ALTRUISM, RIVALRY AND CROWDING-OUT IN THE NONPROFIT FIRM'S SUPPLY OF CHARITY SERVICES: THE CASE OF HOSPITALS

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ABSTRACT

This paper extends previous research on individuals' supply of charitable donations to the behavior of nonprofit firms. Specifically, we study provision of charity care by private, nonprofit hospitals. We demonstrate that in the absence of large positive income effects on charity care supply, convex preferences for the nonprofit hospital imply crowding out by other private or government hospitals. Extending our model to include patient heterogeneity and impure altruism (rivalry) provides a possible explanation for the previously reported empirical result that both crowding out and income effects on indigent care supply are often weak or insignificant. Empirical analysis of data for hospitals in Maryland provides strong evidence of rivalry on the supply of outpatient plus inpatient charity care, but not when the analysis is confined to inpatient care.

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"The giver is a man of influence and prestige, and the more he can give away, the greater his largesse, the larger he will loom among his peers"

Michael Walzer
Spheres of Justice, p. 125

I. Introduction

The extent to which government expenditure on human services "crowds out" private charitable activity has received considerable attention in the theoretical and empirical literatures (Roberts 1984, Steinberg 1987, Warr 1982, Abrams and Schmitz 1984, 1986, Arcelus and Levine 1986, Weisbrod 1988). The point of departure for most theoretical work is the household's decision to make a donation to a privately owned producer of a public good (Steinberg 1987 and Rose-Ackerman 1987). A typical specification of the household's preferences assumes "altruistic" motives. That is, the household is assumed to only derive utility from the total amount of the public good provided regardless of the source. Empirical studies of crowding out have tended to obtain results that show weaker effects of governmental activity on the level of private production of the public good than is predicted by models based on purely altruistic motivations. Recent efforts to model the crowding-out phenomenon have therefore focused on what has been referred to as "impure altruism" as a characterization of household preferences. Impure altruism is viewed in terms of the private benefits obtained from donations or "the warm glow of giving" (Andreoni 1988). It has also been proposed that heterogeneity in the recipient population may influence the impact of public expenditures on private provision of public goods (Weisbrod 1988, p. 106), and thereby may serve to explain the weak crowding out effects reported in empirical studies. This possibility has yet to receive formal treatment in the literature.

Since much of the work on charitable donations has focused on households and the impact of government expenditures on household donation decisions, little has been written regarding the relationship between private donors. If, however, one is concerned with donations of services by privately owned nonprofit firms, the possible influence of one firm's donations on another becomes a relevant concern. Charitable activities may either be motivated by pure altruism of the firms' managers and trustees or by the perceived advantages to be gained from doing more "good" than one's competitors. Pure altruism implies private crowding out, while competitive concerns, referred to below as rivalry, may produce results more analogous to impure altruism.

In the research presented here, we model the supply of charity services by a nonprofit firm and examine altruistic, rivalrous, and crowding-out influences on this supply. The specific focus for our study is the supply of services by nonprofit hospitals to the poor and uninsured. By almost any economic measure, nonprofit hospitals are the most important type of nonprofit firm in our economy. Figures presented by Weisbrod (1988, pp. 179-181) indicate that these hospitals account for more than 40 per cent of all employees and more than 45 per cent of all expenses among tax-exempt service firms in 1977. Moreover, several important characteristics of nonprofit hospitals, such as the importance of sales as a revenue source and the modest role played by grants and donations, are also shared by other major groups of nonprofit firms such as educational institutions and nursing and personal care facilities (Weisbrod, 1988, p. 76). One can hope, therefore, that studies of nonprofit hospital behavior generate insights of some significance for nonprofit firms generally.

We study the provision of charity services within several related theoretical contexts. First, we consider the case of pure altruism where crowding-out can result from charity-care provision either by publicly-owned hospitals or by other nonprofit facilities. Second, we examine the rivalry case in which a nonprofit hospital cares whether other nonprofits are providing charity services that may increase their public goodwill.[1] In this case, while crowding out can occur from government activity, the nonprofit hospital's own charity care supply may be increased when other nonprofits provide more charity care. The third case we consider involves purely altruistic motives and a heterogeneous population of indigent patients along with the constraint that public hospitals predominantly serve the least desirable indigents. This case formalizes the suggested connection (noted above) between heterogeneity in the populations served by nonprofit vs. public providers and the weak empirical estimates of crowding out effects.

Following our analyses of these theoretical models, the paper reviews evidence on the key hypotheses reported in the literature. We then present an empirical application of the model using data on hospitals from the State of Maryland. The concluding section comments on directions for future research and implications of our findings for policy.

II. Comparative Statics Analysis of a Model of Provision of Indigent Care

A. The Basic Model

Our point of departure is a price-taking private nonprofit hospital operating in a market with other private as well as public hospitals. Hospitals may be viewed as price-takers if their rates are regulated (as

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[1]This is analogous to Andreoni's (1988) view of impure altruism. The hospital pursues self interest in making donations to alleviate the public bad.

they are in several states), if prices are set by one or two dominant insurers,[2] or if the local market in which they function is competitive. We also allow for the possibility that the hospital receives a subsidy payment from the government for providing care to the indigent based on the volume of such care provided; we assume the per unit amount of this subsidy is below both marginal cost and the price paid by non-indigent patients so that the provision of this care represents a "charitable contribution" on the part of the hospital.

The hospital is assumed to maximize an objective function

(1) $U = U(R, N)$

whose two arguments are net revenue (R) and the amount of need of the indigent that is unmet (N), and where $U_R > 0$ and $U_N < 0$. The disutility associated with N indicates that nonprofit hospitals are concerned with a "public bad", unmet need for hospital care. We refer to this formulation of the objective function as purely altruistic in N because the hospital cares only about the amount of unmet need in the community regardless of which hospital gets "credit" for serving the indigents and thereby reducing unmet need.

Hospital net revenue is defined as the sum of endowment income (E) plus revenues from providing services, $PQ + rD$, where P is the fixed price, Q is the number of paying patients, D is the number of indigent patients, and r is the subsidy per indigent patient (where $0 \leq r \leq P$). The hospital's cost

[2]The degree of market power possessed by apparently dominant private insurers has been questioned in the recent literature on the ground that entry barriers in the health insurance market are quite low (Staten, Umbeck and Dunkelberg, 1987 and 1988); however, this contention has been disputed (Pauly, 1987). Large public insurers (Medicare and Medicaid) obviously have considerable discretion in setting fee levels.

function is C = C(Q+D). Thus, net revenue (R) is defined as:

(2) $R = PQ + rD + E - C(Q + D)$.

The inclusion of net revenue as an argument in the nonprofit firm's objective function may seem odd in view of the non-distribution constraint under which these firms operate. A number of recent studies, however, point out that "profits" earned in one activity can be spent by nonprofit firms to pursue other objectives of the management and/or trustees (Hansmann, 1980; James, 1983; Danzon, 1982; Clark, 1980; Pauly, 1987). These other objectives might include personal gain from management "perks" (e.g., higher salaries, thicker carpets), assuring the future survival of the firm by accumulating assets, or doing "good works" in the community. Further support for inclusion of R as an argument of the objective function comes from empirical studies of nonprofit hospitals which generally report at most only modest differences in behavior between for-profit and nonprofit facilities (Pauly, 1987; Sloan, 1988). The foregoing suggests that as an argument of U, R may be viewed as a composite "commodity" representing "profits" spent on all "goods" (as perceived by the firm's managers and/or trustees) other than reduction of indigent care need (N). While acquiring these other "goods" may entail expenses on the part of the firm, such expenses are not included in C(Q+D).[3]

The level of unmet need (N) is equal to the total community indigent care need (T) minus the levels of indigent care provided by various types of hospitals. Letting D, H and G respectively denote the number of indigent persons served by the hospital in question, other private hospitals and

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[3]The reader should note that some models of nonprofit behavior do not include R in the objective function. A re-forumlation of our analysis to incorporate this view is presented in Section II.E below.

public hospitals we define:

$$(3)\ N = T - D - H - G.$$

We assume that the hospital can sell as much Q as it chooses at the fixed price P. We further assume excess demand for D, and we employ the Cournot assumption that the hospital ignores any impact of its own supply of indigent care (D) on the amount supplied by other nonprofit hospitals (H). The hospital is assumed to choose the levels of Q and D so as to maximize its objective function. Substituting equations (3) and (2) into (1) allows us to rewrite the objective function as:

$$(1')\quad U = U\,[(PQ + rD + E - C(Q+D)),\ (T-D-H-G)].$$

The first order conditions for a maximum with respect to D and Q are:

$$(4)\ U_D = U_R \cdot [r-C_D] - U_N = 0$$

$$(5)\ U_Q = U_R \cdot [P-C_Q] = 0$$

Equation (4) indicates that at the optimum the hospital will admit indigent patients up to the point where the financial loss is just balanced, in utility terms, by the marginal reduction of unmet indigent care need in the community. Equation (5) indicates that price equals marginal cost at the optimum.

The hospital's choice problem can also be depicted as a constrained maximization involving the choice of R and N. The equilibrium solution for this problem is illustrated in Figure 1. One hospital indifference curve is represented by II. The OO curve is the boundary of the opportunity set of combinations of R and N. Each point on OO is derived by finding the level of Q which maximizes R given each level of N. The first order condition for this maximum is $P = C_Q(Q+T-H-G-N)$ which may be solved for the optimal level of Q as a function of P, T, N, H and G. Substitution of this function for Q in the net revenue identity (equation (2)) yields the equation for OO. Assuming convexity for II and concavity for OO (which holds for $C_{QQ}>0$), an interior solution to the maximization will occur at a tangency point such as A.

Returning to the previous formulation of choosing Q and D, we note that the second order conditions for maximization of U are: $U_{QQ}<0$, $U_{DD}<0$ and $U_{QQ} U_{DD}-U_{DQ}^2>0$. These conditions are satisfied when:

(6) $U_{NN} - 2[r-C_D]\ U_{NR} + [r-C_D]^2\ U_{RR}<0$

Inequality (6) follows from the convexity of the indifference curves of U(R,N) and first order condition (4) above. It would also be implied by the more restrictive assumptions that U(R,N) is strongly separable (i.e., $U_{NR} = 0$) and that U_{RR} and $U_{NN}<0$.

The hospital's optimum tangency point, in Figure 1, will depend on the value of the exogenous variables P, r, E, T, H and G; as the values of these variables change, the position of OO will shift. (This would also be the case for exogenous changes in input prices that would appear in a fully-specified cost function). Our main interest is in the effects of changes in the exogenous variables on the optimal level of D, the supply of care to the indigent by the hospital. Expressions for these effects derived by differentiation of the first order conditions (4) and (5) are shown in Table 1.

Equation (7) shows the pure income effect while equations (8) and (9) are directly analogous to Slutsky consumer demand equations. In each case the first term on the right hand side is an income effect, while the second is a substitution effect. The latter is positive in equation (8) and negative in equation (9) since $|J|>0$ and $C_{DD}>0$ are implied by concavity of the OO locus and inequality (6). While the magnitude of the two substitution effects are the same, note that the income effect is presumably larger in (9) because Q is likely to be much larger than D. Hence, if the income effect is positive, increases in P are likely to increase the hospital's supply of indigent care unless the negative substitution effect is very strong.

Equation (10) allows us to examine the conditions under which government care "crowds-out" private indigent care. Assuming strong separability ($U_{RN}=0$) and $U_{NN}<0$ will guarantee crowding-out (i.e.:, $dD/dG<0$). In the absence of these restrictions on U, we can still use inequality (6) to derive the following relationship between the crowding out and income effects:

(11) $- dD/dG - [r-C_D] \cdot dD/dE>0$

Inequality (11) shows that if the income effect is negative, zero or positive but relatively small, crowding out will occur. Only a large positive income effect is inconsistent with crowding out.

B. Rivalry and Private Crowding Out

In our purely altruistic model with homogeneous patients, increases in the supply of charity care by other private hospitals (H), has the same "crowding out" effect on D as does increases in G. If the hospital "competes" with other private hospitals for public goodwill by providing charity care, its preferences over feasible combinations of Q and D may depend upon the level of H. This can be incorporated in our model by introducing a third argument into the utility function Z, which measures the hospital's performance in supplying charity care relative to its rivals. Formally, we expand the utility function in (1′) to

(1") $U = \{[PQ+rD-C(Q+D)],(T-D-H-G),Z(D,H)\}$

where $U_Z>0$, $Z_D>0$ and $Z_H<0$. Differentiating the first-order conditions and solving for dD/dM yields

$$(10') \qquad \frac{dD}{dH} = \frac{U_R C_{DD}[U_{RN}(P-r)+U_{NN}]}{|J|}$$

$$+ \frac{U_R C_{DD}\{U_{RZ}Z_H(r-P)+U_{ZZ}Z_H Z_D-U_{NZ}(Z_H+Z_D)+U_Z Z_{DH}\}}{|J|} \quad .$$

The numerator of the first fraction is the numerator for dD/dG (and dD/dH) in (10) above. The second fraction cannot be signed in the general case; however, assuming $U_{ZZ}<0$ and non-negative cross-partials of U implies that the second term is positive provided that $(Z_H+Z_D)\leq 0$ and $Z_{DH}\geq 0$. This would be so for the simple case where Z=(D-H). This case, at least, provides an example of how adding a rivalry motivation can increase dD/dH and thus diminish the extent of private crowding-out.

C. Crowding-Out and Heterogeneous Patients

We now relax the assumption of indigent patient homogeneity by allowing for two types of patients that differ in the cost of treatment. We redefine the population of medically indigent as:

(12) $T = T_1 + T_2$

where T_1 are the more desirable (less costly) indigent patients, and T_2 are the less desirable (more costly) indigent patients. It is further assumed that public hospitals serve only the least desirable indigents but that not all such patients are served by the public hospitals (i.e., $G<T_2$). We can therefore define the probability that an indigent patient seeking care from a nonprofit hospital will be from the undesirable (T_2) group as

(13) $d = (T_2 - G)/[T_1 + T_2 - G]$.

This probability depends upon the quantity of medically indigent services provided by public providers (G).

This formulation is consistent with the observed role of public hospitals as a provider of last resort to the most disadvantaged population groups. It suggests that one way in which public hospitals affect nonprofits' willingness to supply indigent care is by reducing the latter's cost for serving indigents. We represent this formally by rewriting the cost function as:

(14) $C = C[Q, D, d(G)]$.

Using this cost function to obtain C_Q and C_D in the first order conditions (4) and (5), we derive the following expression for the displacement of the equilibrium value of D as G changes:

(15) $$dD^*/dG = \frac{U_R C_{QQ} U_{RN}[C_D - r] + U_R C_{QQ} U_{NN}}{|J|} - \frac{\{U_R C_{QQ} C_G [U_{RR}\, [r - C_D] - U_{RN}]\}}{|J|} + \frac{U_R^2 (C_{QG} C_{QD} - C_{QQ} C_{DG})}{|J|}.$$

To examine the impact on crowding out of introducing patient heterogeneity, we rewrite (15) as:

(15') $dD^*/dG = dD/dG - C_G(dD/dE) + U_R^2(C_{QG}C_{QD} - C_{QQ}C_{DG})/|J|$.

Equation (15') states that dD^*/dG consists of the original expression for dD/dG in equation (10) minus the product of C_G and the income effect (dD/dE) plus the expression $U_R^2(C_{QG}C_{QD} - C_{QQ}C_{DG})$. We know that $dD/dG<0$ (unless dD/dE is very large and positive), dD/dE is expected to be positive and C_G

will be negative since equation (13) shows that d decreases when G increases. Thus the second term in (15′) will be positive. The third term will be positive if the following condition holds:

(16) $(C_{QG}/C_{DG}) > (C_{QQ}/C_{DQ})$.

This states that the impact of a change in G on the ratio of the marginal costs of Q and D has to be greater than that resulting from a change in Q. This is certainly plausible since an increase in G is assumed to have a direct and negative impact on the costliness of indigent patients which should increase C_Q <u>relative</u> to C_D. If inequality (16) is assumed to hold then both the second and third terms of (15′) will be positive; in this case, we can say unambiguously that introducing indigent patient heterogeneity diminishes crowding out.

D. <u>Alternative Assumptions Regarding Determination of Q</u>

Thus far we have assumed that P is exogenous to the hospital and that the hospital may choose a utility-maximizing level of Q. These assumptions are consistent with competitive market conditions or with the situation of a regulated firm facing excess demand. Since the number of firms in many local hospital markets is very small, and since the rate of capacity utilization of nonprofit hospitals has dropped markedly in the last several years, the reformulation of our model to apply to circumstances other than perfect competition or excess demand is of interest.[4] We have examined the properties of our model (maintaining the assumption of exogenous P) under two alternative assumptions about demand conditions: (1) that Q is

[4]The equivalent of an excess demand situation would also arise if the hospital (and its medical staff) could "create demand" costlessly by recommending to additional prospective patients that they be admitted for treatment. We do not regard such an extreme assumption about malleability of consumer demands as plausible.

determined exogenously and (2) that the hospital influences the demand for its services by non-price competition. Exogenous determination of Q (as well as P) corresponds to the situation of a regulated utility that provides service to all who request it. Models with exogenous P and endogenous determination of Q based on non-price competition have previously been applied to regulated industries with multiple sellers such as airlines (White, 1972; Douglas and Miller, 1974) and hospitals (Allen and Gertler 1987).

With exogenous Q, the hospital's only remaining choice variable is D and the only relevant first-order condition is equation (4). Inequalities (6), (11) and equation (10) are unchanged, however, so our previous analysis of crowding out and rivalry still applies. The analysis of indigent patient heterogeneity is modified slightly; in equation (15′) the third term on the right side becomes $U_R C_{DG}/U_{DD}$, which is clearly positive since both C_{DG} and U_{DD} are negative. Thus, the dilution of crowding out caused by indigent patient heterogeneity is also unambiguous in this model.[5]

Non-price competition can be introduced into the model by letting Q be a function of service "quality" (q), rewriting the cost function as C(Q+D,q), and assuming that the hospital maximizes U(R,N) by choosing optimal values of q and D. In this case, concavity of the OO locus requires that $M_q<0$ (where M is defined as the marginal net revenue of q, that is, $[PQ_q-C_QQ_q-C_q]$). Comparative statics results with respect to crowding out and rivalry in inequality (11) and equation (10′) still hold as stated. Again the analysis of indigent patient heterogeneity changes slightly; the

[5]Another comparative statics result which changes when Q is exogenous is equation (9). With no substitution possible, dD/dP becomes a pure income effect.

numerator of the third term on the right side of equation (15′) becomes $U_R^2[(C_{QG}Q_q+C_{qG})(C_{QD}Q_q+C_{qD})-M_qC_{DG}]$ so inequality (16) becomes

(16′) $[(C_{QG}Q_q+C_{qG})/C_{DG}]>[M_q/(C_{QD}Q_q+C_{qD})]$.

This holds when the impact of a change in G on the ratio of marginal costs of q and D is greater than the impact of a change in q on the ratio of the marginal revenue of q to the marginal cost of D.[6]

E. Behavior with A Break-Even Constraint

An alternative approach to modelling the behavior of nonprofit firms which is common in the literature is to assume utility maximization subject to a maximum loss, maximum profit, or break-even constraint (e.g., Rose-Ackerman, 1987). In the literature on nonprofit hospitals, this concept was articulated by several writers in the mid-1960's (Klarman, 1965, p.121; Long and Feldstein, 1967; Reder, 1965) and a formal model was first presented by Rice (1966). Proposed arguments of the hospital's utility function have included output (Long, 1964; Rice, 1966; Clark, 1980), weighted output (Reder, 1965) and both output and quality (Newhouse, 1970; Feldstein, 1971).[7]

To examine the applicability of our own results to this type of model, we replaced U(R,N) with U(Q,N) and imposed the constraint that R=0. Comparative statics analysis yielded conclusions with respect to crowding out and rivalry that again were identical to those stated in (11) and (10′) above. In the case of patient heterogeneity, the numerator of the third

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[6]Note that Slutsky expressions for dD/dP and dD/dr are obtained in this case; unlike equations (8) and (9), however, the two substitution effects are not exactly equal in magnitude.

[7]An excellent recent review of the literature on hospital behavioral models is given in Rosko and Broyles (1988, Chapter 4).

term on the right side of (15′) will be positive when $(r-C_D)/(P-C_Q) < C_{DG}/C_{QG}$. The left side of the inequality is the ratio of the (negative) net revenues for an additional indigent patient versus an additional paying patient. This will presumably exceed 1.0 since $r<P$; it may, however, still be less than the ratio on the right side if an increase in G has only a very small (negative) effect on the marginal cost of paying patients. Moreover, since the second term on the right side of (15′) will be positive as long as dD/dE is positive, the possibility that patient heterogeneity will dilute an otherwise negative crowding out effect is still present in the break-even model.[8]

III. Evidence to Date on Key Hypotheses

While no previous empirical studies have directly tested the model set forth above, two recent studies present results which are related to the propositions put forth in our theoretical discussion. Thorpe and Phelps (1988) use data from private nonprofit hospitals in the State of New York to estimate the impact of a program to subsidize provision of indigent care by hospitals. Using audited financial statements of hospitals for the years 1981 to 1984 as well as county population characteristics and county hospital market structure information, they estimate the subsidy price impact on the volume of uncompensated care supplied (dD/dr above) and the income effect (dD/dE above) . The results show a positive and significant subsidy price elasticity of 0.17 while their estimated income effect was not significantly different from zero. Coefficient estimates for several additional variables used by Thorpe and Phelps may be related to crowding

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[8]With this model, the substitution term in dD/dr is equal to $-(P-C_Q)/(r-C_D)$ times the substitution term in dD/dP.

out phenomena. The share of total hospital discharges in the county that are accounted for by public hospitals yielded a negative coefficient (suggesting crowding out by public hospitals) but its significance level varied somewhat with the estimation technique employed. A market stucture variable (the county-level Herfindahl index based on numbers of hospital discharges) yielded a positive coefficient with significance levels again varying by estimation method. This result could be interpreted as providing indirect support for private crowding out since it is not based on a measure of the actual levels of charity care.

Sloan, Morrissey and Valvona (1988) analyzed the volume of "self-pay" patients served by hospitals in selected years between 1980 and 1985. Explanatory variables in their regression models included hospital characteristics (e.g. ownership and teaching status) and county characteristics (employment, Medicaid enrollment, and hospital market structure). The models that were estimated, using the hospital as the unit of analysis, provide some evidence relating to public and private crowding-out effects (dD/dG and dD/dH). The authors reported a significantly negative coefficient for a binary variable indicating the presence of an "other public hospital" in the county. In contrast, a binary variable indicating that a hospital was the "only hospital in a county" showed no significant effect on the percentage of self-pay discharges, although its estimated coefficient was positive. These results provide some support for the existence of public hospital crowding-out but not for the existence of either private crowding out or rivalry.

IV. Empirical Application

A. Methods

To illustrate the empirical application of our model, we present an analysis of annual data for 40 voluntary general acute care hospitals in Maryland spanning the years 1980 - 1984.[9] Regression analyses were carried out with two different dependent variables: the number of equivalent admissions accounted for by uncompensated care in the hospital (UCEQUA) and the number of discharges of inpatients classified at admission as either self-pay or charity cases (SPCDIS). The first of these variables was calculated by dividing the dollar amount of uncompensated care by the hospital's gross inpatient revenue per admission. Note that it includes both inpatient and outpatient services. Recent data from New York (Thorpe, 1987) and New Jersey (State of New Jersey, 1988) show that outpatient services account for about one-third of all uncompensated care dollars.[10]

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[9] In the hospital field, private nonprofit institutions are referred to as "voluntary." The classification of hospitals as voluntary was based on information published by the American Hospital Association in its annual Guide to the Health Care Field. Some general acute care hospitals classified as voluntary during at least one year of the study period were excluded from our study sample because they were major teaching hospitals (Johns Hopkins, Francis Scott Key, and University of Maryland) or because they were newly opened or changed ownership status to voluntary during the period (Shady Grove Adventist, Memorial of Cumberland, Wyman Park, Greater Laurel, Prince Georges).

[10] Uncompensated care expenses include both bad debts and charity care expenses. Distinctions between bad debts and charity care, however, are difficult to draw. In deciding to provide services to uninsured individuals, hospitals presumably realize there is a high probability these individuals will not be able to pay their bills. Once the services are rendered, hospitals vary in the extent to which they seek payment from these persons. Thus, hospital billing policies may tend to determine the shares of bad debt and charity care in total uncompensated care, while their policies about rendering care are more important determinants of the total amount of uncompensated care. Since our model focuses on decisions to render care rather than billing policies, the distinction between bad debt and charity care is not used.

The second dependent variable only pertains to inpatients. It probably overstates somewhat the number of inpatients who are uninsured since some of these patients will qualify for Medicaid eligibility after they have been admitted.

To measure crowding out and rivalry effects, we constructed explanatory variables, analogous to our dependent variables, which measured the provision of uncompensated care in the same county by (1) other voluntary hospitals (OVUCEQUA, OVSPCDIS), (2) for-profit hospitals (FPUCEQUA, FPSPCDIS), and (3) public hospitals (PUBUCEQUA, PUBSPCDIS).[11] We differentiated by ownership to allow for the possibility that voluntary hospitals react differently to charity-care-supply decisions of their voluntary vs. for-profit vs. public competitors. Our ability to detect such differences in reactions is limited by our data however. Only three of the 21 counties in which hospitals were located in fact had any public hospital

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[11]In computing values for these variables, note that the county totals included equivalent admissions and discharges for the excluded hospitals listed in footnote 9 above. Also note that the Baltimore City voluntary hospital totals included data for the Johns Hopkins Oncology Center, the Maryland Institute for Emergency Medical Services, the University of Maryland Cancer Center, and three other specialty hospitals (Children's, Kernan, and Mount Washington). Figures for Prince Georges General and Greater Laurel were included in the public hospital totals for Prince Georges County for all years, even though these hospitals were classified by the American Hospital Association as voluntary in 1983 and 1984, because the county government directly controlled the boards of these facilities.

One might argue that OVUCEQUA and OVSPCDIS are not exogenous since the influence of random disturbances on UCEQUA and SPCDIS will induce reactions in other hospitals and thereby influence OVUCEQUA and OVSPCDIS. The frequency distribution of hospitals by county, however, leads us to expect that the extent of any resulting simultaneity bias is fairly small. More specifically, note that sixteen hospitals had no other study hospital in their counties, only four hospitals had one other study hospital in their county, and the remaining twenty study hospitals had at least three other study hospitals in their county.

beds and only two counties had any for-profit hospital beds.[12] Since the precision of the coefficient estimates for the public and for-profit charity-care-supply variables was expected to be low, we also estimated regressions in which a single set of charity-care-supply variables (aggregated across ownership categories) was included (ALLUCEQUA and ALLSPCDIS). In addition, some regressions were run with a dummy variable indicating that a hospital was the only one in its county (ONLYHOS).

Three variables were included as proxies for the level of need (T): the estimated number of persons with no public or private health insurance coverage (NOINS),[13] the number of births to residents of the county (RBIRTHS), and the number of deaths in the county due to external causes (accidents, homicide, etc.) (EXDEAD). The rationale for including RBIRTHS and EXDEAD is that obstetrical deliveries and accident cases account for a very large fraction of inpatient admissions of self-pay and charity cases; one recent estimate puts this fraction at about one half (Sloan, Valvona, and Mullner, 1986). The applicability of this fact to Maryland may be questioned, however, on several grounds. First, Maryland law mandates

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[12]The counties with public beds were Prince Georges, Allegany (in 1980 and 1981), and Baltimore City. Harford and Prince Georges were the only counties with for-profit hospital beds.

[13]To compute NOINS, we first subtracted the number of persons over 65 and the number of under-65 SSI, AFDC, and general assistance recipients in the county from the total population on the assumption that these persons were virtually all covered by Medicare or Medicaid. For Baltimore City, we then used data from the 1980, 1982, and 1984 Health Interview Surveys to estimate the number of persons under 65 with private health insurance coverage. (Interpolation was used for 1981 and 1983.) Subtracting this figure from the result of our first step yielded the value of NOINS in each study year. For other counties, the number of persons under 65 with private insurance was estimated based on insurance coverage regressions run on the Health Interview Survey data. (Details of these regression calculations are available from the authors.)

coverage of maternity services under private health insurance plans. Second, the Maryland Medicaid program includes coverage of first-time pregnant women who fall within the program's income limits. These two factors would tend to create a negative relationship between RBIRTHS and T.

Accurate measurement of endowment income is complicated by a variety of factors, including the existence of multiple endowment funds (some for specialized purposes) and the varying formats used by hospitals to report financial data. Since E could not be measured directly, two proxies were used: median household income in the county (HHINC) and net non-operating income of the hospital (NNINC). The price paid by paying patients (P) was measured by gross patient revenue per equivalent admission (GPREQUA); note that this slightly overstates the average price figure since some patients (such as those covered by Blue Cross insurance) receive discounts. The subsidy for indigent patients was assumed to be zero for all hospitals. In the Maryland rate-setting system, full rate reviews were conducted during the latter half of the 1970's and hospitals' actual bad debt and charity costs were included in the resulting rate computations. Once the rates were set, however, they were simply trended forward for inflation and no further recomputation based on hospitals' actual charity and bad debt experience took place in most instances. In the latter part of our study period, a small number of hospitals petitioned for special rate increases as their bad debt and charity costs grew but there was no formal policy of granting these requests. Thus, as a first approximation for our study period, it seems reasonable to view the hospitals as bearing the full costs of any indigent care which they rendered. In general, these costs could not be passed through in the form of higher rates allowed by the rate-setting commission

(Maryland Health Services Cost Review Commission, 1984).

To control for variations in cost conditions among hospitals, we include the hospital's average wage plus fringe benefit cost per hour for general duty nurses (RNCOST). For several reasons, we also included the number of beds (BEDS) in the hospital as an explanatory variable. First, the size of the hospital presumably affects the shape of C( ); at any given level of output, the rate of increase of marginal cost is presumably lower for hospitals with a larger capital stock (as proxied by the number of beds). Second, one might argue that bed size affects the hospital's preferences; for example, larger hospitals may be more visible in the community and therefore may feel more of a responsibility to concern themselves with reducing N. To allow for differences in preferences of teaching and non-teaching hospitals, we included a teaching dummy (TEACH) to denote the hospitals that operated one or more residency programs approved by the American Medical Association. Finally, to allow for other changes over time not captured by our explanatory variables (e.g., increases in the deductible and coinsurance liabilities of insured persons), we included either a time trend (TIME) or separate intercepts for each of the study years.

Regression models were estimated with the Fuller-Battese (1974) variance components procedure and with ordinary least-squares (OLS) including individual hospital intercepts. The latter is less efficient (in that no information from cross-sectional variation is used in estimating slope coefficients) but it is also less subject to omitted-variables bias. All continuous dependent and most explanatory variables were included in the regressions in logarithmic form. Since the charity-care-supply variables and

NNINC take on zero values in some cases, they were entered in linear form.

B. Results

Regression results for uncompensated care equivalent admissions are shown in Table 2. Regressions 1 - 4, 6, and 7 include TIME while Regression 8 includes individual year dummies. Regressions 3 and 7 are OLS variants of Regressions 2 and 6 respectively.

Several features of these results are quite stable across a variety of specifications and our two different estimation methods. First, the coefficient of the variable describing uncompensated care volume at other voluntary hospitals (OVUCEQUA) is strongly positive, suggesting that rivalry effects dominate crowding-out effects. Evaluated at the mean value for OVUCEQUA of 3,850, the coefficient values imply an increase of about 0.25 equivalent admissions for every additional admission in another voluntary hospital. Coefficients for the for-profit and public hospitals do not support either crowding-out or rivalry effects. Aggregation across ownership types (in Regressions 6 and 7) yields a somewhat smaller but still highly significant positive coefficient for ALLUCEQUA. On the other hand, the coefficient of the dummy for the only hospital in the county (ONLYHOS) does provide weak support for the crowding out notion. The coefficient (in Regression 4) is positive and implies that uncompensated care equivalent admissions are roughly 30 per cent higher when no other hospitals are located in the county, but this effect is not significant at conventional levels.

Results for the price variable (GPREQUA) are consistent with the existence of a strong substitution effect and a relatively weak income effect; as noted above, Thorpe and Phelps (1988) reported similar results.

On the other hand, more direct evidence on the income effect is contradictory. While NNINC is clearly not significant, the results for HHINC suggest a fairly strong positive income effect; but this would also imply a significantly negative coefficient for the wage variable (RNCOST) when, in fact, this variable's coefficient is insignificantly positive. The variables intended to proxy for the level of total indigent care need (RBIRTHS, EXDEAD, and NOINS) would be expected to have positive coefficients based on our theoretical model. In fact, only the EXDEAD coefficient is occasionally (and weakly) positive; the reasons for the significantly negative coefficients for RBIRTHS are not clear but the mandated benefits and Medicaid eligibility rules noted above may be relevant to this finding.

Coefficients for BEDS (particularly in the variance-components regressions) imply that a hospital's supply of indigent care increases roughly in proportion to its bed size. On the other hand, the presence of a teaching program tends to reduce the hospital's indigent care supply. (Bear in mind though that three major teaching hospitals were excluded from the study sample.)

Results obtained when our measure of indigent care supply includes only inpatient services (SPCDIS) are shown in Table 3. These results do not show that rivalry effects outweigh crowding-out.[14] The supply of indigent care by other voluntary hospitals tends to reduce the individual hospital's supply though the magnitude of the effect is small and its significance

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[14]Values of SPCDIS were missing for four data points (Provident Hospital in 1980, Church Hospital in 1983, and Suburban Hospital in 1982 and 1983). The effects of these missing values on our coefficient estimates were eliminated by including dummies for each of these four data points. Estimated values of SPCDIS were also computed for these data points in order to compute the corresponding values of OVSPCDIS.

varies by estimation method. (Evaluated at the mean, each additional admission in other voluntary hospitals reduces the individual hospital's supply by about 0.15 admissions.) Effects of the corresponding for-profit and public hospital variables are again insignificant, though this may be largely due to the data limitations noted above. Aggregating across ownership types (in Regressions 6 and 7) yields slightly smaller crowding out effects. Deletion of the TIME trend and use of OLS with individual hospital dummies reduce the significance of the crowding-out effects considerably (Regressions 3, 5, and 7). The positive coefficient for ONLYHOS is larger and more significant than in Table 2. Results for GPREQUA again suggest a strong substitution effect and a weak income effect. Results for RNCOST and HHINC actually suggest a negative income effect though this interpretation seems implausible. (Note that the negative HHINC coefficients are not significant; moreover, HHINC measured at the county level may be a rather imprecise proxy for each hospital's endowment income or wealth.) The BEDS coefficient is again strongly positive and roughly equal to 1.0 and the expected positive coefficients for the "need" variables are once again not consistently observed. The teaching dummy coefficient suggests a positive effect of teaching on indigent care supply but it is not significant at conventional levels.

To examine further the implications of our results, we used them to simulate the effects of changes in hospital market structure on the total community's supply of charity care. The starting point for our simulation was a county with two 300-bed voluntary hospitals. Each hospital provided 1000 equivalent admissions of charity care and reported 750 uninsured and charity discharges per year. (These values are roughly in the middle of the range of observed values for our study hospitals.) We then simulated the change in total equivalent charity admissions and uninsured and charity discharges for the county when the 300 bed hospitals were subdivided first into four identical 150-bed hospitals and then into six identical 100-bed hospitals. We simulated Cournot equilibrium outcomes using (for simplicity) a BEDS elasticity of charity care supply equal to 1.0. The UCEQUA simulations used the coefficient in Table 2 for OVUCEQUA from Regression 1 and the SPCDIS simulations used the analogous coefficient from Table 3.[15]

Results of the simulation are shown in Table 4. For equivalent charity care admissions, the change from two to four hospitals results in a 4.2 per cent increase in total community supply while the change from four to six yields an additional 1.3 per cent increase. For inpatient discharges, where the sign of the SPCDIS coefficient implies crowding out, going from two to four hospitals reduces community supply by only 2.1 per cent while going from four to six implies a further reduction of 1.1 per cent.

C. Discussion

Results for the only hospital dummy suggest some crowding-out as new hospitals enter a county but at the margin results of the UCEQUA regressions suggest that rivalry dominates crowding out effects. On the other hand, when our dependent variable includes only inpatient indigent care supply

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[15]The following computational method was used in the simulations. Using the OVUCEQUA coefficient of 7.3307×10^{-5} from Regression 1 of Table 2, along with an assumed coefficient for the log of beds of 1.0 and the assumed initial values of 1000, 1000 and 300 for UCEQUA, OVUCEQUA and BEDS respectively, we solved for the value of Z from the Cournot equilibrium equation $\ln UCEQUA = Z + \ln(600/n) + (n-1)UCEQUA \times 7.3307 \times 10^{-5}$, where n (the number of hospitals in the county) had an initial value of two. Then, using this value of Z and the Cournot equilibrium equation, we solved for UCEQUA when n took on values of four and six. The identical method was used for the SPCDIS simulation.

(SPCDIS), small crowding-out effects are obtained which are somewhat sensitive to estimation method. We speculate that hospitals may behave differently in supplying inpatient versus outpatient indigent care since the latter may be more visible to the community at large and thus more likely to generate a rivalrous response. Of course, this is merely speculation and further empirical investigations are clearly in order.

Because of its potential policy importance in assessing crowding out and rivalry effects, as well as changes in hospital market structure, and because of its relevance for understanding nonprofit hospital behavior, a more detailed examination of the only-hospital effect is clearly in order. This sort of discontinuity in behavior does not flow from the straightforward models of altruism and rivalry we have explored thus far. One could conjecture that charity care supplied by only hospitals is highly visible and reflects a response to clear public pressures while "shirking" of the hospital's "duty" becomes feasible with more than one hospital. Verification of this conjecture will require additional empirical probing.

V. Summary and Concluding Remarks

This paper has extended previous research on the individual's supply of charitable donations to the case of nonprofit firms. The specific case we study is the provision of care by hospitals to the medically indigent. Using several different formulations of our theoretical model, we demonstrate that in the absence of very large and positive income effects on indigent care supply, convex preferences for the nonprofit hospital imply crowding out by government hospitals. Extending our model to include patient heterogeneity and impure altruism (rivalry) provides a possible explanation for the previously reported empirical result that <u>both</u> crowding out and income effects on indigent care supply are often weak or insignificant.

Our own empirical analysis of indigent care supply (including both inpatient and outpatient services) provides direct support for the rivalry hypothesis based on our finding of a significantly positive effect, on the nonprofit hospital's supply, of the supply of such care by other nonprofit hospitals in the local area. One important policy implication of this result concerns the assessment of varying market structures. In the presence of rivalry, increased numbers of suppliers leads to a larger total community supply of indigent care services; conversely, mergers of nonprofit hospitals imply reductions in indigent care supply. On the other hand, when our indigent care supply measure pertains only to inpatient services, the rivalry hypothesis is not supported. Further investigation is needed to verify and understand this apparent difference in hospital behavior with regard to supplying inpatient versus outpatient indigent care. Furthermore, our results for hospitals that are the sole provider in a county also point to a possible predominance of crowding out over rivalry effects (particularly in supplying inpatient care to indigents) when an additional hospital enters the market. From a theoretical perspective, and in the context of policy assessment of changing market structures, further exploration of this possibility seems warranted.[16]

Finally, our finding of a strong substitution effect on indigent care

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[16]The reader should also bear in mind that the rivalry and crowding out results discussed here pertain to other private hospitals. Because of the limited number of public hospitals in Maryland, our estimates of private hospital responses to public indigent care supply very imprecise. Further research that is better able to distinguish between public and private crowding out and rivalry is clearly needed.

supply is also of policy interest. It suggests that reductions in the prices paid to hospitals on behalf of paying patients would increase the supply of indigent care. Several states (Florida and South Carolina) have implemented indigent care subsidy programs that are financed by taxes on hospital revenues. Our results suggest that this policy will have a large impact on indigent care supply both by increasing the subsidy payment (r) and by reducing the after-tax price received by the hospitals from paying patients. Thus, financing of additional subsidies via taxes (and reductions in after-tax prices) may increase the supply of indigent care without greatly increasing total funds flowing into the hospital sector.

APPENDIX: DATA SOURCES

Data for calculating values of the variables UCEQUA, OVUCEQUA, FPUCEQUA, PUBUCEQUA, ALLUCEQUA, GPREQUA, and NNINC were taken primarily from the annual reports entitled Disclosure of Hospital Financial and Statistical Data published by the Maryland Health Services Cost Review Commission (HSCRC). In several instances where data on numbers of equivalent admissions were missing (for either study hospitals or other hospitals located in the same county as a study hospital), estimates were developed from data published by the American Hospital Association (AHA) and by the Maryland Hospital Association. Data for computing values of SPCDIS, OVSPCDIS, FPSPCDIS, PUBSPCDIS, and ALLSPCDIS were extracted from the hospital discharge abstract tapes submitted to the HSCRC by each hospital. Note that these data pertain to calendar years whereas the financial disclosure data are based on each hospital's fiscal year. Values of HHINC were taken from Sales and Marketing Management. RNCOST is reported in annual wage surveys conducted by the HSCRC. RBIRTHS and EXDEAD were extracted from the Area Resources File distributed by the U.S. Department of Health and Human Services. NOINS values were synthetic estimates based on insurance coverage regressions developed from Health Interview Survey data for 1980, 1982 and 1984. (Estimates for Baltimore City were taken directly from the survey data.) Data on BEDS and TEACH were taken from the Guide to the Health Care Field published annually by the AHA.

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TABLE 1

COMPARATIVE STATICS RESULTS FOR SIMPLE ALTRUISM MODEL*

Equation No.	
(7)	$\frac{dD}{dE} = \frac{U_R C_{DD}[U_{RR}\cdot(r-P)-U_{NR}]}{\lvert J\rvert}$
	where $\lvert J\rvert = -U_R C_{DD}[U_{NN}-2U_{NR}\cdot(r-C_D)+(r-C_P)^2 . U_{RR}]$
(8)	$\frac{dD}{dr} = D\frac{dD}{dE} + \frac{U_R^2 C_{DD}}{\lvert J\rvert}$
(9)	$\frac{dD}{dP} = Q\frac{dD}{dE} - \frac{U_R^2 C_{DD}}{\lvert J\rvert}$
(10)	$\frac{dD}{dG} = \frac{U_R C_{DD}[U_{RN}\cdot(P-r) + U_{NN}]}{\lvert J\rvert}$

*Note that in this model $C_{QQ} = C_{DD}$

Table 2: Regression Coefficients for Ln UCEQUA
(t-statistics in parentheses)

REGRESSION#	1	2	3	4	5	6	7	8
Method[d]	TSCS	TSCS	OLS	TSCS	TSCS	TSCS	OLS	TSCS
Intercept	0.379	0.365	-0.890	-1.335	-1.253	0.771	9.739	0.241
OVUCEQUA $\times 10^{-5}$	7.3307[a]	7.3602[a]	8.4494[a]	8.1243[a]	8.5221[a]			7.3980[a]
	(4.571)	(4.613)	(4.747)	(4.944)	(5.814)			(4.386)
FPUCEQUA $\times 10^{-4}$	2.4055	2.4504	-1.9262	3.8218	3.2834			2.8588
	(0.650)	(0.665)	(0.281)	(1.037)	(0.889)			(0.771)
PUBUCEQUA $\times 10^{-5}$	-4.2819	-4.2361	-5.1119	-3.7707	-3.2276			-5.1557
	(1.098)	(1.090)	(1.024)	(0.940)	(0.810)			(1.197)
ALLUCEQUA $\times 10^{-5}$						4.8439[a]	5.6706[a]	
						(3.867)	(3.537)	
Ln NOINS	-0.0553	-0.0558	-0.0124	-0.0027	-0.0034	-0.0736	-0.0069	-0.0699
	(0.975)	(0.985)	(0.188)	(0.0418)	(0.054)	(1.309)	(0.106)	(1.047)
Ln GPREQUA	-0.4292[b]	-0.4331[b]	-0.4036[c]	-0.4020[b]	-0.3938	-0.4481[b]	-0.3980[c]	-0.3886[b]
	(2.258)	(2.292)	(1.835)	(2.135)	(2.172)	(2.347)	(1.819)	(1.977)
Ln RNCOST	0.0587	0.0497	-0.0326	0.0826	0.2092	0.0022	0.1613	0.0463
	(0.161)	(0.137)	(0.089)	(0.228)	(0.761)	(0.006)	(0.428)	(0.121)
Ln BEDS	0.9543[a]	0.9495[a]	0.4640[c]	1.0397[a]	1.0385[a]	0.9723[a]	0.5341[b]	0.9463[a]
	(7.811)	(7.956)	(1.741)	(8.187)	(8.105)	(8.329)	(2.006)	(7.873)
Ln EXDEAD	-0.0172	-0.0169	0.0422	0.1035	0.0874	-0.0175	0.0700	-0.0034
	(0.229)	(0.225)	(0.449)	(1.129)	(0.967)	(0.231)	(0.747)	(0.039)
Ln HHINC	0.4113[c]	0.4200[c]	0.6128[b]	0.5244[b]	0.5915[a]	0.4033	0.3118	0.4090[c]
	(1.710)	(1.772)	(2.001)	(2.168)	(2.717)	(1.696)	(1.032)	(1.715)
TEACH	-0.1039	-0.1037	-0.1148	-0.1018	-0.1025	-0.1129[c]	-0.1104	-0.1011
	(1.571)	(1.572)	(1.636)	(1.562)	(1.576)	(1.693)	(1.580)	(1.529)
Ln RBIRTHS				-0.1740	-0.2823[b]		-0.9577[b]	
				(1.1645)	(2.188)		(2.454)	
TIME	0.0355	0.0357	0.0253	0.0202		0.0520	0.0606	
	(0.865)	(0.871)	(0.563)	(0.479)		(1.271)	(1.344)	
ONLYHOS				0.3291				
				(1.382)				
1981								0.3526
								(0.513)
1982								0.1032
								(0.893)
1983								0.7147
								(0.469)
1984								0.1481
								(0.837)
NNINC $\times 10^{-7}$	-0.0867							
	(0.27)							

Notes: a - significant at the 0.01 level;b - significant at the 0.05 level;c - significant at the 0.10 level; d - TSCS denotes Fuller-Battese error components estimates while equations estimated by OLS include hospital-specific dummies.

Table 3: Regression Results for Ln SPCDIS

REGRESSION#	1	2	3	4	5	6	7	8
METHOD[d]	TSCS	TSCS	OLS	TSCS	TSCS	TSCS	OLS	TSCS
Intercept	9.130	9.064	2.163	6.679	5.693	7.850	2.294	9.400
OVSPCDIS x10^{-5}	-6.1832[a] (2.684)	-6.1219[a] (2.661)	-2.8035 (0.658)	-5.0852[b] (1.987)	-3.2959 (1.428)			-6.4028[a] (2.757)
FPSPCDIS x10^{-4}	-3.1812 (0.762)	-3.2455 (0.782)	2.3777 (0.312)	-1.3533 (0.321)	-1.6177 (0.387)			-32.796 (0.787)
PUBSPCDIS x10^{-5}	-0.2948 (0.087)	-0.3788 (0.112)	-2.1047 (0.240)	-0.8898 (0.259)	-0.4235 (0.125)			-0.7110 (0.205)
ALLSPCDIS x10^{-5}						-4.3615[b] (2.203)	-5.2579 (1.281)	
Ln NOINS	-0.0777 (0.986)	-0.0765 (0.972)	-0.0601 (0.749)	-0.0251 (0.279)	-0.0227 (0.251)	-0.0458 (0.606)	-0.0429 (0.539)	-0.0364 (0.733)
Ln GPREQUA	-1.0290[a] (4.150)	-1.0356[a] (4.180)	-1.0419[a] (3.922)	-0.9963[a] (4.024)	-0.9601[a] (3.988)	-1.0004[a] (4.052)	-1.1039[a] (4.046)	-1.0400[a] (4.113)
Ln RNCOST	1.4999[a] (3.296)	1.4660[a] (3.230)	1.7799[a] (4.59)	1.4970[a] (3.293)	1.9045[a] (5.323)	1.5287[a] (3.379)	1.3761[a] (2.918)	1.4536[a] (3.122)
Ln BEDS	1.0449[a] (6.785)	1.0190[a] (6.771)	0.9572[a] (2.937)	1.0793[a] (6.691)	1.0842[a] (6.636)	1.0116[a] (6.770)	0.9764[a] (3.017)	1.0279[a] (6.803)
Ln RBIRTHS				-0.0276 (0.139)	-0.2617 (1.537)		0.3353 (0.713)	
Ln EXDEAD	0.0817 (0.811)	0.0853 (0.847)	0.1591 (1.388)	0.1536 (1.382)	0.1154 (1.046)	0.0497 (0.506)	0.1641 (1.438)	0.0851 (0.796)
Ln HHINC	-0.3622 (1.176)	-0.3338 (1.091)	0.1860 (0.548)	-0.5003 (0.775)	-0.0431 (0.145)	-0.2593 (0.863)	0.0001 (0.000)	-0.3752 (1.216)
TEACH	0.1156 (1.433)	0.1160 (1.437)	0.1067 (1.229)	0.1198 (1.494)	0.1220 (1.513)	0.1288 (1.604)	0.0984 (1.139)	0.1166 (1.441)
TIME	0.0929[c] (1.708)	0.0934[c] (1.718)		0.0742 (1.307)		0.0634 (1.250)	0.0630 (1.207)	
ONLYHOS				0.5754[c] (1.818)				
1981								0.0139 (0.163)
1982								0.1364 (0.947)
1983								0.3208[c] (1.715)
1984								0.3419 (1.591)
NNINC x10^{-6}	-0.0346 (0.907)							

Notes: a - significant at the 0.01 level;b - significant at the 0.05 level;c - significant at the 0.10 level; d - TSCS denotes Fuller-Battese error components estimates while equations estimated by OLS include hospital-specific dummies.

TABLE 4

MARKET STRUCTURE SIMULATIONS OF TOTAL COUNTY CHARITY CARE SUPPLY

	Two 300-bed Hospitals	4 150-Bed Hospitals	6 100-Bed Hospitals
Equiv. Admissions	2000	2084	2112
Inpatient Discharges	1500	1468	1452

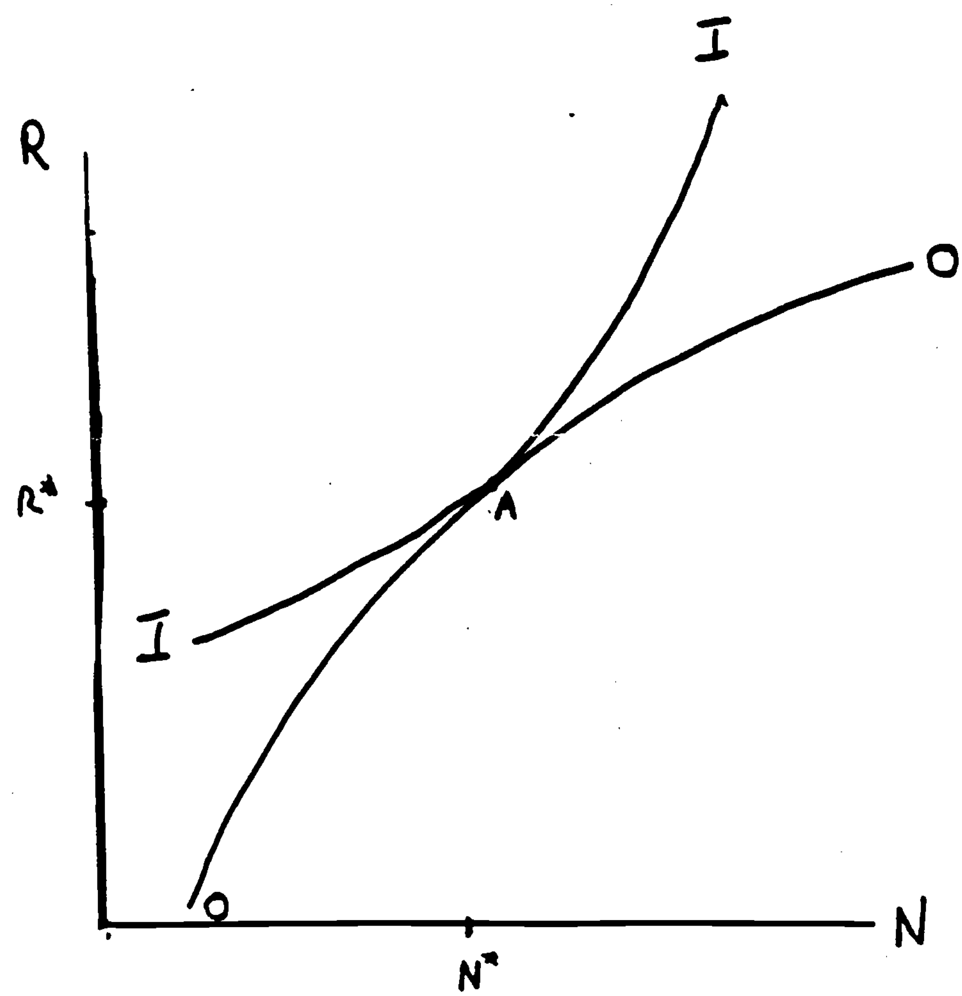

Figure 1.
Equilibrium in R, N Space