compete at a level approximating that of other potential purchasers. This option is inferior to putting the license in the auction, however, because it interferes with the simultaneous, multiple-round bidding regime that I proposed in an earlier affidavit and that the Commission selected. Nonetheless, because it ensures that the preference recipient will not accept the license if the result would be impaired competition, it is superior to giving away the license for free.4

25. If the Commission uses this latter method, no discount (or at most a modest discount) is appropriate, because the guarantee of a license itself has substantial value. First, the certainty of obtaining a license gives a bidder an advantage in competing for complementary licenses. Second, the guarantee is like an options contract that can be exercised some time after the auction; if the preference winner decides that the auction prices were

reasonable, it can accept the license and pay the fee; if its post-auction decision is that bids were too high, the preference holder can decline to pay and surrender the license. Such a guarantee, in terms of a purchase auction and if available on the open market, would be worth millions of dollars.

25. Keeping a preference winner's license out of the auction, some may argue, will force the preference winner to pay a distorted (and increased) price. A preference winner's license fee is linked to the auction price of a comparable license, and withholding the preference winner's license from the auction will increase the price paid for that comparable license. This effect on price, however, may be offset by the higher value of having an option on a license rather than a bidding credit. In any event, if this is truly a concern, each preference winner can be given a choice to be exercised before the auction: The preference winner can either participate in the auction with some sort of credit <u>or</u> have a license withheld from the auction and awarded upon payment of a fee that closely approximates (or represents a modest discount from) the auction price. The preference winner could choose the award it expects to be more valuable before the auction begins. Of all the proposals, however, giving the pioneers a bidding credit is best.

Conclusion

26. The pioneers preference policy of giving away PCS licenses for free is extremely poor economic policy. The award of a free licenses will distort both competition and bidding by permitting the preference awardees to obtain and retain very valuable licenses even if they will be less effective competitors. Consumer welfare (and competition) will suffer as a result. To the extent the Commission must award licenses to pioneers rather than putting them in the auction, imposing a payment requirement mitigates these adverse effects.

27. Although Professor Gould and Dr. Bamberger claim that giving away

licenses to pioneers for free will have no effect on competition or the bidding process, their prediction is correct only in one situation. That situation occurs if the FCC planners were lucky enough each time to choose 1 of the 2 most economically efficient firms in each of the MTAs. This outcome is extremely unlikely especially given that the FCC was not aiming to achieve this goal. However, economists and Congress know how to achieve these goals of economic efficiency, maximum competition, and largest consumer benefits. Auction all of the broadband PCS licenses without restriction, and let the most efficient firms win.

I hereby swear, under penalty of perjury, that the foregoing is true and correct, to the best of my knowledge and belief

Jerry A. Hausman
Professor of Economics
Massachusetts Institute of Technology
Cambridge, MA 02139

Sworn and subscribed to before me this 28th day of July, 1994.

Heather Knight
Notary Public

My Commission expires: 5-31-99

Declaration of BARRY J. NALEBUFF

I, Barry J. Nalebuff, hereby declare

1. My name is Barry J. Nalebuff. I am Professor of Economics and Management at Yale School of Management in New Haven, Connecticut, 06520.

2. I received an S.B. in economics and an S.B in mathematics from Massachusetts Institute of Technology in 1980. As a Rhodes scholar, I earned an M. Phil. and a D. Phil. (Ph.D.) in economics from Oxford University in 1982, where my thesis was awarded the George-Webb Medley prize. Following Oxford, I was a Junior Fellow in Harvard University's Society of Fellows. My area of expertise is the application of game theory to business strategy. I am the co-author of a leading textbook in this area and the author of 30 scholarly articles. I am an associate editor of *Journal of Economics and Management Studies*, *Journal of Law, Economics, and Organization*, and *Journal of Economic Perspectives*. My curriculum vitae is attached.

3. I have been actively involved in the PCS auction design process. I organized a Sloan Foundation conference on this topic and have submitted 3 filings to the FCC regarding auction design and designated entity bidding credits.

4. I have been asked by Bell Atlantic Personal Communications to consider the filing by American Personal Communications (APC) and

the affidavit filed by Professor Jack Gould and Dr. Gustavo Bamberger with respect to FCC policy toward Pioneer Preference Awards for PCS.

5. It is my view that the 30 MHz MTA licenses awarded to APC, Cox, and Omnipoint for free will have a deleterious effect on the auction and will constitute undue enrichment to these companies. My recommendation is that APC and the other pioneers be given a bidding credit for the claimed pioneering activity. I will first explain why the present awards are excessive. Given that the pioneers should then be required to pay for their licenses, I explain why a bidding credit is equivalent to a guaranteed license with a payment requirement if APC (Cox, and Omnipoint) do indeed buy their licenses, and much superior if they do not.

6. The MTA awards are undue enrichment, pure and simple. In my view, the current market value of the combined pioneer preference awards is in the range of $5.15 billion.

7. I base my estimate on the market values from the recent narrowband auction. This is the best market data for the value of new spectrum. It is fungible with the broadband spectrum. The same bidders could have used part of the broadband allocation for advanced paging applications, sharing it with PCS providers. *At the close of the auction, the current market price was $94.5 per pop for a 30 MHz license.* To see this, note that the narrowband spectrum brought in a total of $617 million for the sale of 787.5 KHz of national licenses. On a per MHz basis, this translates to

$783.5 million per MHz for a national license. Since a national license covers roughly 250 pops, this comes out to $94 a pop per 30 MHz license. This figure was remarkably constant across different licenses. The range was $96 a pop for the five paired 50 KHz channels; $91 a pop for the three 50/12.5 channels; and $90 a pop for the 50 two one-way channels.

8. The Washington 30 MHz MTA license covers roughly 8 million pops. Thus it has a current estimated value of $756 million. Of course, large metropolitan centers such as New York, Los Angeles and Washington are likely to command a significant premium to the average per pop price since they have higher proportion of business use and are essential to any regional network strategy. The value of the APC license giveaway thus exceeds 3/4 of a billion dollars.

9. To put this in perspective, this exceeds the revenue generated by the entire narrowband PCS auction, which itself exceeded CBO expectations by a factor of ten.

10. To put this in further perspective, APC has stated that its investment in technology was $20 million. Even if one accepts APC's self-reported figure of $20 as an accurate statement of their reliance on the pioneer's preference program, an output of $750 million from a $20 million investment represents a return of 3,750%.

11. Accepting for the moment APC's claim that it is entitled to some sort of "reward" based on its reliance on the pioneer's

preference program, APC, Cox and Omnipoint have never indicated precisely how they relied on the receipt of free licenses in developing their claimed innovations. Nor have they ever quantified the extent of such reliance. APC's reliance on the preference program should be measured by the marginal costs it incurred in excess of those that would have existed in the absence of the program. In other words, what matters is the part of APC's investment that was *marginal* in nature and *directly* related to its reward activity. It is unclear what fraction of APC'S $20 million figure this number would be. One reasonably expects that a good fraction of this investment was not marginal to their pioneer preference activity (in that they would have done it anyway as preparation for the auction and adoption of the new technology). If one assumes that the $20 million was evenly split between marginal and non-marginal activity (or activity not directly related to the pioneer preference award) then a free license produces a $750 million return on a $10 million investment or a 7,500% rate of return.

12. The same effect is even further amplified with the addition of license awards for New York and Southern California. The three MTAs awarded all have large populations --- Washington has 8 million pops, New York has 26.5 million pops, and Los Angeles/San Diego has 20 million pops. The pioneer award cover a total of 54.5 million pops. *All told, at current market valuations of $94.5 per pop for a 30 MHz license, the combined value of the pioneer preference awards is $5.15 billion.* This is an extraordinary amount of money to give away. This is almost equal to the original forecasted revenue from