Notes

1. Physicians as Agents

1. Cf. V. Fuchs, *Who Shall Live?* (New York: Basic Books, 1975), pp. 58–59.

2. American Medical Association, *Profile of Medical Practice, 1975–76 Ed.* (Chicago: American Medical Association, 1976), table 41.

3. U. Reinhardt, *Physician Productivity and the Demand for Health Manpower* (Cambridge: Ballinger Publishing Co., 1975).

4. M. Feldstein, "Econometric Studies of Health Economics," in M. Intriligator and D. Kendrick, eds., *Frontiers of Quantitative Economics II* (Amsterdam: North Holland Publishing Co., 1974).

5. M. V. Pauly, "What Is Unnecessary Surgery?" *Health and Society, The Milbank Memorial Fund Quarterly* 57 (Winter 1979):95–117.

6. D. Smallwood and K. Smith, "Optimal Treatment Decisions, Optimal Fee Schedules, and the Allocation of Medical Resources," unpublished paper, Graduate School of Management, Northwestern University, 1976.

7. Feldstein, "Econometric Studies," suggests that it is easier for the patient to communicate his financial position and tastes to the physician than for the physician to provide the patient with medical information. While there is little empirical information, the communication of patient preferences hardly seems to be an easy task, nor are typical medical encounters so complex that informing the patient would always be undesirable.

8. Fuchs, *Who Shall Live?*

9. Reinhardt, *Physician Productivity.*

10. D. Coate, "The Optimal Employment of Inputs in Fee-for-service, for-profit Health Practices: The Case of Optometrists," *Explorations in Economic Research* 4 (Spring 1977):316–30.

2. Physicians and Hospitals

1. R. Evans, "Behavioural Cost Functions for Hospitals," *Canadian Journal of Economics* 4 (May 1971):190–215.

2. For an analysis of hospital cost inflation based in part on this view, see M. S. Feldstein, *The Rising Cost of Hospital Care* (Washington: Information Resources Press, 1971).

3. J. Newhouse, "The Erosion of the Medical Marketplace," in W. Greenberg, ed., *Competition in the Health Care Sector: Past, Present, and Future* (Washington: Federal Trade Commission, 1978).

4. One additional qualification occurs if the mix of inputs used to treat a given case can be altered by changing the mix of procedures. Suppose the cost-minimizing way of treating a given case is to use a relatively small amount of physician time. Suppose "indemnity" type physician fee insurance pays x dollars for this procedure. Suppose the case can also be treated equally well by another procedure which uses more physician time, but for which the indemnity level is sufficiently high that the physician's net income per hour is greater. Then income-maximizing physicians will use this other procedure. This is a specific illustration of the point made in chapter 4, that when incentive neutrality is lacking, least-cost combinations may not be chosen. Here the distortion in input mix arises not from the insurance coverage per se, but rather from the fee that the insurance pays.

5. M. Olson, *The Logic of Collective Action* (Cambridge, Harvard University Press, 1965); Joseph Newhouse, "The Economics of Group Practice," *Journal of Human Resources* 7 (Summer 1972):37–56.

6. For an attempt to measure this influence, see M. V. Pauly, "The Effect of Medical Staff Characteristics on Hospital Costs," *Journal of Human Resources, Supplement* 13 (1978):77–111.

7. J. Newhouse, "Toward a Theory of Non-profit Institutions: An Economic Model of a Hospital," *American Economic Review* 60 (March 1970):211–26; M. S. Feldstein, "Hospital Cost Inflation: A Study of Nonprofit Price Dynamics," *American Economic Review* 61 (December 1971):853–72.

8. M. S. Feldstein, *Economic Analysis for Health Services Efficiency* (Amsterdam: North Holland Publishing Co., 1967), p. 93.

3. Physician Influence on the Productivity of Hospitals: Empirical Results

1. U. Reinhardt, "A Production Function for Physicians' Services," *Review of Economics and Statistics* 54 (February 1972):55–56.

2. M. Feldstein, *Economic Analysis.*

3. Reinhardt, "A Production Function."

4. V. Fuchs, "Health Services Research Moves Ahead," *Health Services Research* (Fall 1969):242–250.

5. One implication of these results is that increased medical staff will *lower* cost per admission. Cost functions that were actually estimated with this data do indeed show that hospitals in counties with more physicians or with more active medical staff members tend to have lower costs per admission. These results contradict the findings of Davis and Manning, which indicate that, in the hospitals in their data, more medical staff members meant higher costs. (Cf. K. Davis, "The Role of Technology, Demand, and Labor Markets in the Determination of Hospital Costs," in *The Economics of Health and Medical Care*, M. Perlman, ed. [London: MacMillan, 1974], pp. 283–301; W. G. Manning, *Comparative Efficiency in Short-Term General Hospitals*, unpublished Ph.D. thesis, Stanford University, 1975.) They attributed these higher costs to the difficulties of coordinating larger medical staffs. One way to resolve this apparent conflict is to note that the hospitals Davis and Manning looked at were primarily in SMSAs or at least in areas in which physicians might be likely to hold appointments at more than one hospital. In such a situation, larger numbers of staff members might well not mean much more physician time input, but would mean that each physician would bear a smaller share of the costs of his cost-increasing actions. A result which confirms this interpretation can also be found in M. Pauly, "Medical Staff Characteristics." In this study costs were found to increase when the fraction of output for which the average physician is the primary attending physician was smaller. It was also found that costs were significantly higher in hospitals in which a larger fraction of patients had a primary

attending physician who cared for three or fewer patients per month. Moreover, no hospital in this study was the only hospital in the county, and over 80% were in metropolitan areas.

6. Occupancy rates of less than 100% do not necessarily indicate excess capacity, because a hospital faced with demand which is stochastic over short periods of time would want to have some empty beds on average. An ideal occupancy rate for all hospitals of about 80% is sometimes suggested in the literature, and for the isolated rural hospitals in this sample a target of 75% might not be inappropriate.

7. The specification used by Reinhardt was also applied to this set of data. That specification takes logarithms of all inputs which are theoretically needed in positive amounts, but is log-linear and log-quadratic in other inputs. The particular specification used was

$$q = A + \delta_1 \text{ persnl} + \delta_2 \text{ beds} + \delta_3 \text{ nlip} + \beta_1 \text{ GPs} + \beta_2 \text{ SURSPEC} + \beta_3 \text{ MEDSPEC} + \beta_4 \text{ OTHSPEC} + \beta_5 \text{ HOSPBDS} + \delta(\text{MDs})^2$$

where lower case variables represent logarithms.

The results are roughly similar to those in tables 3.4 and 3.5. For example, for the full sample, $\bar{R}^2$ was .869 (vs. .869 in table 3.4) and the marginal admissions product for a G.P. was 38.4 (vs. 31.3) and for a surgical specialist 54.7 (vs. 46.0).

8. Feldstein, *Economic Analysis*, pp. 78–79.

9. The latter interpretation is not, of course, consistent with the single-product Cobb-Douglas form.

10. Fuchs, "Health Services Research."

4. Physician Information and the Consumer's Demand for Care

1. I. Illich, *Medical Nemesis: The Expropriation of Health* (London: Calders & Bagars, 1975).

2. U.S. House of Representatives, *Cost and Quality of Health Care: Unnecessary Surgery*, Subcommittee on Oversight and Investigations, Committee on Interstate and Foreign Commerce. (Washington: U.S. Government Printing Office, 1977).

3. M. Grossman, *The Demand for Health* (New York: Columbia University Press, 1972).

4. To see this, note that when the distribution of $f(g_1)$ takes the degenerate form $(1, 0, 0, \ldots)$, then the conditional and unconditional probabilities in Bayes' formula are equal, and so $f(g_1|g\phi_1) = f(g_1)$. If the distribution of $f(g_1)$ were altered to $(1-\epsilon, \delta_1, \delta_2, \ldots)$, $\Sigma_1 \delta = \epsilon$, and if ϵ were very small, then it follows that the ratio of the conditional and unconditional probabilities could be made virtually equal to one, for any likelihood function.

5. F. Sloan and R. Feldman, "Monopolistic Elements in the Market for Physicians' Services," in W. Greenberg, ed., *Competition in the Health Care Sector.*

6. U. Reinhardt, "Parkinson's Law and the Demand for Physicians' Services," in W. Greenberg, ed., *Competition in the Health Care Sector.*

7. R. Evans, "Supplier-Induced Demand," in M. Perlman, ed., *The Economics of Health and Medical Care* (London: MacMillan, 1974).

8. M. Satterthwaite, "The Effect of Increased Supply on Physician Price: A Theory for the Strange Case of Physicians Services," Center for Health Services and Policy Research, Northwestern University, October, 1977.

9. M. V. Pauly and M. Satterthwaite, "The Effect of Physician Supply on Physician Price," Center for Health Services and Policy Research, Northwestern University, February, 1979.

10. Ibid.

11. If enough consumers are able to detect slight reductions in accuracy, the equilibrium level of accuracy will be "telling the truth"; the cost of reducing accuracy, in the form of loss of customers, will exceed the gain from doing so. Even if the number of physicians then increases, and some persons are less able to detect reductions in accuracy, it may still not pay to reduce accuracy, because the cost of reducing accuracy (even though less) still exceeds the gain from doing so.

12. G. Monsma, "Marginal Revenue and the Demand for Physician's Services" in H. Klarman, ed., *Empirical Studies in Health Economics* (Baltimore: Johns Hopkins Press, 1970).

13. U. Reinhardt has discussed this question in "Reimbursing Non-institutional Providers," in *Controls on Health Care* (Washington: Institute of Medicine, 1975), but he obtains conclusions which differ from those presented here.

14. An incentive system in which money income alone induces the physician to act in *each* patient's interests has been discussed by Ross in the more general context of the "principal-agent" problem. (Cf. S. Ross, "The Economic Theory of Agency: The Principal's Problem," *American Economic Review* 63 (May 1973): 134–39.) But his results seem irrelevant to the empirical situation we are analyzing. He concluded that the class of payoff structures or fee-schedules that maximize the principal's (patient's) utility will be one in which fees depend upon the payoff or outcome. The relevant outcome for physician's services would primarily be health. Actual payments to physicians almost never depend upon the final health outcome achieved. The only exceptions are that (1) if the health outcome is sufficiently low and sufficiently unexpected, then a malpractice action will readjust the fee received, and (2) in prepaid practice, improvements in health do reward the agent insofar as they lead to lower demands for his services. This latter incentive structure is also not ideal, since the agent is rewarded for any action that reduces demand for his services, including death of the patient. Why approximations to Ross's ideal fee schedules have failed to emerge in medical care, as in many other places, is not easy to determine. The reason may be that it is so costly or impossible concerning the outcome, and so easy for the principal to dissimulate about the outcome actually achieved, that such arrangements are not really optimal.

15. On this point, see M. Pauly, "Managing Physicians: Economic Theory," Paper Presented at the Symposium on Hospital Affairs, University of Chicago, Center for Health Administration Studies, June, 1979.

16. Monsma, "Marginal Revenue."

5. The Availability Effect: Empirical Results

1. V. Fuchs, *Who Shall Live?*

2. On this question, see M. Pauly, "What is Unnecessary Surgery?"

3. V. Fuchs and M. Kramer, *Determinants of Expenditures for Physicians Services in the U.S., 1948–68* (Washington: National Center for Health Services Research, 1973).

4. V. Fuchs, "The Supply of Surgeons and the Demand for Surgical Operations," *Journal of Human Resources Supplement* 13 (1978):35–56.

5. J. P. Acton, "Demand for Health Care When Time Prices Vary More than Money Prices," RAND Corporation, May, 1973.

6. C. Phelps and J. Newhouse, "Coinsurance, the Price of Time, and the Demand for Medical Services," *Review of Economics and Statistics* 56 (August 1974): 334–42.

7. If the prices of inputs or the quantity of inputs are fixed below the market-clearing level, then excess demand will occur. Increases in supply will then permit more use if this excess demand becomes manifest. This explanation would seem to be the appropriate one for the "availability effect" observed by Feldstein in his

study of hospital care in the United Kingdom. (Feldstein, *Economic Analysis*). It is certain that there is excess demand for hospital beds in the U.K., and money user price is zero, so that variations in bed supply will be related to use because of variations in the extent of excess demand.

8. M. S. Feldstein, "The Rising Price of Physicians' Services," *Review of Economics and Statistics* 52 (May 1970):121–33.

9. J. Newhouse and F. Sloan, "Physician Pricing: Monopolistic or Competitive: Reply," *Southern Economic Journal* 38 (April 1972):577–80.

10. R. Evans, "Supplier-Induced Demand."

11. Ibid., p. 18.

12. A similar point is made by Sloan and Feldman, "Monopolistic Elements".

13. Evans, "Supplier-Induced Demand," p. 21.

14. Sloan and Feldman, "Monopolistic Elements".

15. For a description of the survey and the data, see National Center for Health Statistics, *Health Survey Procedure: Concepts, Questionnaire Development, and Definitions in the Health Interview Survey*, Vital and Health Statistics, Series L, No. 2, May, 1964, and U.S. National Health Survey, *The Statistical Design of The Health Household-Interview Survey*, Health Statistics, Series A–2, Public Health Service, Washington, D.C., July, 1958.

16. Prices are reported in J. Wooldridge, *The Price of Medical Care as Reflected in a Survey of the 100 Largest SMSA's*, Policy Analysis Series No. 10, Mathematica, Inc., 1975.

17. J. Newhouse and C. Phelps, "New Estimates of the Price and Income Elasticities of Medical Care Services," in R. Rosett, ed., *The Role of Health Insurance in the Health Services Sector*, (New York: National Bureau of Economic Research, 1976). K. Davis and R. Reynolds, "The Impact of Medicare and Medicaid on Access to Medical Care," in Rosett, ed., *Role of Health Insurance*.

18. Newhouse and Phelps, "New Estimates".

19. Although price is endogenous to the market area and is affected by the demand creation efforts of physicians overall, it is probably not strongly affected by the efforts applied to a relatively small fraction of the population (e.g., the uneducated poor).

20. B. Friedman, "On the Rationing of Health Services and Resource Availability," *Journal of Human Resources, Supplement* 13 (1978):57–75.

21. M. Grossman and E. Rand, "Consumer Incentives for Health Services in Chronic Illness," in S. Mushkin, ed., *Consumer Incentives for Health Care* (New York: Prodist., 1974).

22. Such effects have been found in Newhouse and Phelps, "New Estimates," Davis and Reynolds, "Impact of Medicare," J. May, "Utilization of Health Services and the Availability of Resources," in R. Andersen, J. Kravits, and O. Anderson, eds., *Equity in Health Services: Empirical Analyses in Social Policy*, (Cambridge: Ballinger Publishing Co., 1975).

6. Hospital Beds, Hospital-oriented Physicians, and Hospital Use

1. M. S. Feldstein, "Hospital Cost Inflation."

2. J. P. Bunker, "Surgical Manpower," *New England Journal of Medicine* 282 (January 15, 1970):135–44.

3. C. Lewis, "Variations in the Incidence of Surgery," *New England Journal of Medicine* 281 (October 16, 1969):880–84.

4. J. Wennberg and A. Gittelsohn, "Small Area Variations in Health Care Delivery," *Science* 182 (December 14, 1973):1102–8.

5. The set of coefficients does differ across educational groups for the nonmetropolitan areas at the 93% level. But the coefficient on BEDS* is in each case larger

for the high education group, which would appear to be more consistent with a time cost theory than an information manipulation theory.

6. M. Roemer, "Bed Supply and Hospital Utilization: A Natural Experiment," *Hospitals* 35 (November 1, 1961):36–42.

7. C. Lewis, "Variations in the Incidence of Surgery."

8. Fuchs, "The Supply of Surgeons."

7. Conclusions and Policy Implications

1. L. Benham, "The Effects of Advertising on the Price of Eyeglasses," *Journal of Law and Economics* 15 (October 1972):337–52; L. Benham and A. Benham, "Regulating through the Professions: A Perspective on Information Control," *Journal of Law and Economics* 18 (October 1975): 421–47; R. Feldman and J. Begun, "The Effects of Advertising—Lessons from Optometry," *Journal of Human Resources Supplement* 13 (1978):247–62.

2. Pauly, "What Is Unnecessary Surgery?"