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The private non-profit firm has been ignored by economic theory until very recently. It was easy for economists to overlook such firms in the past because of their relative unimportance, at least for the past century and a half.[1] But presently this sector has grown to a position of importance. In 1966 nearly $15 billion was spent on hospital care, not including expenditures on construction, research, or insurance administration charges.[2] Hospitals employed nearly 1.3 million people in 1963, over twice as many as "Blast Furnace and Basic Steel Products" and nearly twice as many as "Motor Vehicles and Equipment."[3] Since decisions made by non-profit institutions affect the allocation of resources, it is important that their decision-making process be understood.

In this paper a very simple model of a hospital is developed, and its implications are considered at some length. An attempt is made to justify the realism of this model, though like any model it cannot be entirely realistic. To develop the model we will make the particularly unrealistic assumption that hospital expenses are financed by the

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[1]There is some evidence that the non-profit corporation was the dominant form of business organization in the Colonial period. See Joseph S. Davis, Essays on the Earlier History of American Corporations; Cambridge: Harvard University Press, 1917.

[2]H. M. and A. R. Somers, Medicare and the Hospitals; Washington: The Brookings Institution, 1967, p. 43.

[3]United States Department of Labor, Bureau of Labor Statistics, Employment and Earnings for the United States, 1909-1962; Washington: GPO, 1963.

consumer and not by a third party. We do this in the hope that this simple model may prove applicable to other non-profit institutions where third party payments are not important, such as colleges and universities, the performing arts, and museums. Later, however, we remove the assumption that the consumer pays his own bill.

We are concerned with the relationship between a hospital's non-profit status and economic efficiency. To understand that relationship we must postulate a maximand for the hospital decision-maker. The first element in the maximand is quantity of services provided. Hospital services seem to be desirable in some ethical sense; this is presumably the basis for the claim that consumers have a "right" to medical care and the basis for hospitals' being granted certain tax and other legal privileges, such as exemption from the Robinson-Patman and Taft-Hartley Acts. It also seems to be the raison d'etre for philanthropy. Apparently it is generally felt that the public is better off if it consumes more hospital services (as well as more of the services provided by other non-profit institutions).[1] No doubt the public would be better off (and think itself better off) if it consumed more of many different kinds of products. Yet that is irrelevant to a decision-maker at a hospital. If his institution exists for a social purpose and because of that can ask for gifts and tax privileges, he is likely to be concerned about the quantity of the service provided. Therefore, we take quantity as one element in the decision-maker's maximand. Maximizing quantity implies (on the assumption of a downward-sloping demand curve) keeping price as low as possible. It may also involve price discrimination such as charity care (or scholarships based on need).

To understand why the second element, quality, belongs in the maximand, it is necessary to examine the locus of decision-making in a hospital. One characteristic of non-profit hospitals is that usually control formally resides in a board of trustees or similar large group. This group in turn appoints an administrator who is in charge of day-to-day decisions. The medical staff may also exert influence over

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[1] And apparently less of some other services.

resource allocation decisions. It is important to know what incentives these various parties face in making decisions regarding resource allocation.

If the administrator is not to make a "profit," his performance cannot be judged by the profit criterion. Therefore, his salary and promotional chances must be a function of some other variable or variables. It seems plausible to assume that the prestige of the institution is prominent among these other variables. The trustees, insofar as they participate in the decision-making process, may also be influenced by this variable. Prestige, in turn, is affected by the size of the institution, but probably even more by the quality of the product produced.

There may be other reasons why the trustees and the administrator would give weight to both quantity and quality.[1] There may be a pursuit of status quite independent of any managerial reward. There may be a desire to serve society independent of the desire to preserve existing tax and legal privileges. There may be a desire to show professional excellence or technical virtuosity by stressing quality. In short, while we have derived a maximand based on quantity and quality by considering the self-interest of the administrator (and trustees) narrowly defined, such a maximand is consistent with other motivations.

The maximand is reinforced by whatever role the medical staff may play in the decision-making process. They have a strong interest in the quality of the facilities available since it is one determinant of the quality of care they can give and of their professional standing. Further, the existing staff will find it easier to attract additional staff (and so ease their own work load) by maintaining high quality facilities. The medical staff is also interested in quantity, since

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[1]The remainder of this paragraph is based on references found in Fritz Machlup, "Theories of the Firm: Marginalist, Behavioral, Managerial," American Economic Review, 57:1, March 1967, pp. 1-33.

each physician wants a bed available, should a patient of his require hospitalization.[1]

The administrator, the trustees, and the medical staff may, of course, weigh quality and quantity considerations differently, but that need not impair the theory. We assume that some final resolution is obtained among the tastes of the administrator, the trustees, and the medical staff, so that we can speak of the tastes of the hospital decision-maker.

Support for the notion that decision-makers perceive both quality and quantity to be in their maximand can be found in the hospital trade literature. One prominent hospital administrator wrote, "No one can seriously believe that the public would knowingly permit any step to be taken that would lead to the slightest sort of deterioration of quality."[2] And an economist said, "... medical ethics and collective concern for quality significantly modify free enterprise... In medicine we are not free to envisage saving resources by lowering the quality of care. Less than the highest quality care often represents a total waste."[3] Another leading hospital administrator has written: "The hospital is the community trustee responsible for a large amount of the definitive medical care provided in a community. Its first responsibility is to program its services to meet community needs, and its second is to conduct such services with suitable efficiency and economy, always with great sensitivity toward its responsibility and authority to meet high standards of both quality and quantity of services...

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[1] See Carl Stevens, "Hospital Market Efficiency: The Anatomy of the Supply Response," paper presented at The Second Conference on the Economics of Health, Baltimore, Maryland, December 5-7, 1968.

[2] Ray E. Brown, "Let the Public Control Utilization Through Planning," Hospitals, 33:23, December 1, 1959, p. 35.

[3] Jerome Rothenberg, "Welfare Implications of Alternative Methods of Financing Medical Care," American Economic Review, 41:2, May 1951, p. 676. The last sentence appears to be an overstatement. Also, it is not clear why a concern for quality should modify free enterprise.

The patient expects that hospital services will be of high quality."[1] A voluminous study of the medical market done for the State of Michigan said: "From the community's viewpoint, the hospital is most effective ... when it admits the greatest number of patients who need admission..."[2]

Yet quality and quantity cannot be maximized without limit. The non-profit institution faces a budget constraint; its deficit cannot be larger than a certain amount. We therefore postulate a model of constrained quantity-quality maximization. Long has informally put forth a similar hypothesis, but he does not draw any conclusions from his model.[3] He saw the "guiding principle" of the hospital as a "desire to maximize the number of patients seen subject to several constraints. There is a financial constraint; operating deficits cannot go beyond a point specified by the sponsoring agency. Another constraint is that the quality of care should be the best possible with available equipment and personnel; hospitals seldom cut corners when doing so would reduce the quality of care."[4] Our model differs in an important respect from

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[1]James P. Dixon, "Hospitals and the Community," in Administration of Community Health Services, ed. Eugene A. Confrey; Chicago: International City Managers' Association, 1961, p. 284. The first part of this quotation ignores the vital question of how one defines community needs and whether needs are different from community demands. Nevertheless, we are interested in the light it sheds on the maximand. The administrator of a different non-profit institution has said, "As dean of a Graduate School of Public Health, reasonably alert to the attractiveness of having the largest possible number of tuition-paying students that his facilities can accommodate..." (James A. Crabtree, "Plans for Tomorrow's Needs in Local Public Health Administration," in American Journal of Public Health, 53:8, August 1963, p. 1179.)

[2]Walter J. McNerney, et al., Hospital and Medical Economics, quoted in Mark V. Pauly, "Efficiency in Public Provision of Medical Care," unpublished Ph.D. dissertation, Department of Economics, University of Virginia, 1967.

[3]Millard F. Long, "Efficient Use of Hospitals," in The Economics of Health and Medical Care, ed. S. J. Axelrod, Ann Arbor: The University of Michigan, 1964, pp. 211-226. W. J. Baumol and W. G. Bowen also emphasize both quality and quantity in the non-profit area generally, but do not formalize their ideas. ("On the Performing Arts," American Economic Review, 55:2, May 1965, pp. 495-502.)

[4]Long, 1964, op. cit., p. 212.

Long's by making quality a variable of choice rather than a constraint. The existence of accreditation bodies, however, may make some minimum standard of quality necessary. Insofar as it does, a constraint does exist.

Martin Feldstein has postulated a maximand for a hospital decision-maker in the British National Health Service which is somewhat similar to ours, but used for a different purpose.[1] Feldstein discovered that the number of cases treated in a region was more responsive to bed availability than was length of stay. He found that such behavior was consistent with a three-variable maximand, which was maximized subject to a budget constraint. The maximand included length of stay, number of cases treated, and a quality variable. Our interest, however, is in a different question, namely, the tradeoff between quality and quantity.

How are quality and quantity measured? One can think of certain criteria which are indicative of quality: personnel/patient ratios or professional personnel/patient ratios or the availability of certain laboratory or other facilities. There are, however, several difficulties associated with the use of such criteria. First, do high personnel/patient ratios indicate high quality or merely substitution of labor for capital (or low-skilled labor for high-skilled labor) in the hospital production function?[2] Similarly, is the availability of certain facilities also merely a substitution in the production function? Second, how may these criteria be combined in any meaningful fashion? The weight each criterion would receive in a weighted average is ambiguous, as is the meaning of any such average. Finally, there are intangibles associated with the notion of quality.

To avert these difficulties, at least in part, we assume quality to be represented by a vector of characteristics, some of which may

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[1] Martin S. Feldstein, Economic Analysis for Health Service Efficiency; Amsterdam: North Holland Publishing Company, 1967, Ch. 7.

[2] Feldstein, 1967, op.cit., Ch. 4, finds that a modified Cobb-Douglas production function with nurses, physician beds, and other supplies as explanatory variables fits data generated by the British National Health Service rather well. In the modified form nursing services are not substituted for other inputs, but the other inputs are substitutes for each other.

not be quantifiable except in the sense of being present or absent. Further, we assume that the demand for the services of each institution depends on quality as well as price. The justification for this assumption is that physicians probably prefer higher quality hospitals and so are more inclined to seek staff privileges there. Also, if the physician has multiple privileges, he may prefer working in the higher quality hospital (and probably will not find it too difficult to convince the patient). When two quality vectors have the same cost, we assume that the hospital decision-maker chooses that quality vector which maximizes quantity bought at a given price. The implication of these assumptions is that an increase in quantity demanded at each price which is brought about by an increase in quality can only be accomplished at an increased cost. Restricting ourselves to this subset of quality vectors which has the property of maximizing quantity demanded at a given price, we can associate each quality vector with a level of cost. We can then attach an arbitrary set of numbers to each quality vector, which serve as an ordinal measure of quality. The only restriction on the numbers is that they must increase as cost increases. For convenience we shall use the costs themselves as measures of quality.[1]

This averts the problem of directly measuring quality, but unfortunately measurement difficulties are not restricted to that variable. Quantity supplied and demanded, while seemingly straightforward, also

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[1]This is another formulation of a problem which has caused some controversy in the literature, namely, how to measure quality. J. L. Nicholson, "The Measurement of Quality Changes," Economic Journal, 77: 307, September 1967, pp. 512-30, has criticized Milton Gilbert, "The Problem of Quality Changes and Index Numbers," Economic Development and Cultural Change, 9:3, April 1961, pp. 287-94, for using cost rather than price to measure the contribution to welfare of a change in quality. Since cost equals price in our model, this criticism presents no problem to it; one could merely say that the assumptions imply that an increase in quality, quantity held constant, implies an equal increase in both cost and price. Our analysis is really in the same spirit as Nicholson's by proposing a criterion which relates to the consumer's preferences as revealed in the marketplace; that is, that the entrepreneur is in equilibrium at the quality level which maximizes quantity bought at a given price when two quality levels have the same cost. Gilbert's measure, on the other hand, seems to be more a technological criterion.

presents an analytical problem. We take it to mean the number of patient-days in the case of a hospital. (One could measure the number of students attending a medical school.) However, the "product" of a hospital may vary so much depending on the diseases its patients have that a simple measure of patient-days cannot accurately reflect the output of the hospital.[1] This is an aggregation problem which is inherent in a multiple-product firm, since each diagnosis can be seen as a distinct product. We simply cannot uniquely associate a scalar with every possible vector of illnesses treated.

If there are distinct demand and cost curves for various diagnoses, each must be analyzed as a separate product with any interdependencies acknowledged. To take account of subproducts and interdependencies here would complicate the analysis, but would not alter the conclusions. Therefore, we shall continue to speak of the hospital as though it were a single product firm whose physicial output were unambiguously measurable. It should be emphasized, though, that such an assumption is made purely for convenience.

Suppose quality is given, say at the minimum permissible level for accreditation. This determines an average cost curve--call it AC_o. At this quality--income and all other relevant variables except price held constant--there is a certain demand at each price which determines a demand curve--call it d_o. Assume for now that the decision-maker cannot run a deficit--that all his costs must be met from revenues. Then, given that he wants to maximize the quantity of output (in physical terms) provided at that quality, and, assuming a downward sloping demand curve, he produces at the quantity q_o for which AR = AC. If there is more than one point where AR = AC, he chooses the one associated with the largest quantity. Such an outcome is graphed in Figure 3-1:

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[1] Martin Feldstein, 1967, op.cit., Ch. 2.

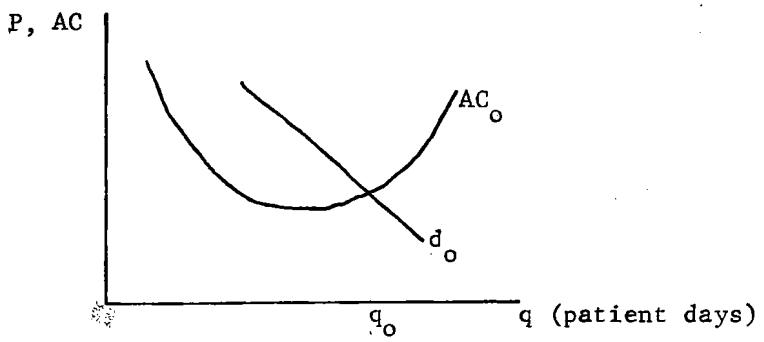

Figure 3-1

Suppose that a higher quality product is available at a cost AC_1--a cobalt radiation machine can be bought or more nurses can be hired. This higher quality product raises the demand curve to d_1, so that there is a new equilibrium output q_1 as shown in Figure 3-2:

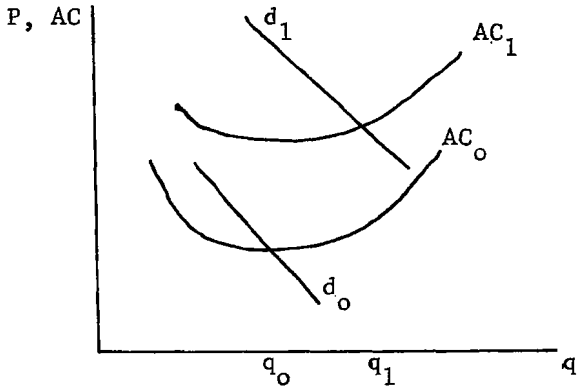

Figure 3-2

Depending on the relative movements of the demand curve and cost curve the new equilibrium point may lie to the right or left of the old one. As the quality variable runs over its potential range of values, the locus of equilibrium quantity-quality combinations is traced out. If, after a certain point, further increases in quality shift demand up less and less while raising costs more and more, the tradeoff curve

will eventually bend back, as is illustrated in Figure 3-3:[1]

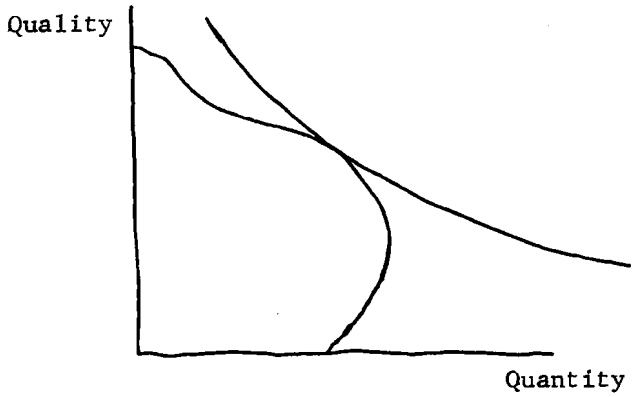

Figure 3-3

An equilibrium will be established where this tradeoff curve is tangent to the decision-maker's indifference curve, I_o, which we assume has the characteristic shape.

Suppose that the decision-maker is told he may run a deficit of a certain size. Then, instead of producing the quantity in Figures 3-1 and 3-2 where AR = AC, the decision-maker produces a sufficiently larger quantity to exhaust the subsidy given him. This shifts the tradeoff curve to the right at each quality level (or, alternatively, up at each quantity level), thereby enabling the decision-maker to attain a higher indifference curve. Suppose the deficit is not given to the decision-maker, but is affected by his actions. Such would be the case if the decision-maker conducted fund-raising drives whose success depended upon the effort he put forth. The fund-raising drive will be carried on until the marginal benefit to the decision-maker of shifting the tradeoff curve out by the amount the marginal dollar would do so equals the marginal cost of raising that dollar. A mathematical statement of this model can be found in the appendix.

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[1] For a discussion of such a tradeoff curve in the context of the traditional theory of the firm and the problems posed by such a curve for the traditional theory, see Henri Theil, "Qualities, Prices, and Budget Inquiries," The Review of Economic Studies, 19:3, 1952, pp. 129-47, and Jack Hirschleifer, "The Exchange Between Quantity and Quality," Santa Monica: The Rand Corporation (P-406), 1955.

We are interested in using this model to assess the effect of the hospital's non-profit status upon efficiency. First, note that this model implies least-cost production insofar as the administrator pursues his maximization goals. For suppose that the marginal revenue product of a factor exceeded its marginal factor cost. A profit-maximizing firm would expand production to the point of equality, thereby achieving a socially optimal allocation of factors.[1] A constrained quantity-quality maximizer will also expand production to the point of equality. He can use the "profit" the profit-maximizing firm would have gained to shift his quantity-quality tradeoff curve out and thereby reach a higher indifference curve. When the equalities hold for all factors, the tradeoff curve cannot be shifted out any more.

Even though the model implies least cost production, there are two reasons why it does not lead to an optimal outcome. (These reasons also apply to a model based on simple cost reimbursement.) The two reasons are a bias against producing lower quality products and barriers to entry resulting from non-profit status. Although we have spoken up until now as though the hospital produced only one quality, in reality it produces several. From a normative standpoint one would desire that the hospital produce all qualities (all products) which were profitable when price equalled marginal cost, just as a profit-maximizing firm would. How likely is this outcome in the non-profit sector? To bring out the essence of the problem, we assume all quality vectors have demand and cost functions which are independent of those associated with other quality vectors. This assumption is made purely for ease of exposition.

Different quality levels generate demand which can be measured in the same units of quantity, for example, patient-days. This makes it possible to derive "total" or "aggregate" quantity; that is, quantity summed over all quality levels. Will the administrator seek to maximize this figure subject to the constraint that all qualities produced at least break even? If he does, the outcome is similar to that

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[1] Assuming perfect product and factor markets and no externalities.

predicted by traditional theory in a profit-maximizing sector.[1] The answer is no, he will not necessarily do so. This is a major difference between the implications of this model and those of the profit-maximizing model, and so from a positive point of view constitutes one test of the model. The reason why the decision-maker does not produce all profitable qualities lies in the quality variable which is in his maximand. An example should make this clear. A hospital can produce hospital care in wards, semi-private rooms, or private rooms, where quality increases from ward to private room.[2] Why should the hospital produce care in a "private" room when the same patient-day would be counted a patient-day in a ward? Because if the patient is willing to pay the additional cost of private-room care, the hospital can raise its quality level without changing its quantity level. But suppose the hospital produces only top quality care. In that case it could conceivably increase quantity by producing lower qualities, but this would lower average quality. Whether it will produce lower qualities depends on how much inferior qualities will increase quantity and on how much weight the decision-maker gives quantity relative to quality. Such a bias against producing low-quality products, even if they are demanded by a certain segment of the population does not exist for a profit-maximizing firm.

Is such a bias observed? First, proprietary hospitals (or hospitals for profit) are thought to produce lower quality care than voluntary short-term general hospitals. There is a much lower percentage of accreditation among the proprietaries than among the voluntaries. Of all the short-term hospitals listed by the American Hospital Association in 1965, 62% (with 87% of the beds) were accredited, but only 34% of the proprietaries (with 60% of the proprietary beds) were.[3]

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[1] Obviously this will not be the outcome in the profit-maximizing sector if the demand and cost functions for various products are not independent. But that does not affect the conclusion.

[2] Quality is measured with respect to demand at a given price.

[3] Somers and Somers, 1967, op.cit., p. 77.

Second, one thinks of the description of medical care as a "Cadillac only" industry.[1] "The potential for 'Cadillac only' medicine is nowhere more real than in the American hospital."[2] Part of the reason for Cadillac only medicine may be that Cadillac medicine tends to maximize the skilled labor input, and the physician has a good deal to say about resource allocation. Nevertheless, Cadillac only output is what would be expected from a sector organized around a non-profit institution.

Third, the model shows why hospitals so frequently run at a deficit. The incentives facing the decision-maker are to run at a deficit; forces of the marketplace, instead of eliminating firms which run at deficits, spawn them.

Fourth, evidence from the nursing home industry agrees with the prediction of the model that non-profit institutions will emphasize quality. More non-profit nursing homes have a registered professional nurse as the top nursing skill level than proprietary homes.[3] This is shown in Table 3-1:

Table 3-1

Top Nursing Skill Level Among Full-Time Staff in Skilled Nursing Homes*

	Proprietary Homes	Non-Profit Homes
Registered Professional Nurse	44%	67%
Licensed Practical Nurse	42%	22%
No RN or LPN	14%	11%

*Based on the 1961 National Inventory Conducted by the Public Health Service

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[1] Recall Long's observation, quoted earlier in this chapter, that "hospitals seldom cut corners when doing so would reduce the quality of care." Long, 1964, op.cit. See also Reuben A. Kessel, "Price Discrimination in Medicine," Journal of Law and Economics, 1, 1958, p. 27.

[2] Gerald D. Rosenthal, "The Public Pays the Bill," Atlantic Monthly, 218:1, July 1966, p. 109.

[3] Jerry A. Solon, "Nursing Homes and Medical Care," New England Journal of Medicine, Vol. 269, November 14, 1963, pp. 1067-1074. This index of quality is subject to the qualification noted above about indices of quality.

Lastly, the model predicts the often maligned duplication of sophisticated and expensive equipment.[1] According to the de Bakey Commission on Heart Disease, Cancer, and Stroke, 30% of the 777 hospitals equipped to do open-heart surgery had no cases in the year under study. Of the 548 hospitals that did have cases, 87% did fewer than one operation per week.[2] The prestige accruing to the voluntary hospital for possessing advanced equipment (and the value its decision-maker gives that prestige) may be the reason for greater capital intensity in the voluntary hospitals than the proprietaries.[3] An alternative explanation is that capital is relatively cheaper for the voluntaries so that cost minimization would lead to greater capital intensity.[4] Cost minimization, however, is neutral with respect to duplication of equipment, since output level is not specified. The twin pressures on the decision-maker in the voluntary hospital to maximize output and quality may well be causing the duplication of equipment which in turn is causing the greater capital intensity.

In normative terms the problem is that the decision-maker has picked a point on the quantity-quality tradeoff curve which is optimal for him but not necessarily socially optimal.[5] Are there any factors which might induce a socially optimal choice by the decision-maker? First, the possibility of entry exists. We show below that this is unlikely to correct the problem. Second, philanthropy, insofar as its

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[1] John T. Dunlop, "The Capacity of the United States to Provide and Finance Expanding Health Services," Bulletin of the New York Academy of Medicine, 41, December 1965, pp. 1325-37 and Rosenthal, 1966, op.cit.

[2] Cited in Rosenthal, 1966, op.cit., p. 109.

[3] Presumably more prestige comes from advanced capital equipment than additional labor. For figures on the greater capital intensity see Somers and Somers, 1967, op.cit., p. 49.

[4] Ralph E. Berry, Jr., "Competition and Efficiency in the Market for Hospital Services," unpublished Ph.D. dissertation, Department of Economics, Harvard University, 1965, pp. 117ff.

[5] The socially optimal point would be the outcome observed in a market dominated by knowledgeable consumers which functioned so as to satisfy their tastes (assuming the income distribution is optimal).

gifts are for a specific purpose, places a constraint on the point on the tradeoff curve which the decision-maker selects.[1] Unfortunately, the projects for which funds are given are usually those which will increase the quality of the output, whereas, as we have seen, the danger is that the decision-maker will on his own choose too high a quality level. Thus, philanthropy does not help very much either in remedying this defect of the organization of the industry.[2]

The second reason why non-profit status hinders economic efficiency is the barriers to entry which result from it. Consider the possibility of entry by other hospitals. If highly unusual entry conditions existed, the hospital sector might still be considered efficient. Suppose that a hospital would enter if it thought it could undersell hospitals already in the industry, even though it would not make a profit from so doing, since it would set price at average cost. In other words, there would be a number of potential quantity-maximizing hospitals, all of whom would now be outside the industry and so producing a zero quantity. Since they are quantity maximizers, they can better their condition by entering the industry and beginning production. In so doing, they force the price of hospitals already producing down to minimum average cost and force them to produce lower quality products. Mirabile dictu, the non-profit hospital sector would be efficient.

While this type of entry may sound strange, before dismissing it out of hand one should consider what attracts resources into the hospital sector (and other non-profit sectors) now. Evidently it is not the opportunity for profit. Perhaps it is not too wide of the mark to

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[1] After receiving a tied philanthropic gift, the decision-maker is in exactly the same position as a consumer who is given more of one particular good. If the decision-maker was in equilibrium before, he will now be out of equilibrium (assuming all inputs show diminishing returns and there are no discontinuities). If the terms of the gift specify that the decision-maker must use at least the amount of the input given him, he will then use exactly that amount. It is in this sense that his choice is constrained.

[2] In fact, it exacerbates it if gifts are a function of prestige, as they probably are.

suggest that the chance to provide a service will lead some altruistic citizens to try to establish a hospital.[1] This does not appear to be such a far-fetched explanation for the founding of either hospitals or private colleges. They are often started by civic-minded individuals who organize a fund drive.

The problem is whether it is realistic to rely on this type of entry to assure satisfaction of demand and least cost production. For the possibility of entry by other non-profit firms seems to be weak support indeed for the proposition that the hospital sector, left to its own devices, will reach a social optimum. It is one thing to say concern for the common weal is responsible for the establishment of hospitals, but quite another to say that it does so in a manner that we might term optimal.

We have spoken throughout in terms of a decision-maker. Yet the theory of the firm assumes that an entrepreneur, not a decision-maker or an administrator, will seize a profitable opportunity for entry. There is no position in the hospital (or non-profit) sector for an entrepreneur. The entrepreneurs in this case are the civic-minded organizers, but they may not be present when an opportunity for entry exists. This has two consequences. Since there is no mechanism analogous to the possibility of profit which makes the threat of entry credible to existing institutions, there is less of a spur to least cost production. Inefficient, but already established firms may continue to exist. Also, demand must generally be met by existing firms, which means some consumer demands for hospital care may not be met. If the non-profit form of organization is to be retained, there is a need for government policies to promote entry, for example, by continuing tax writeoffs to philanthropists or by providing funds for hospital construction. Even if non-profit status is not retained, the role physicians play in resource allocation may lead to a quality bias.

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[1] "Back in the nineteen-twenties, a group of eight or ten collectors in New York decided (to establish the Museum of Modern Art). . . . . The Metropolitan would not show any so-called modern art. They would not collect it and they would not show it, and one of the reasons the Museum of Modern Art was established was that this otherwise great institution was not ready to move into this field." Nelson A. Rockefeller, "The Governor Lectures on Art," New York Times Magazine, April 9, 1967.

However, there may be mechanisms other than entry by non-profit hospitals for driving average revenue to minimum average cost and for satisfying consumer demands.[1] Suppose hospitals are being operated at an average cost above minimum average cost. An opportunity would exist for the entry of a profit-making firm. Why do we not observe this? That is, why does this sector of the economy continue to be organized primarily on a not-for-profit basis? One possibility is, of course, that hospitals are operating at minimum average cost and consumer demands are satisfied, so there is no opportunity for entry for a profit-making firm. If so, the existence of a profit-making sector keeps the non-profit sector efficient in the same way that a non-union sector may place a constraint on wage changes in the union sector. But this is at best an explanation of why non-profit and profit-making firms might coexist. It does not explain why so very few profit-making hospitals exist.

One possible explanation has been advanced by Arrow.[2] He views the notion of profit in medicine as incompatible with the delegation of choice the consumer makes to the physician; that is, as incompatible with the trust the consumer must have that the physician is deciding solely in the interests of the consumer. Hence, hospitals must be non-profit. This view, while not without some intuitive appeal, does not withstand close scrutiny. The argument about trust, if it is true at all, is only true for medicine. Yet schools and universities, museums, symphony orchestras, and theater groups are also often organized on a non-profit basis. Hence, some explanation of the phenomenon more general than trust must be found. Also, the patient places his trust in the physician. It does not logically follow that the hospital or the medical school must be non-profit. The existence of profit-making firms in medicine--most notably pharmaceutical manufacturers and distributors, but also private laboratories and private nursing homes--tends to indicate that there must be other reasons for hospitals' being

[1] Or at least to a point on the average cost curve if indivisibilities are important.

[2] Kenneth J. Arrow, "Uncertainty and the Welfare Economics of Medical Care," American Economic Review, 53:5, December 1963, pp. 941-73.

non-profit. Thus, we cannot rely on Arrow's hypothesis to explain why we do not observe the entry of profit-making firms.

There are other, simpler explanations. One is merely that it became a tradition or a convention that hospitals were non-profit and this was continued more or less because of inertia. Another is that there are legal barriers to entry for profit-making firms. Another has to do with the subsidies the hospital receives from private philanthropy and its favorable tax status. This permits the hospital some deviation from the minimum average cost of a private firm and hence some scope for inefficiency. The non-profit hospital might be run more inefficiently than a hypothetical profit-making one and yet be able to charge a price equal to or below that of a private firm. The difference in costs would simply be made up by the subsidy. Nor should it be thought that philanthropy is negligible; for all non-federal short-term hospitals in 1964 there was a capital input of $1.68 billion, 38% of which or over $630 million came from philanthropy. The 38% is up from 25% in 1958.[1] The argument here is not that philanthropy directly causes inefficiency, but that it hinders selection of the fittest.[2] Good management is not rewarded, which may explain the persistent calls for strengthening hospital management.[3]

Philanthropy thus has its drawbacks. Perhaps philanthropy's favored tax status should be discontinued. Its existence, which provides some shelter for the non-profit hospital, raises the barriers to entry by profit-making firms.

The analysis up to this point has assumed that the consumer pays his own bill. The increased importance of third party schemes, particularly after the advent of Medicare, makes it important to modify

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[1] Irwin Wolkstein, "Capital Formation in Hospitals," Memorandum, Social Security Administration, February 27, 1967, cited in Somers and Somers, 1967, op.cit., p. 211.

[2] There is some reason to think, however, that operation of the market may not lead to selection of the fittest even under competitive conditions in any simple way. See Sidney G. Winter, Jr., "Economic Natural Selection and the Theory of the Firm," Santa Monica: The RAND Corporation, (P-2167), 1960.

[3] See Somers and Somers, 1967, op.cit., pp. 51-55, 121-126, 247-250, 286-288, among others.

the model to take account of their existence. It should be clear that so long as resources are constrained, the quality-quantity tradeoff is an inherent one; these are simply two "commodities" to which the administrator can allocate his resources. The effect of changing the basis of payment may be merely to alter the location and shape of the tradeoff curve and doing that alters none of the conclusions reached above.

However, simple charge or cost-reimbursement by a third party introduces a further potential inefficiency. Under this system the decision-maker could conceivably push both quality and quantity to the point where the additional utility to him was zero. What would keep him from doing so? To do so would naturally lead to relatively high insurance rates, and this might lower the quantity demanded. (Individuals might not purchase insurance.) Would the decision-maker take account of this effect? If there were many hospitals in one area, any one hospital's contribution to the high insurance rates would be negligible so that no single decision-maker would take account of his contribution to them.[1] Thus, quality may be even higher and quantity lower than all would desire. If rates were based on the experience of a small number of hospitals, the effect each hospital has on insurance rates is more noticeable and so more likely to be taken into account. The growth of hospital planning councils may be viewed as a step to make the large-group case similar to the small-group case.

One implication of the large-group case is that there is no incentive to the decision-maker to minimize cost. In effect, resources are no longer constrained to the individual decision-maker; the tradeoff curve can be shifted out at will. This, of course, is the extreme case; nevertheless, the real world may be quite close to it. Even in this world lower qualities may simply have a negative marginal benefit to the decision-maker and so not be produced. Thus, the "cost-reimbursement" model can generate the same quality bias that the "demand-curve" model shows.

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[1] See Mancur Olson, Jr., The Logic of Collective Action; Cambridge: Harvard University Press, 1965, for an analysis of this phenomenon.

It is now time to summarize the conclusions of this discussion. We have examined ways in which the non-profit status of voluntary hospitals may cause misallocation of resources. First, there is a bias against producing lower quality products (a bias in the sense that a profit-maximizing firm would produce such qualities). Second, there is little reason to think that a non-profit hospital will enter in response to a profitable opportunity (which may exist either because consumer demands are not being satisfied or because inefficient hospitals are providing the product). Philanthropy gives the non-profit hospital some latitude for inefficiency, and this, among other things, tends to forestall entry by profit-making firms. An additional problem exists if the hospital is simply reimbursed by a third party for its costs. By removing the budget constraint, incentives for least cost production are weakened.

Appendix

A MATHEMATICAL FORMULATION OF THE MODEL

We assume there exists a cost function and a demand function: (1) TC = F (Quantity Supplied, Quality Supplied) with both partial first derivatives positive, and (2) Q_d = G (Demand Price, Quality Demanded) with $\frac{\delta Q_d}{\delta \text{ Demand Price}} < 0$ and $\frac{\delta Q_d}{\delta \text{ Quality Demanded}} > 0$. Solving for average cost we get from (1): (3) AC = F/Quantity Supplied = f(Quantity Supplied, Quality Supplied). Solving (2) for the demand price (assuming that is possible) yields: (4) Demand Price = g(Quantity Demanded, Quality Demanded). We have in equilibrium two market clearing equations: (5) Quantity Supplied = Quantity Demanded and (6) Quality Supplied = Quality Demanded. Finally we have the behavioral assumption: (7) Supply Price = AC = Demand Price.[1] Using (3), (4), (5), (6) and (7) and eliminating the price and cost variables we get in equilibrium: (8) Quality = h(quantity). This is the tradeoff curve depicted in Figure 3. It bends back after some quantity and quality level is reached, if the following is true of the second derivatives of (1) and (2):[2]

$$\frac{\delta^2 TC}{\delta \text{ Quantity}^2} > 0; \qquad \frac{\delta^2 TC}{\delta^2 \text{Quality}^2} > 0; \qquad \frac{\delta^2 TC}{\delta \text{ Quality } \delta \text{ Quantity}} = 0;$$

$$\frac{\delta^2 Q_d}{\delta \text{ Price}^2} \gtrless 0; \qquad \frac{\delta^2 Q_d}{\delta \text{ Quality}^2} < 0; \qquad \frac{\delta^2 Q_d}{\delta \text{ Quality } \delta \text{ Price}} = 0.$$

Furthermore, we postulate a preference function for the decision-maker: (9) U = U (Quality, Quantity) with both first derivatives positive. We can derive indifference curves in the usual fashion by taking the total differential, setting it equal to zero, and solving. We get (10): $\frac{dq_2}{dq_1} = -\frac{U_1}{U_2}$ where 1 and 2 are quantity and quality respectively,

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[1] If there is a subsidy, this becomes: (7) Supply Price = AC and (7') (Supply Price - Demand Price) (Quantity Supplied) = Subsidy.

[2] These assumptions are stronger than are actually necessary.

and where U_1 and U_2 are the partials of U with respect to 1 and 2. We assume

$\frac{d^2 q_2}{dq_1^2} > 0$, so that the indifference curves

are convex in the usual way. The decision-maker then maximizes: (11) V = U (Quality, Quantity) + λ (Quality - h(Quantity)), where λ is an undetermined LaGrangean multiplier. Differentiating with respect to the three variables and setting the results equal to zero we get:

(12) $\frac{\delta V}{\delta \text{ Quality}} = \frac{\delta U}{\delta \text{ Quality}} + \lambda = 0.$

(13) $\frac{\delta V}{\delta \text{ Quantity}} = \frac{\delta U}{\delta \text{ Quantity}} - \lambda \frac{\delta h}{\delta \text{ Quantity}} = 0.$

(14) $\frac{\delta V}{\delta \lambda} = \text{Quality} - h(\text{Quantity}) = 0.$

Transposing in (12) and (13), we get, (15): $\frac{\delta U}{\delta \text{ Quality}} = -\lambda$

and (16): $\frac{\delta U}{\delta \text{ Quantity}} = \lambda \frac{\delta h}{\delta \text{ Quantity}}$. Dividing (16) by (15) and multiplying by -1 yields (17):

$$- \frac{\delta U}{\delta \text{ Quantity}} \Big/ \frac{\delta U}{\delta \text{ Quality}} = \frac{\delta h}{\delta \text{ Quantity}} .$$

We know from (10) that the left side of (17) is the slope of the indifference curve. The right hand side is the slope of the tradeoff curve since it is the first derivative of (8); thus, mathematics confirms the graphical result.