IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

UNITED STATES OF AMERICA, Plaintiff, v. BROWN UNIVERSITY IN PROVIDENCE IN THE STATE OF RHODE ISLAND, AND PROVIDENCE PLANTATIONS; THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK; CORNELL UNIVERSITY; THE TRUSTEES OF DARTMOUTH COLLEGE; PRESIDENT AND FELLOWS OF HARVARD COLLEGE, MASSACHUSETTS; MASSACHUSETTS INSTITUTE OF TECHNOLOGY; THE TRUSTEES OF PRINCETON UNIVERSITY; THE TRUSTEES OF THE UNIVERSITY OF PENNSYLVANIA; and YALE UNIVERSITY, Defendants.	Civil Action No. 91-CV-3274

AFFIDAVIT OF DENNIS W. CARLTON

Dennis W. Carlton, being duly sworn, deposes and says:

INTRODUCTION AND QUALIFICATIONS

1. My name is Dennis W. Carlton. I am Professor of Business Economics at the Graduate School of Business of The University of Chicago. I received a B.A. in Applied Mathematics from Harvard University and an M.S. in Operations Research and a Ph.D. in Economics from the Massachusetts Institute of Technology ("MIT"). During the past 16 years I have served on the faculties of the Business School, the Law School and the Department of Economics at The University of Chicago. I was on the faculty of the Department of Economics at the Massachusetts Institute of Technology for one year in 1975-76. I specialize in the economics of industrial organization, which is the study of individual markets and the branch of economics that deals with regulatory and antitrust issues. I also specialize in the application of econometrics and statistics to economic problems. I have served for three years on an advisory panel to the U.S. Census regarding statistical and econometric issues. I have published over 30 articles in professional journals and am co-editor of the Journal of Law and Economics, a leading journal that publishes research applying economic analysis to industrial organization and legal matters. I am also co-author of the book Modern Industrial Organization, a leading textbook in the field.

2. In addition to my academic experience, I am Executive Vice President of Lexecon Inc., an economics

consulting firm which specializes in the application of economic analysis to legal issues. I have provided expert testimony on numerous occasions before a variety of state and federal agencies, Courts, and the U.S. Congress. I have worked on numerous antitrust matters and have appeared frequently before the Federal Trade Commission and Department of Justice regarding antitrust matters. My qualifications are described in greater detail in Exhibit A.

3. I have been asked by counsel for MIT to analyze the economic issues raised by the Government's motion for summary judgement. I have been identified as an expert in this case, have been deposed by the Government and am prepared to testify at trial.

4. I have read the Government's complaint in this case and its motion for summary judgement. The Government argues that MIT's participation in "overlap," a group including the financial aid officers of the eight Ivy League schools and MIT, constitutes a per se violation of the antitrust laws.[1] I understand that overlap consisted of three types of activity: an agreement not to offer any aid beyond financial need (I refer to this as the "need-based aid" policy); efforts to arrive at uniform principles for determining financial need; and meetings to discuss the financial need of individual students.

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1. I understand that 23 schools participated in overlap meetings, including the members of the Ivy League, MIT, and 14 other schools.

5. I understand that such meetings did occur, that the financial aid officers generally used the same or similar formulas to determine financial aid, that discussions about financial aid to individual students did occur, and that the schools endorsed the principle that aid be given only to students judged to be in financial need.

6. I explain in this affidavit why application of a per se rule is inappropriate in this case. I also explain why the challenged conduct should not be prohibited under the antitrust laws. First, I explain the underlying economic rationale for a per se rule and why economic theory demonstrates that that rationale does not apply here. Because universities and colleges are non-profit organizations, they pursue objectives that differ from those of profit-maximizing firms. This does not mean that non-profit firms should be exempt from the antitrust laws but only that intuition or experience gained from the study of profit-maximizing firms is not necessarily applicable to non-profits. Specifically, the underlying economic rationale for a per se rule against collective price setting by profit-maximizing firms with market power is that such behavior typically is anticompetitive because it raises prices, reduces output and harms society. This need not be so for non-profit schools, and in fact was not so here.

7. Second, I have performed a detailed statistical analysis of the effect of the collective agreements at issue

in this litigation on average net price.[2] By average net price I mean the average net revenue received by the school, which is list tuition plus room and board plus mandatory fees minus average grants and scholarships per student. The evidence shows that the challenged conduct had no effect on average net price. This means that the evidence provides no statistical support for the Government's hypothesis that the overlap agreements had the effect of increasing the schools' revenues. Based on the evidence and discussions I have had with education experts, I conclude that the challenged agreements did affect which students received financial aid but did not affect the total amount that students, as a group, paid. Thus, the effect of the overlap meetings was not to raise price, as is typically associated with price fixing, but rather to transfer dollars primarily <u>from</u> students with higher-income parents who would otherwise receive non-need-based aid <u>to</u> other students. The schools' revenues were unaffected. Profit-maximizing firms would never engage in this type of collective price setting which would leave profits unaffected.

8. Third, I ask why schools would engage in collective behavior that leaves their revenues and costs unaffected. The answer lies in the non-profit motivation of the

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2. I have not analyzed the effect of participation in overlap on total output. I am unaware of any evidence (nor does the Government or its expert, Dr. Leffler, present any) that participation in overlap reduced total output.

schools. The evidence is consistent with the schools' claim that they want to concentrate aid on needy students. The schools' collective action, therefore, promotes a public policy of need-based aid endorsed by the Federal Government, but does not affect average price, schools' total revenues or total output.[3] In such circumstances I see no reason for the antitrust laws to prohibit the challenged conduct.

9. Finally, I point out that the Government's own position contains a fundamental inconsistency when it allows schools to continue to provide only need-based aid to student-athletes. If it is reasonable to provide only need-based aid to student-athletes, how can a blanket policy of providing only need-based aid be a per se violation?

I. THE UNDERLYING ECONOMIC RATIONALE FOR A PER SE RULE DOES NOT APPLY TO NON-PROFIT SCHOOLS

10. A per se violation of the antitrust laws occurs when the conduct in question is judged illegal without a detailed investigation of the reasons for, or the effect of, the conduct. Such a rule saves enforcement costs if there is a class of conduct that typically harms consumers and society.

11. I understand that there is a per se rule against price fixing by profit-maximizing firms. I explain in this section that that per se rule should not be applied in this

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3. I understand that financial aid provided by the Federal Government is need based.

case because the objectives of these non-profit schools differ from those of profit-maximizing firms.

12. Market power is the ability of a firm (or group of firms acting collectively) to set price profitably above the competitive level. If a group of firms has market power collectively, then those firms could raise prices and profits if they could restrict competition amongst themselves. For example, if they collectively set price above the competitive level, they could earn supracompetitive profits. Consumers would be harmed as they reduced purchases at the higher price.

13. The primary goal of most firms is to maximize profits. A group of competing profit-maximizing firms with market power that acts collectively has both the incentive and ability to set a supracompetitive price and harm consumers. For this reason, I (and most economists) would condemn such collective price setting because the likely result is to raise price, and reduce both output and society's welfare.

14. In certain cases, collective price setting may be desirable if the collective action generates large efficiency gains. The clearest example of such beneficial collective price setting is when either the product would not be produced or its price would be very high without the

collective action. The BMI case,[4] commonly known as the ASCAP (American Society of Composers, Authors, and Publishers) case, provides a concrete example of the efficiency need for collective action. BMI is an organization of copyright owners of musical compositions which compete with each other. When a song is played, for example, by a radio station, a royalty must be paid to the copyright owner. Although a radio station could locate and pay the owner of each song it plays, BMI and another organization, ASCAP, were formed in order to avoid this costly situation. A radio station pays a fee to ASCAP and BMI for a blanket license which gives the station the right to use any song in ASCAP's or BMI's repertoire. In turn, ASCAP and BMI monitor usage and compensate copyright holders. Society benefits from the reduction in transaction costs achieved through the collective action of profit-maximizing copyright owners in setting blanket license fees, monitoring music usage and making payments to copyright holders.

15. Although efficiencies can accompany collective price setting among profit-maximizing firms, in my opinion it is appropriate to consider claims of efficiencies only in exceptional cases. Every profit-maximizing firm would like to collude with its rivals to raise price, but efficiencies do not always accompany such collective price setting.

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4. Broadcast Music Inc. vs. Columbia Broadcasting System, Inc., 441 U.S. 1 (1979).

Moreover, usually it is hard to measure efficiencies. Therefore, I believe that a general rule that profit-maximizing firms with market power be prevented from setting prices collectively is a wise enforcement policy.[5] This reasoning provides the economic logic underlying the per se prohibition on collective price setting.

16. Unlike profit-maximizing firms, profit maximization is not the primary goal of many non-profit firms. Non-profits have many, quite varied, objectives that depend on the particular non-profit. Universities and colleges, for example, consider various interest groups, including students, faculty, administrators, and donors.

17. If schools meet to set a scholarship aid policy collectively, it is possible that they are acting like a cartel and are attempting to lower total aid in an effort to raise net price paid and to increase the funds available to the schools. The increased funds could be used to benefit the faculty or administrators through higher salaries. If schools were to act in this way, their actions would have an effect similar to a price-fixing conspiracy of profit-maximizing firms -- namely, higher prices and reduced output to

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5. Some situations where collective action is likely to generate efficiency gains are discussed in Carlton and Klamer, "The Need for Coordination Among Firms With Special Reference to Network Industries," University of Chicago Law Review (Spring 1983). In these situations, the per se rule should not be used.

consumers.[6] However, since one (perhaps the primary) interest group that schools serve is their students, a price increase is not inevitable because it would harm students as a group and schools are concerned about student welfare. Such concerns never influence the behavior of a profit-maximizing firm because it is concerned about profits, not the welfare of its customers.

18. It is wrong as a matter of economics to condemn conduct practiced by non-profits simply because that same conduct when practiced by profit-maximizing firms is anticompetitive. The incentive to raise revenues through actions which harm consumers differs between profit-maximizing firms and non-profit schools. When profit-maximizing

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6. A school's output is multi-dimensional, including, for example, the quality of instruction and research output. If average net price rose and the increased revenues were spent to improve students' educational experience (e.g., better dorms, better labs), one could argue that students benefit from the collective price setting. As an enforcement matter, I think it would be difficult to determine whether increased expenditures benefit students or other interest groups, like faculty. Therefore, I would not condone collective price setting that raised average net price on the basis of an efficiency justification, except perhaps in the exceptional case where there is clear and overwhelming evidence of significant efficiencies.

   The difficulty in measuring efficiencies for schools is similar to that of identifying efficiency gains from collective action of profit-maximizing firms. All else equal, given their different incentives, collective action by non-profits is more likely motivated solely by efficiency justifications than in the case of profit-maximizing firms. Of course, this does not mean that non-profit firms' claims of efficiency are always true.

firms meet to set price, they almost always want to increase price regardless of efficiency. This is not true when schools act collectively to set scholarship aid policy. Therefore, looking at the effect of the schools' collective action is necessary before the conduct can be condemned.

II. THE EVIDENCE DOES NOT SUPPORT THE HYPOTHESIS THAT THE COLLECTIVE AGREEMENTS RAISED AVERAGE NET PRICE

19. The economic rationale for a per se rule against collective price setting is that price typically rises as a result of the collective action. I have already explained why on theoretical grounds this underlying rationale does not apply necessarily to schools. The only way to determine whether the collective agreements on aid raised price is to see what happened as a result of the agreements.[7] I performed such a study and find no statistically significant basis for the claim that the collective action raised net price per student at the overlap schools.[8] That is, the

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7. Because a school's output is multi-dimensional, measuring output is very difficult. The Government has provided no evidence, nor am I aware of any, that the challenged behavior reduced the overlap schools' "output." As explained in footnote 2, I have not studied output. My analysis assumes that the overlap agreements did not affect the number of students at the overlap schools or have a negative effect on aggregate "output."

8. The expert economist for the Government, Dr. Leffler, agrees that average net price per student is the variable to focus on. He endorses using average revenue per student and this is exactly how I am (Footnote Continued)

statistical evidence does not support the Government's hypothesis that collective action raised net price.

20. I investigated through a multiple regression analysis whether average net price per student was higher at schools that engaged in the challenged actions (i.e., those which participated in the overlap meetings). A multiple regression analysis is a well-accepted standard statistical procedure to examine the factors influencing average net price. Through a multiple regression analysis, it is possible to isolate the effect of a single variable in a complex factual environment containing multiple variables. In the regression analysis, I controlled for other characteristics of a school that could affect net price in addition to participation in the collective agreement. By controlling for these other factors, one can obtain estimates of the effect of overlap membership on price. For example, whether a school is private or public or whether a school has a religious affiliation could influence net price.

21. I briefly report here factors that I considered in my analysis. They are more fully described in Exhibit B. The variables I use in Exhibit B to explain net price at a particular school are:

1. Public or private;
2. religiously affiliated;

(Footnote Continued)
defining average net price per student. See Leffler Deposition p. 216, L9-11.

3. Ivy League plus MIT;
4. other overlap school;
5. SAT scores;
6. average state income;
7. Carnegie classification;
8. percentage of applicants accepted;
9. percentage of undergraduates not receiving aid; and
10. percentage of freshmen completing degree.[9]

22. I gathered annual data for each of these variables for 1984-1990 for approximately 225 schools. I included all 23 schools with available data that I understand participated in overlap meetings. The Carnegie Foundation classifies schools into a variety of categories (see Exhibit B for definitions). I included all schools with available data that were in any Carnegie category that included any of the 23 schools that participated in the overlap meetings.

23. I analyzed the data yearly and in aggregate averages. The results are unambiguous. A typical result is presented in Exhibit B. The evidence simply provides <u>no</u> statistically significant support for the Government's position that the overlap agreements raised average net price. Moreover, the results overwhelmingly support my conclusion that in this case the economic justifications for applying the per se rule to profit-maximizing firms are not transferable to the non-profit sector.

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9. I have also examined the effect of other variables, including the size of a school's endowment, on net price and I have estimated alternative equation specifications. These experiments had no substantive effect on the results.

III. THE ANTITRUST LAWS SHOULD NOT PROHIBIT THE OVERLAP AGREEMENTS

24. If the challenged conduct is judged by the rule of reason rather than a per se rule, one must examine the effect of the collective action and judge the desirability of those effects.

25. The collective action of schools resulted in students from higher-income families who otherwise would receive non-need-based aid paying more as a group and other students paying less as a group than if the schools involved in overlap gave non-need-based aid. The evidence does not provide statistically significant support for the hypothesis that the collective action raised average price and increased school revenues. No group of profit-maximizing firms would ever engage in collective price-setting behavior intended to leave profits unaffected.

26. Why would schools engage in behavior that does not increase their revenues? The answer lies in the non-profit motivation of the schools. I understand that the schools' rationale for their collective policy of granting only need-based aid is that it allows them to concentrate aid on students who have financial need. The schools deny that the collective action was intended to raise their revenues by increasing net price. The evidence is consistent with the schools' claims, but provides no statistical support for the Government's claims. The schools (and some of their experts) believe that without collective action, significant

non-need-based aid will be awarded, resulting in a significant reduction in their ability to meet the financial need of poorer students. I have not studied this issue and therefore do not know whether the schools are correct in this belief.[10] However, their policy of concentrating aid only on those in financial need is consistent with the Government's policy that federal funds can be disbursed only to those in financial need.

27. As an economist, it is difficult to judge the desirability of a policy of granting only need-based aid, since the policy's effect is to redistribute income. The social desirability of income redistribution involves value judgments and is not an issue on which an economist is necessarily better suited to render opinions than anyone else. As an economist, I render no opinion on whether granting only need-based aid is a sound educational and social policy. But, I do not see why the antitrust laws should prohibit non-profit schools from engaging in collective action to achieve social goals (consistent with those articulated by the Government) when that collective action leaves average price and total output unaffected.

28. Non-profits, in contrast to profit-maximizing firms, generally are formed to pursue social goals (other

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10. The Government and the Government's expert, Dr. Leffler, appear to endorse the belief that students' decisions are sensitive to financial aid. See Leffler Deposition, p. 311.

than profit maximization). I would not expect profit-maximizing firms ever to pursue collective price setting with the objective and effect of leaving their total profits unchanged. Therefore, the antitrust laws typically have not dealt with the pattern of behavior seen in this case.

29. The Government's position in this case is analogous to an argument that the antitrust laws should prevent two non-profit food banks (that sell food at subsidized prices) from coordinating their location decisions (i.e., dividing a geographic market) as they see fit, even if the total food subsidy were unaffected by the coordination. Collective action by the food banks would benefit some consumers and harm others, just as occurs in this case. The logic of the Government's antitrust position on overlap leads to the conclusion that the non-profit food banks should be prohibited from acting in concert.

30. I believe that collective action by non-profit schools to better achieve the social goals that they were created to pursue should not be challenged under the antitrust laws when there is no effect on average price and total output.

IV. THE GOVERNMENT'S POSITION IS LOGICALLY INCONSISTENT

31. I understand that the Government argues that the collective policy of granting only need-based aid to students is a per se violation, requiring no understanding of its effect before condemning it. I also understand that

collective agreement on granting only need-based aid to student-athletes is acceptable to the Government. Presumably, the Government must believe that the effect of granting only need-based aid to student-athletes is desirable.

32. I cannot understand the economic logic of why collective agreement on granting only need-based aid to all students is per se illegal, but collective agreement for student-athletes is not. The fact that a policy of granting only need-based aid sometimes is acceptable must mean that the effect of a particular policy of granting only need-based aid must be understood before determining its desirability.

V. CONCLUSIONS

33. Collective price setting by profit-maximizing firms with market power typically harms society by leading to higher prices and higher profits for the firms. Because of the high probability of harm, a per se rule is a sensible enforcement policy. However, non-profit schools have different incentives than profit-maximizing firms and it is not obvious that collective action will raise prices and harm students as a group. Indeed, schools consider students to be one of the groups whose interests they serve. Hence, on theoretical grounds alone, application of the per se rule is not economically justified here because the challenged conduct does not lead automatically to the typical problems

associated with price fixing -- namely, higher prices and harm to consumers.

34. The empirical evidence makes clear the danger of applying a per se rule here. The schools' rationale for the collective action is to achieve a goal of providing aid only to needy students. The challenged conduct does not lead to the type of price effect that justifies the per se rule. There is no evidence that the collective action raised average net price paid by a statistically significant amount.

35. Non-profit schools were created to pursue social goals other than profit maximization. The antitrust laws should not be used to prevent the schools from engaging in conduct that furthers a social goal when that conduct does not affect average price and does not reduce total output.

36. Finally, the Government's position that a collective agreement on granting only need-based aid for students should be per se illegal is directly in conflict with its position that a collective agreement on granting only need-based aid to student-athletes is reasonable.

37. I declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information and belief.

Dennis W. Carlton

Dennis W. Carlton

Sworn to and subscribed before me this 28th day of April, 1992.

Holly A. Scheurer

Notary Public

"OFFICIAL SEAL"
HOLLY A. SCHEURER
Notary Public, State of Illinois
My Commission Expires 1-10-95

EXHIBIT A

EXHIBIT A

DENNIS WILLIAM CARLTON March 1992

Economist

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EDUCATION

Ph.D., MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts: Economics, 1975.

M.S., MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts: Operations Research, 1974.

B.A., HARVARD UNIVERSITY (Summa cum laude): Applied Math and Economics, 1972.

EMPLOYMENT

LEXECON INC., Chicago, Illinois (1980 - present): Executive Vice President.

UNIVERSITY OF CHICAGO, Graduate School of Business (1984 - present): Professor of Business Economics.

UNIVERSITY OF CHICAGO, Law School (1980 - 1984): Professor of Economics.

UNIVERSITY OF CHICAGO, Department of Economics: Assistant Professor (1976 - 1979): Associate Professor (1979 - 1980).

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts, Department of Economics (1975 - 1976): Instructor in Economics.

OTHER PROFESSIONAL EXPERIENCE

HARVARD UNIVERSITY, Public Policy Summer Course in Economics (1977): Professor.

BELL TELEPHONE LABORATORIES (Summers 1976, 1977).

JOINT CENTER FOR URBAN STUDIES OF M.I.T. AND HARVARD UNIVERSITY, Cambridge, Massachusetts (1974 - 1975).
CHARLES RIVER ASSOCIATES, Cambridge, Massachusetts (Summers 1971, 1972): Research Assistant.

FIELDS OF SPECIALIZATION

Theoretical and Applied Microeconomics
Industrial Organization
Econometrics
Urban Economics

ACADEMIC HONORS AND FELLOWSHIPS

M.I.T., National Scholar Award, 1968
Edwards Whitacker Award, 1969
Detur Book Prize, 1969
John Harvard Award, 1970
Phi Beta Kappa, 1971
National Science Foundation Fellowship, 1972 - 1975
Recipient of Post-doctoral Grant from the Lincoln Foundation, 1975
National Science Foundation Grant, 1977 - 1985
Recipient of the 1977 P.W.S. Andrews Memorial Prize Essay, best essay in the field of Industrial Organization by a scholar under the age of thirty
Ph.D. Thesis chosen to appear in the Garland Series of Outstanding Dissertations in Economics.

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Co-editor, Journal of Law and Economics, 1980 - present
Associate Editor, Regional Science and Urban Studies, 1987 - present
Associate Editor, The International Journal of Industrial Organization, 1990 - present.
Member, American Economics Association, Econometrics Society
National Bureau of Economic Research, Research Associate
Member, Advisory Committee to the Bureau of the Census, 1987 - 1990
Editorial Board, Intellectual Property Fraud Reporter, 1990 - present.

BOOKS

"Market Behavior Under Uncertainty," Ph.D. Thesis, Massachusetts Institute of Technology (September 1975); Garland Publishing (1984).

Modern Industrial Organization, Scott, Foresman & Co., (1990), co-authored with Jeffrey Perloff.

RESEARCH PAPERS

"The Equilibrium Analysis of Alternative Housing Allowance Payments," Chapter 6 of Analysis of a Direct Housing Allowance Program, The Joint Center for Urban Studies of M.I.T. and Harvard University (July 1975), co-authored with Joseph Ferreira.

"Theories of Vertical Integration," presented at Fourth Annual Telecommunications Conference (April 1976). Appears in a volume of Proceedings of the Fourth Annual Telecommunications Conference, Office of Telecommunications Policy.

"Uncertainty, Production Lags, and Pricing," American Economic Review (February 1977).

"Selecting Subsidy Strategies for Housing Allowance Programs," Journal of Urban Economics (July 1977), co-authored with Joseph Ferreira.

"Peak Load Pricing Under Uncertainty," American Economic Review, (December 1977).

"The Distribution of Permanent Income," presented at the Symposium on Income Distribution and Economic Inequality (May 1976), co-authored with Robert Hall. Published in Income Distribution and Economic Inequality, edited by Zvi Griliches, et al. (Halsted Press, 1978).

"Market Behavior with Demand Uncertainty and Price Inflexibility," American Economic Review (September 1978).

"Why New Firms Locate Where They Do: An Econometric Model," in Studies in Regional Economics, edited by W. Wheaton (Urban Institute, 1980). Presented at the Conference on Regional Economics, sponsored by the Committee on Urban and Public Affairs, Baltimore, Maryland (May 1978).

"Vertical Integration--An Overview," in Congressional Record Hearings on the Communications Act of 1978. Bill H.R. 13105 (August 3,1978).

"Vertical Integration in Competitive Markets Under Uncertainty," Journal of Industrial Economics (March 1979). Awarded the P.W.S. Memorial Prize for the best essay in the field of Industrial Organization by a scholar under the age of thirty.

"Valuing Benefits and Costs in Related Output and Input Markets," American Economic Review (September 1979).

"Contracts, Price Rigidity and Market Equilibrium," Journal of Political Economy (October 1979).

"Benefits and Costs of Airline Mergers: A Case Study," Bell Journal of Economics (Spring 1980), co-authored with W. Landes and R. Posner.

"The Limitations of Pigouvian Taxes As A Long Run Remedy for Externalities," Quarterly Journal of Economics (September 1980), co-authored with G. Loury.

"The Law and Economics of Rights in Valuable Information: A Comment," Journal of Legal Studies (December 1980).

"Price Discrimination: Vertical Integration and Divestiture in Natural Resources Markets," Resources and Energy (March 1981), co-authored with J. Perloff.

"The Spatial Effects of a Tax on Housing and Land," Regional Science and Urban Economics (November 1981).

"Comments on Weicher," Journal of Law and Economics (December 1981).

Comment, in Sherwin Rosen ed. Studies in Labor Markets, University of Chicago Press (1981).

"Planning and Market Structure," in The Economics of Information and Uncertainty, edited by J.J. McCall, University of Chicago Press (1982).

"The Disruptive Effect of Inflation on the Organization of Markets," in Robert Hall, ed. The Economics of Inflation, University of Chicago Press (1982).

"A Reexamination of Delivered Pricing," Journal of Law and Economics (April 1983).

"Futures Trading, Market Interrelationships, and Industry Structure," American Journal of Agricultural Economics (May 1983).

"The Location and Employment Choices of New Firms: An Econometric Model with Discrete and Continuous Endogenous Variables," The Review of Economics and Statistics (August 1983).

"The Need for Coordination Among Firms With Special Reference to Network Industries," (with J. M. Klamer) University of Chicago Law Review (Spring 1983).

"The Regulation of Insider Trading" (with D. Fischel), Stanford Law Review, (May 1983).

"Economic Goals and Remedies of the ATT Modified Final Judgement" (with W. Lavey), Georgetown Law Review (August 1983).

"Equilibrium Fluctuations When Price and Delivery Lags Clear the Market," Bell Journal of Economics (Autumn 1983).

"Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures," paper presented at the Columbia University Conference on Futures Markets, February 1984, Journal of Futures Markets (September 1984).

"Energy and Location," presented at the Brookings Conference on Housing and Energy, Washington, D.C., (November 1981), Energy Costs, Urban Development, and Housing, Brookings Institution (1984).

"The Limitations of Pigouvian Taxes As A Long Run Remedy for Externalities: Extension of Results," Quarterly Journal of Economics (August 1986), co-authored with Glenn Loury.

"The Rigidity of Prices," American Economic Review (September 1986).

"The Theory and The Facts of How Markets Clear: Is Industrial Organization Valuable for Understanding Macroeconomics?," in Handbook of Industrial Organization, eds. Schmalensee and Willig (1989).

"Market Power and Mergers in Durable Good Industries," Journal of Law and Economics, (October 1989).

Comments on Vertical Foreclosure, Brookings Papers on Economic Activity, December 19, 1989.

Book Review of Tirole's The Theory of Industrial Organization, Journal of Political Economy, June 1990.

"The Economics of Cooperation and Competition in Electronic Services Networks", in Economics of Electronic Service Networks, Wildman Steven ed., Praeger Press, (1992).

"The Genesis of Inflation and the Costs of Disinflation: Comment", Journal of Money, Credit & Banking, (August 1991, Part 2).

"The Theory of Allocation and its Implications for Marketing and Industrial Structure: Why Rationing is Efficient," Journal of Law and Economics, (October 1991).

"Price Rigidity," Encyclopedia of Business Cycles, Panics, Crises and Depressions, Garland Press, (forthcoming).

UNPUBLISHED PAPERS

"Modeling the Housing Allowance Program," M.A. Thesis, Massachusetts Institute of Technology (September 1974).

"The Cost of Eliminating a Futures Market and The Effect of Inflation on Market Interrelationships," (1984).

"The Empirical Importance of Delivery Lags as an Explanation of Demand," (1984).

EXHIBIT B

EXHIBIT B

Description of Statistical Model of Net Price

This exhibit describes the statistical model that was used to analyze average net price. The model employs multiple regression analysis. This statistical procedure reveals how a "dependent variable," in this case the average net price charged by a school, is influenced by a set of "independent variables," such as overlap membership, objective indicators of school quality, wealth of the student body, and other factors. A multiple regression is able to measure the separate effect of each independent variable on the price.

The primary data source for this study is Peterson's Annual Survey of Undergraduate Institutions ("Peterson's"), which is an annual survey of the prices and characteristics of undergraduate schools. Schools are independently categorized by the Carnegie Foundation according to amount of outside funded research, size of graduate programs, and breadth of undergraduate curriculum. The price study includes all public and private schools in the same Carnegie classifications as the overlap participants to obtain a sample of comparable institutions. The variables used in the analysis are:

AVNET -- Average net undergraduate price: gross (list) tuition plus room and board charges plus mandatory undergraduate student fees less average

institutionally administered grant and scholarship aid per undergraduate.
Source: Peterson's.

IVY -- Ivy League and MIT overlap dummy variable: equal to 1 for Ivy League schools and MIT, otherwise equal to 0.

NONIVY -- Overlap college dummy variable: equal to 1 if overlap school and IVY equals 0, otherwise equal to 0.

RSRCH1 -- Carnegie classification dummy variable: equal to 1 if Research I category, otherwise equal to 0.
Source: Carnegie Foundation for the Advancement of Teaching.

RSRCH2 -- Carnegie classification dummy variable: equal to 1 if Research II category, otherwise equal to 0.
Source: Carnegie Foundation for the Advancement of Teaching.

DOCTOR1 -- Carnegie classification dummy variable: equal to 1 if Doctoral I category, otherwise equal to 0.
Source: Carnegie Foundation for the Advancement of Teaching.

DOCTOR2 -- Carnegie classification dummy variable: equal to 1 if Doctoral II category, otherwise equal to 0.
Source: Carnegie Foundation for the Advancement of Teaching.

PCTACC -- Percentage of applicants accepted.
Source: Peterson's.

WEALTH -- Percentage of undergraduates not receiving need-based grant or scholarship aid.
Source: Peterson's.

SAT -- Percentage of freshmen scoring over 700 on SAT Verbal Exam plus percentage of freshmen scoring over 700 on SAT Mathematics Exam.
Source: Peterson's.

COMPDEG -- Percentage of freshmen that completes a degree.
Source: Peterson's.

NONRELIG -- Dummy variable equal to 1 if school has no religious denomination or affiliation, otherwise equal to 0.
Source: Peterson's.

FEEMISS -- Dummy variable equal to 1 if AVNET does not include mandatory student fees, otherwise equal to 0.
Source: Peterson's.

YDPC -- State disposable income per capita for state in which school is located.
Source: Statistical Abstract of the United States.

PUBLIC -- Dummy variable equal to 1 if school is state college or university, otherwise equal to 0.
Source: Peterson's.

The regression model explains AVNET using all the explanatory variables listed above. Variables IVY and NONIVY are used to measure any "overlap effect." Variables RSRCH1, RSRCH2, DOCTOR1, DOCTOR2, PCTACC, SAT, and COMPDEG capture different dimensions of school quality. WEALTH controls for the effect of average family wealth of the student body on the total amount of grant and scholarship aid. YDPC captures both the effect of income on demand and the relative supply cost of inputs. NONRELIG and PUBLIC control for differences resulting from religious affiliation or public sponsorship.

The data for this study are available annually over the period 1984-1990. While the Carnegie classifications contained a total of 350 comparable schools, only 226 schools reported sufficient data to Peterson's in one or more years to be usable in the multiple regression analysis.[1] Multiple regressions were calculated for each year separately and for the (inflation-adjusted) averages of the variables for each school over the entire period.

Table 1 shows a typical result of the analysis. This table reports the regression for the entire period. Many of the variables are statistically significant, as indicated by the "t" statistics greater than roughly two. Because the t statistic for IVY is well below two, one cannot reject the hypothesis that the net price for IVY is the same as for the non-overlap schools after controlling for the other factors.

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1. Although it makes no difference to the results, I have excluded eight public schools that reported zero tuition.

Table 1

Multiple Regression Equation to Explain 1984-1990 Average Net Price
(In 1990 Dollars)

$$
\begin{aligned}
\text{AVNET} = \; & \underset{(2.76)}{5199} + \underset{(.92)}{411.2}\ \text{NONIVY} - \underset{(-.33)}{216.8}\ \text{IVY} + \underset{(1.60)}{663.8}\ \text{DOCTOR1} + \underset{(.03)}{9.738}\ \text{DOCTOR2} + \underset{(2.13)}{763.0}\ \text{RSRCH1} + \underset{(2.51)}{1032}\ \text{RSRCH2} \\
& - \underset{(-3.91)}{36.76}\ \text{PCTACC} + \underset{(4.79)}{36.60}\ \text{WEALTH} - \underset{(-.05)}{.4276}\ \text{SAT} + \underset{(5.46)}{.3186}\ \text{YDPC} + \underset{(1.81)}{21.45}\ \text{COMPDEG} - \underset{(-.91)}{228.2}\ \text{FEEMISS} \\
& + \underset{(5.70)}{1352}\ \text{NONRELIG} - \underset{(-21.45)}{8391}\ \text{PUBLIC}
\end{aligned}
$$

Number of observations = 226

Estimation Method: Weighted Least Squares

T-statistics in parentheses below each estimated coefficient.

See Exhibit B for definitions of the variables.