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REGULATED PRICE DISCRIMINATION AND QUALITY: THE IMPLICATIONS OF MEDICAID REIMBURSEMENT POLICY FOR THE NURSING HOME INDUSTRY

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ABSTRACT

Nursing homes participate simultaneously in a regulated and an unregulated market, and are required to supply the same quality of service to both markets. Specifically, nursing homes compete for patients who finance their care privately, and patients whose care is financed by the government's Medicaid program. The government reimburses nursing homes a set fee for the care of Medicaid patients, whereas nursing homes charge "private pay" patients what the market will bear. Quality is determined by competition in the "private pay" patient market. The greater the size of the "private pay" market relative to the Medicaid market, the higher is quality.

We find that Medicaid policy makers face a trade-off between the access of Medicaid patients to care and quality. Specifically, an increase in the Medicaid reimbursement rate causes nursing homes to reduce quality, increase "private pay" price, and to admit more Medicaid patients and fewer "private pay" patients. Hence, in the nursing home industry, higher prices are associated with lower levels of quality. In addition, nursing homes set quality higher if the remibursement rate is set via "cost plus" pricing than if it is set via "flat rate" pricing. Moreover, consumers in both markets are better off under "cost plus" pricing, nursing homes earn higher profits under "flat rate" pricing, and total governmental Medicaid expenditures are the same under both reimbursement methods.

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I. INTRODUCTION

In the nursing home industry firms participate simultaneously in a regulated and an unregulated market, and are required to supply the same quality of service to both markets. Specifically, nursing homes compete for patients who finance their care privately, and patients whose care is financed by the government's Medicaid program. The government reimburses nursing homes a set fee for the care of Medicaid patients, whereas nursing homes charge "private pay" patients what the market will bear. Quality is determined by competition in the "private pay" patient market. The greater the size of the "private pay" market relative to the Medicaid market, the higher is quality. If the "private pay" market did not exist, then nursing homes would face only Medicaid demand, which is insensitive to quality, and consequently, there would be no incentive to provide more quality than is necessary to obtain government certification.

The purpose of this paper is to analyze current and proposed Medicaid reimbursement policies. We find that an increase in the Medicaid reimbursement rate reduces quality, causes an increase in the "private pay" price, and causes homes to admit more Medicaid patients at the expense of "private pay" patients. Hence, in the nursing home industry, higher prices are associated with lower levels of quality. This contrasts with the growing "reputation" literature which shows that, in general, higher prices are associated with higher levels of quality.[1] Furthermore, we find that an increase in the Medicaid reimbursement rate diminishes the welfare of consumers in the "private pay" market, increases nursing home profits, but does not necessarily improve the welfare of consumers in the Medicaid market.

In addition, holding the Medicaid reimbursement constant, we find that quality is higher if the remibursement rate is set via "cost plus" pricing than if it is set via "flat rate" pricing; whereas the price charged "private pay" patients, and the mix of Medicaid and "private pay" patients are the same under both reimbursement methods. Moreover, consumers in both markets are better off under "cost plus" pricing, nursing homes earn higher profits under "flat rate" pricing, and total governmental Medicaid expenditures are the same under both. This result is of particular interest since the government is currently proposing switching from "cost plus" to "flat rate" pricing. The policy implications must be tempered since we ignore the obvious moral hazzard problems inherent in "cost plus" pricing, in order to focus on the role of

price discrimination. Therefore, although these results do not necessarily imply that "cost plus" pricing is superior to "flat rate" pricing, they do point out the value of making the Medicaid price depend upon the behavior of the firm.

Our model of the nursing home market is based on the notion that there are quantity and quality aspects to production, and both quantity and quality are endogenous.[2] Specifically, nursing homes produce a series of commodities, such as medical care, room and board, and social activities. The quality of nursing home care is the utility patients derive from consuming this package. Nursing home output, then, is characterized by the total number of patients under care and the average quality of care. Nursing homes are assumed to maximize profits by choosing quality and "private pay" price (which determines the mix of "private pay" and Medicaid patients) subject to a governmentally imposed capacity constraint.[3]

The model also takes into account the notion that the nursing home industry is not perfectly competitive by allowing spatial competition for "private pay" patients. The spatial representation is a convenient way to formalize a market where product differentiation is important. The specification is an extension of the spatial model of monopolistic competition developed in Salop (1979). Our work extends Salop's model in three ways: (i) by allowing non-price (quality) as well as price competition, (ii) by allowing nursing homes to participate simultaneously in a second market, the perfectly competitive Medicaid market, and (iii) by expanding the distribution of consumers to two dimensions which provides another source of demand elasticity so that the outcome of non-price competition in non-trivial. The spatial representation also provides a convenient way to measure welfare in terms of representative consumers.

The analysis precedes as follows. In section II, we discuss the relevant institutional aspects of the nursing home industry. In section III, we derive home specific demand functions. In section IV, we derive and compare the equilibria under "flat rate" and "cost plus" Medicaid reimbursement, and analyze the effects of increases in the Medicaid reimbursement rate on the equilibria. In section IV, we discuss the welfare properties of Medicaid policy, and finally in section V, we summarize and draw conclusions.

II. THE NURSING HOME INDUSTRY

Over the last thirty years, the nursing home industry has expanded on an annual average of 17%, from approximately $190 million in 1950 to over $18 billion in 1980.[4] The bulk of the expansion took place after 1966, the year in which the Medicaid program began subsidizing nursing home care. As of 1980, the public share of nursing home expenditures was over 65%. Health care regulators have the task of trying to control this expansion, while simultaneously providing the poor with access to nursing home care and promoting a high standard of quality. The major forms of government intervention into the nursing home market are the Medicaid patient subsidy program and the Certificate of Need (CON) cost containment program.

Medicaid is an entitlement program established under the Social Security Act to provide the poor with a minimum floor of health services. Through direct subsidies, the Medicaid program makes health care available to individuals who otherwise could not afford it. It is jointly financed by State and Federal governments, but administered on a State basis. The Medicaid program reimburses nursing homes a set fee for the care of Medicaid patients. Typically, States pay nursing homes using a "cost plus" reimbursement mechanism, although, a few States have opted for a prospectively set "flat rate" reimbursement mechanism.

The other major form of government intervention in the nursing home industry is the Certificate of Need (CON) cost containment program. CON was passed into law in response to the rapid growth of the health care industry during the late 1960's and early 1970's. It requires that in order to expand an existing nursing home or build a new one that the government must certify that the proposed facility is indeed "needed". Effectively, CON limits the existing capacity of existing nursing homes and new entry into the market.[5] It was thought that the expansion could be contained by limiting the available supply of nursing home beds.

In essence, government regulation has turned nursing homes into price discriminators. The Medicaid program creates a second market for nursing home care, and CON restricts supply so that there is excess Medicaid patient demand. The excess Medicaid demand hypothesis is supported empirically in Scanlon (1980). Hence, nursing homes compete with each other for "private pay" patients knowing that they can always admit Medicaid patients at the Medicaid reimbursement rate if they have excess capacity.

III. DEMAND

Those who seek nursing home care are usually motivated by large discrete changes in their health. In general, individuals prefer to live independently as long as health permits. Other things equal, it is unlikely that small changes in the price and quality of nursing home care would induce anyone to give up independent living in favor of nursing home care. Therefore, the total pool of potential nursing home patients is approximately fixed and independent of nursing home choices of price and quality. Once health dictates that nursing home care is required, a nursing home must be chosen. Nursing homes compete for patients based on price and quality. Individuals who can afford nursing home care choose the home that offers the highest utility. Individuals who cannot afford nursing home care enter the pool of potential Medicaid patients.

A nursing home's quality is comprised of two parts: one of common value to all, and another of value only to specific individuals. Common quality is the utility patients derive from consuming the package of goods and services nursing home's provide their patients. This package includes commodities such as food, shelter, nursing care, and social and leisure activities. Specific quality is characterized by factors such as how far the home is located from family and the religious affiliation of the home.[6] In the short run, "common quality is chosen by homes, whereas "specific quality" is fixed.

The price of nursing home care depends upon Medicaid eligibility. If eligible, individuals turn over their income to the government, which assumes financial responsibility for their care. Medicaid eligibility depends on an income test. The maximum allowable income is usually below the price charged "private pay" patients. To simplify subsequent analysis, we assume that individuals are eligible for Medicaid subsidization if their income is less than the lowest price charged "private pay" patients. If they pass this income test, then they enter a pool of potential Medicaid patients from which nursing homes can choose.

In this section we derive home specific demand functions by aggregating individuals' choices. Aggregation requires specification of a functional form for individuals' utility functions, and the distribution of individuals by income, health, and "specific quality" preferences.[7] The individual's decision is discussed in section A, the distributional assumptions in section B, and the home specific demand functions in section C.

A. THE INDIVIDUAL'S DECISION

Individuals are assumed to have one of two possible health states: good health and poor health. Those with good health always choose independent living, and those with poor health always choose nursing home care. What remains to be determined is which nursing home will those with poor health choose, and whether they are "private pay" patients or Medicaid patients. Individuals are "private pay" patients if they can afford nursing home care, and are eligible for Medicaid subsidization if they cannot. "Private pay" patients choose the nursing home that offers them the highest utility.

Individuals derive utility from quality and savings. Quality is comprised of common and specific parts. If all individuals have the same preferences over the components of "common quality", the components can be indexed into a single measure of "common quality" using the preferences to determine weights. Let Q_j be the value of nursing home j's "common quality" index.

Unlike "common quality", a home's "specific quality" provides different individuals with different levels of utility. The utility an individual derives from a home's "specific quality" depends on how closely that home's "specific quality" matches the individual's ideal "specific quality". For example, the closer a home is located to a patient's family, the better the match. Let D_{ij} measure the value of individual i's match with home j. The smaller D_{ij}, the better the match. Hence, utility is decreasing in D_{ij}.

Individuals also derive utility from savings either for their own use after they leave the home or as a bequest to their heirs. Let Y_i be individual i's income and P_j be the price home j charges "private pay" patients. If individual i enters home j as a "private pay" patient, then her savings are $Y_i - P_j$. If she cannot afford any P_j, then she is eligible for Medicaid and her savings are zero.

We are now ready to characterize an individual's decision. Assuming a linear utility function, individual i's utility from nursing home j is

$$(1) \qquad U_{ij} = \begin{cases} Q_j - D_{ij} + Y_i - P_j & \text{if } Y_i - P_j > 0 \\ Q_j + D_{ij} & \text{if } Y_i - P_j \leq 0. \end{cases}$$

Suppose there are N nursing homes, each offering a package (Q_j, D_j, P_j). If Y_i is greater than any P_j, then individual i chooses the nursing home that offers her the greatest utility from amongst the homes she can afford. If Y_i is less than all P_j, then she joins the pool of potential Medicaid patients.

B. DISTRIBUTIONAL ASSUMPTIONS

In order to aggregate individual decisions into home specific demand functions it is necessary to specify the distribution of individuals over their "specific quality" preferences and income. Individuals are assumed to be distributed uniformly over the shell of a cylinder with density one. An individual's horizontal position on the cylinder determines her "specific quality" preferences, and her vertical position determines her income.

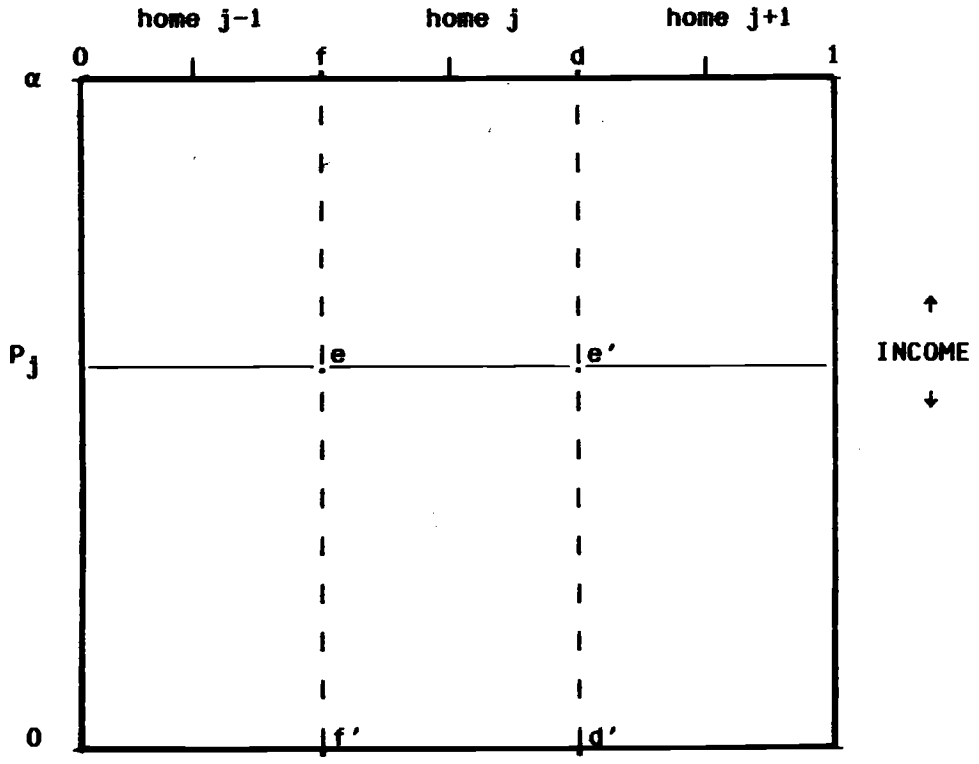
Consider the distribution of individuals with the same level of income over their "specific quality" preferences. These individuals are distributed on the circumference of a unit circle. If we locate the nursing homes on the same circle equidistant from one another, then an individual's "specific quality" from a particular home is given by the position of the individual relative to the home. Specifically, D_{ij} is calculated as the distance from individual i's location to home j's location moving along the circumference of the circle by the shortest path.

Now consider the joint distribution of individuals over "specific quality" preferences and income. We assume that the distribution of individuals by income is uniform with density one over the interval $[0,\alpha]$, and that there exists a "specific quality" preference circle for each level of income. In addition, the distribution of individuals is the same on all circles. By stacking these circles in order of increasing income and so that individuals with identical "specific quality" preferences are on top of one another, we derive a cylindrical distribution where an individual's horizontal position determines her "specific quality" preferences, and vertical position determines her income.

The distributional assumptions are summarized on this cylinder. A flattened version with 3 homes is presented in figure 1. The homes located equidistant from one another along the circumference of the top of the cylinder. Individuals are distributed uniformly with density one along the shell of the cylinder. As we move down the cylinder individuals' income falls from α to zero. Individuals' "specific quality" preferences are captured by their horizontal location. Suppose individual i is located at point e'. By moving her on a perpendicular line to the top of the cylinder, she is placed on the same circle as the nursing homes at point d. Then, D_{ij} is equal to the distance between point d and home j.

FIGURE 1

THE DISTRIBUTION OF PATIENTS BY INCOME AND SPECIFIC QUALITY PREFERENCES



C. HOME SPECIFIC DEMAND FUNCTIONS

The cylindrical distribution can be subdivided into regions whose areas are "private pay" demand for each home and the pool of potential Medicaid patients. In order to calculate a home's "private pay" demand, the marginal individuals who reside on the borders of these regions must be identified. The horizontal location of these individuals is

$$(2) \qquad D_j^* = (1/2)\left(Q_j - Q_{j+1} + P_{j+1} - P_j + 1/N\right).$$

Notice that this location is independent of income.[8] Therefore, the marginal individual on each income circle is located in the same horizontal position. Let point d in figure 1 be the location of the marginal individual with α income. Then, a line perpendicular to d represents the locus of individuals who are indifferent between homes j and j+1. This locus is given by the dd' line figure 2. Let the ff' line represent the analogous locus for homes j and

j-1. Suppose home j charges its "private pay" patients P_j. Then, those individuals who choose home j, and whose income is greater than P_j constitute home j's "private pay" patient demand.

Home j's "private pay" demand is calculated as the area of the rectangle dd'e'e in figure 1. If both of home j's neighbors choose $\hat{P}$ and $\hat{Q}$, then home j's "private pay" demand is

$$(3) \qquad X_j = \begin{cases} (Q_j - \hat{Q} + \hat{P} - P_j + 1/N)(\alpha - P_j) & \text{if } P_j < \alpha \\ 0 & \text{if } P_j \geq \alpha, \end{cases}$$

where X_j is number of "private pay" patients demanding care from home j.

In a symmetric equilibrium, where all homes choose the same "private pay" price and quality, equilibrium "private pay" demand is

$$(4) \qquad X = (1/N)(\alpha - P).$$

Notice that equilibrium "private pay" demand is independent of quality. Since price determines who is a "private pay" patient and who is a Medicaid patient, it also determines the market level of "private pay" demand. If a home raises its price it looses some "private pay" patients to other homes and some "private pay" patients to the Medicaid pool. Quality choices only affect the distribution of market "private pay" demand amongst homes. If a home raises its quality, it gains "private pay" patients from other homes, but the market level of "private pay" demand remains unchanged. If all homes choose price P, then total "private pay" demand is $\alpha - P$. In addition, if all homes choose the same level of quality, then they each receive an equal share of market "private pay" demand.

Those individuals who cannot afford nursing home care enter a pool of potential Medicaid patients from which nursing homes can choose. Nursing homes receive the Medicaid reimbursement rate from the government for each Medicaid patient. We assume that the income distribution is large enough so that each nursing home has enough Medicaid demand so as to more than fill every bed in the home. Therefore, Medicaid demand is perfectly elastic as the Medicaid reimbursement rate.

IV. EQUILIBRIUM

In this section we consider symmetric Nash equilibria under "flat rate" and "cost plus" Medicaid reimbursement. We begin by assuming that all nursing homes face parametrically identical demand functions, have the same cost function, and are subject to identical government regulation.

Nursing homes have two sources of demand: "private pay" and Medicaid. Each home faces a "private pay" demand whose functional form is given by (3), and can admit Medicaid patients at the Medicaid reimbursement rate.

CON regulation imposes a capacity constraint on the total number of patients each nursing home is able to admit. Since there is excess Medicaid demand, the capacity constraint is binding. It is specified as

$$X + M = \bar{X}, \tag{5}$$

where X is the number of "private pay" patients, M is the number of Medicaid patients, and $\bar{X}$ is the CON allowed capacity. CON also controls entry and exit. We assume that CON policy allows N firms, each with capacity $\bar{X}$, in the market.

Nursing homes are required to provide the same quality to all patients, regardless of method of payment. Thus, a nursing home's costs are a function of the total number of patients and average quality. Let the cost of providing quality level Q to $\bar{X}$ patients be C(Q), which is increasing and convex.

The government pays nursing homes for Medicaid patient care either by "flat rate" or "cost plus" reimbursement. Under "flat rate" reimbursement, the payment per Medicaid patient is fixed at R. Under "cost plus" reimbursement the payment per Medicaid patient is

$$R = r + C(Q)/\bar{X}, \tag{6}$$

where r is the "plus" factor. Under "flat rate" reimbursement marginal Medicaid revenue is constant. In the "cost plus" case, marginal Medicaid revenue rises with quality.

Each home is assumed to choose "private pay" price and quality so as to maximize profits taking its competitors' choices as given. Profits are

$$\Pi(P,Q) = PX(P,Q) + R[\bar{X} - X(P,Q)] - C(\bar{X},Q).$$

A symmetric Nash equilibrium is exists in both the "flat rate" and "cost plus" cases, and the rest of the analysis concerns only these equilibria.

A. "Flat Rate" Reimbursement

1. Equilibrium

The behavioral conditions that each home must satisfy are the CON capacity constraint in (5), the "private pay" demand function in (4), and

$$(7) \qquad PX_P + X = RX_P$$

$$(8) \qquad PX_Q = C_Q + RX_Q,$$

where $X_P = \partial X/\partial P$, etc. The behavioral conditions have straight-forward interpretations. Price is chosen in (7) to equate marginal "private pay" revenue to the opportunity cost of Medicaid revenue, and quality is chosen in (8) to equate marginal "private pay" revenue to the marginal cost of quality plus the opportunity cost of Medicaid revenue.

Condition (7), when evaluated at the symmetric Nash equilibrium, is independent of quality. Substitution of the "private pay" demand function (3) and its appropriate derivatives into (7), and evaluation of those expressions at the symmetric Nash equilibrium yields

$$(9) \qquad -(P - R)(\alpha - P + 1/N) + (1/N)(\alpha - P) = 0$$

$$(10) \qquad (P - R)(\alpha - P) - C_Q = 0.$$

Condition (9) is a quadratic expression in P. The quadratic expression has two potential solutions, one of which can be ruled out because $(\alpha - P)$ must be non-negative. Therefore,

$$(11) \qquad P = (1/2)\left[\alpha + R + 2/N - \left((\alpha - R)^2 + 4/N^2\right)^{1/2}\right].$$

Equation (11) implies that the equilibrium "private pay" price is independent of quality. Therefore, the first order conditions can be solved recurively. First, P is determined by (7), and then, Q by (8), X by (4), and M by (5).

2. An increases in the Medicaid Reimbursement Rate

Here we show that an increase in the Medicaid reimbursement rate causes nursing homes to lower quality, raise "private pay" price, and adjust patient mix in favor of more Medicaid patients. Substitution of (11) into (10) yields

$$(12) \qquad (1/N)\left((\alpha - R)^2 + 4/N^2\right)^{1/2} - 2/N^2 - C_Q = 0.$$

By the implicit function theorem,

$$\frac{dQ}{dR} = \frac{-(\alpha - R)}{2N\left((\alpha - R)^2 + 4/N^2\right)^{1/2} C_{QQ}} \leq 0 .$$

From (11), it is clear that P is increasing in R. Therefore, it follows from (4) that X is increasing in R, and from (5) that M is decreasing in R.

The intuition behind this result is straightforward. Increasing R raises marginal Medicaid revenue. As a result, it becomes profitable to substitute Medicaid patients for "private pay" patients. Homes raise "private pay" price and lowers quality to reduce "private pay" demand and lower operating costs. The beds vacated by "private pay" patients are filled with Medicaid patients.

B. "Cost Plus" Reimbursement

1. Equilibrium

In this case, proprietary nursing homes are maximizing profits subject to the Medicaid reimbursement rule specified in (6). The behavioral conditions that each home must satisfy are

$$(13) \qquad PX_P + X = RX_P$$

$$(14) \qquad PX_Q = C_Q(X/\bar{X}) + RX_Q,$$

along with (4) and (5). These conditions are almost identical to the behavioral conditions in the "flat rate" case. One difference occurs in condition (13), where the marginal cost of providing additional quality to all patients is weighted by the proportion of patients who are "private pay". Since increases in the cost of caring for Medicaid patients are recovered via Medicaid reimbursements, only the marginal cost of caring for "private pay" patients is important in the decision making process. Therefore, the relevant marginal cost of quality is lower under "cost plus" reimbursement. Also, the "private pay" price condition (13) is not independent of quality since the Medicaid reimbursement rate depends on average cost.

As before, the equilibrium conditions are recursive. Substitution of (3) and its derivatives into (13) and (14), and evaluation at equilibrium gives

$$(15) \qquad -(P - R)(\alpha - P + 1/N) + (1/N)(\alpha - P) = 0$$

$$(16) \qquad (P - R)(\alpha - P) - (1/N\bar{X})(\alpha - P)C_Q = 0.$$

Solving (15) for P yields

$$(17) \qquad P = (1/2)\left[\alpha + R + 2/N - \left((\alpha - R)^2 + 4/N^2\right)^{1/2}\right],$$

and substitution of (17) into (16) gives

$$(18) \qquad (1/2)(\alpha - R + 2/N) - (1/2)\left((\alpha - R)^2 + 4/N^2\right)^{1/2} - C_Q/N\bar{X} = 0.$$

Hence, Q is determined by (18), then, P by (17), X by (4), and M by (5).

2. An Increase in the Medicaid "Plus Factor

In this case, the government's policy instrument is r, the Medicaid "plus" factor. We show that an increase in r decreases quality. In addition, if the the Medicaid reimbursement rate is increasing (decreasing) in r, then "private pay" price rises (falls), and the home adjusts its patient mix in favor of more Medicaid ("private pay") patients.

By application of the implicit function theorem to (18)

$$(19) \qquad \frac{dQ}{dr} = \frac{-(1/2)\left[1 - (\alpha - R)\left((\alpha - R)^2 + 4/N^2\right)^{-1/2}\right]}{(1/2)\left[1 - (\alpha - R)\left((\alpha - R)^2 + 4/N^2\right)^{-1/2}\right] + C_{QQ}/N\bar{X}} \leq 0 .$$

From (17) it is clear that P is increasing in R. Differentiation of R with respect to r yields

$$\frac{dR}{dr} = 1 + \frac{C_Q}{\bar{X}} \frac{dQ}{dr} .$$

The total change in R is decomposed into two effects. The first is the direct effect due to the increase in r, and is positive. The second is an indirect effect due the change in average cost, and is negative since Q is decreasing in r. If the total effect on R is positive (negative), then P rises (falls), implying from (4) that X falls (rises), and from (5) that M rises (falls).

C. "Flat Rate" Versus "Cost Plus" Reimbursement

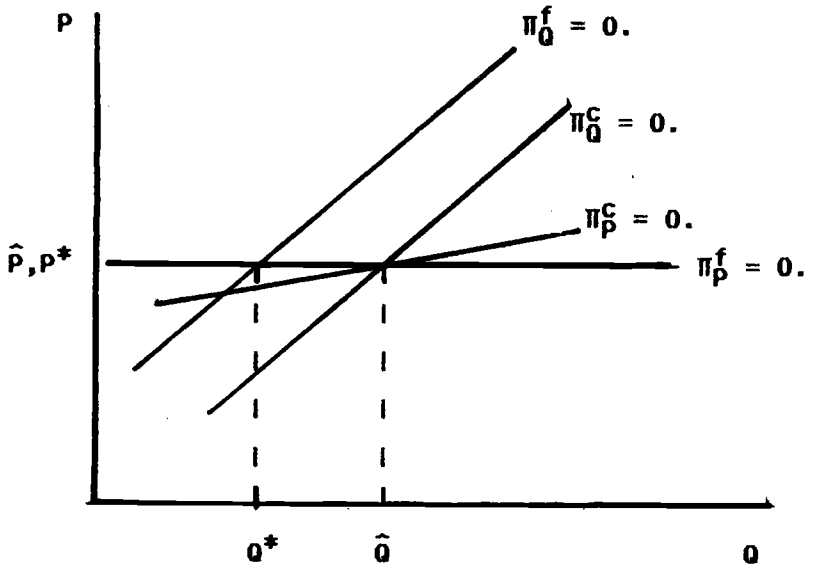
In order to isolate differences in incentive structures, we compare equilibria when the equilibrium "cost plus" reimbursement equals the "flat rate". We show that homes provide higher quality under "cost plus" reimbursement, whereas they charge "private pay" patients the same price and care for the same number of "private pay" and Medicaid patients under both methods. The intuition is as follows. Since equilibrium "private pay" demand is independent of quality, homes charge the same "private pay" price under both methods, and therefore, care for the same number of "private pay" and Medicaid patients. Hence, since homes charge the same "private pay" price and the marginal cost of quality is lower under "cost plus" reimbursement, homes choose a higher level of quality under "cost plus" reimbursement.

These results are easily seen in figure 2 where the profit maximizing first order conditions are pictured. The $\pi_P^f = 0$ and $\pi_Q^f = 0$ curves represent all the combinations of P and Q that satisfy (7) and (8), respectively. Since equilibrium "private pay" demand is independent of Q, the $\pi_P = 0$ curve is horizontal. On the other hand, the $\pi_Q^f = 0$ is upward sloping.[9] The "flat rate" equilibrium (P^*,Q^*) occurs at the intersection of the two curves. The cost plus first order conditions are given by the $\pi_P^c = 0$ and $\pi_Q^c = 0$ curves. They represent all the combinations of P and Q that satisfy (9) and (10), respectively. Since R depends on Q, the $\pi_P^c = 0$ curve is not horizontal. In fact, both curves are upwards sloping with $\pi_Q^c = 0$ being steeper.[10] The cost plus equilibrium $(\hat{P},\hat{Q})$ occurs at the intersection of the two curves.

The relative positions of the four curves provides the comparison. Since the profit function is concave and the marginal cost of quality is lower in the "cost plus" case, (10) is satisfied at a higher Q for each P than is (8). Therefore, the $\pi_Q^c = 0$ curve is located everywhere to the right of the $\pi_Q^f = 0$ curve. Since (7) is independent of Q and (9) depends on Q only via R, equilibrium P occurs at the same point under both reimbursement schemes. Therefore, the $\pi_P^c = 0$ curve intersects the $\pi_Q^c = 0$ curve at the same P that the $\pi_P = 0$ intersects the $\pi_Q = 0$ curve. Consequently, the "cost plus" equilibrium occurs at a higher Q than does the "flat rate" equilibrium.

FIGURE 2

COST PLUS VERSUS FLAT RATE REIMBURSEMENT



IV. WELFARE

In this section we analyze the impact of Medicaid policy on the welfare of "private pay" patients, on welfare of Medicaid patients, on total government Medicaid payments, and on nursing home profits.

A. "PRIVATE PAY" PATIENT WELFARE

The total welfare of "private pay" patients is measured as the sum of their utility. Since each patient pays P to receive Q and there are N identical homes, equilibrium "private pay" patient welfare is

$$W^P = 2N \int_0^D \int_P^\alpha \left(Q + Y_i - P - D_{ij}\right) dY_i \, dD_{ij},$$

where D is the equilibrium distance of the individuals who are indifferent between homes. From (2), that distance is 1/(2N). Hence,

$$W^P = (\alpha - P)\left[Q + (\alpha - P)/2 - 1/(4N)\right]. \tag{20}$$

Hence, "private pay" welfare is the total number of "private pay" patients times average utility, is decreasing in price, and increasing in quality. Specifically, a rise in price reduces the number of "private pay" patients and average savings, and an increase in quality raises average utility.

These observations provide us with three immediate conclusions. First, "private pay" welfare is higher under "cost plus" reimbursement than under "flat rate" reimbursement. This follows from the earlier observation that nursing homes provide higher quality under "cost plus" reimbursement, and charge "private pay" patients the same price under both methods of reimbursement. Second, under "flat rate" reimbursement, an increase in the Medicaid reimbursement rate reduces "private pay" welfare, since an increase in R causes nursing homes to raise "private pay" price and lower quality. Finally, under "cost plus" reimbursement, an increase in the Medicaid plus factor reduces "private pay" welfare if dR/dr is positive, since an increase in r causes nursing homes to lower quality, and raise "private pay" price.

B. MEDICAID PATIENT WELFARE

Medicaid welfare is also measured as the sum of utility is calculated as the number of Medicaid patients times average utility. Therefore, if there are M patients in N homes, Medicaid patient welfare is

$$W^m = NM\left[Q - 1/(4N)\right].$$

Substitution of (5), and then (4) into the above expression gives

$$(21) \qquad W^m = \left[N\bar{X} - (\alpha - P)\right]\left[Q - 1/(4N)\right].$$

Hence, Medicaid welfare is increasing in both "private pay" price and quality. Specifically, an increase in "private pay" price reduces "private pay" demand, and therefore, increases the number of Medicaid patients. In addition, an increase in quality raises average utility.

These observations provide us with the following results. First, Medicaid welfare is higher under "cost plus" Medicaid reimbursement than under "flat rate" reimbursement, Tsince that quality is higher under "cost plus", and "private pay" price is the same as under both. Second, under "flat rate" reimbursement, an increase in the Medicaid reimbursement rate has an ambiguous affect on Medicaid welfare, since an increase in R raises the "private pay" price, but also reduces also reduces quality. Finally, under "cost plus" reimbursement, an increase in the Medicaid "plus" factor has an indeterminate effect on Medicaid patient welfare, since an increase in r lowers quality, and, if dR/dr is positive (negative) lowers (raises) "private pay" price.

C. GOVERNMENT MEDICAID PAYMENTS

Total government Medicaid payments are R times the total number of Medicaid patients receiving care. Therefore, under "flat rate" reimbursement, an increase an increase in R raises total Medicaid payments, since the payment per person rises and nursing homes admit more Medicaid patients. Under "cost plus" reimbursement, an increase in r has an indeterminate effect on total Medicaid payments, since an increase in r has an indeterminate effect on R. In addition, when the equilibrium "cost plus" reimbursement equals the "flat rate", total Medicaid payments are the same under under both reimbursement mechanisms. This follows from the earlier observations that nursing homes admit the same number of Medicaid patients under both reimbursement methods. Therefore, the payment per Medicaid patient and the total number of Medicaid patients are the same under both reimbursement schemes.

D. NURSING HOME PROFITS

Nursing home profits are lower under "cost plus" reimbursement than under "flat rate" reimbursement. Since the Medicaid reimbursement rate, "private pay" price, and patient mix are the same under both reimbursement schemes, revenues must be the same. On the other hand, since quality is higher under "cost plus" reimbursement costs must be higher. In addition, profits are increasing in R under "flat rate" reimbursement, and increasing in r under "cost plus" reimbursement.

VI. POLICY IMPLICATIONS

The goals of government intervention in the nursing home industry are to assure a high standard of quality, provide the poor access to care, with minimum government expenditure. The Medicaid program was created to provide "access", and allows nursing homes to be price discriminators. This paper analyzes the implications of current and proposed Medicaid policy.

The first implication is the importance of the unregulated "private pay" patient market. Quality is regulated without direct government control by competition in the "private pay" market. The greater "private pay" demand, the higher is quality. Consequently, if all care were financed by the government, there would be a welfare loss to all consumers.

Second, there is a quality-access trade-off in setting the Medicaid reimbursement rate. Specifically, higher Medicaid reimbursement rates induce nursing homes to care for more Medicaid patients, but at the expense of lower quality. Moreover, higher Medicaid reimbursement rates can lead to increases in the price charged "private pay" patients. Finally, higher Medicaid reimbursement rates reduce the welfare of "private pay" patients, increase nursing home profits, but do not necessarily increase Medicaid patient welfare. These results are supported by empirical work in Gertler (1985).

In addition, holding the Medicaid reimbursement constant, we find that quality is higher under "cost plus" reimbursement than under "flat rate" reimbursement, whereas the "private pay" price and the mix of "private pay" and Medicaid patients are the same under both reimbursement methods. This result (along with a moral hazzard story) is consistant with the empirical regularity that, other things equal, nursing homes paid by "cost plus" reimbursement have higher average costs than nursing homes paid by "flat rate" reimbursement.[10] Moreover, consumers in both markets are better off under "cost plus" reimbursement, nursing homes earn higher profits under "flat rate" reimbursement, and total government Medicaid expenditures are the same under both reimbursement schemes.

This work does not necessarily advocate "cost plus" over "flat rate" reimbursement. Indeed, the analysis ignores the important moral hazzard problems inherent in "cost plus" reimbursement in order to focus on price discrimination. On the other hand, it does point out the value of making the Medicaid reimbursement rate depend on the behavior of the firm. Therefore, before switching to "flat rate" reimbursement, the government should investigate the practicality of superior reimbursement rules as suggested in the principle-agent literature.

FOOTNOTES

[1] For example, see Allen (1984), Klein and Leffler (1981), and Shapiro (1982) and (1983).

[2] This representation of a firm's output is similar to general models analyzed in Spence (1975), Sheshinski (1976), and Leffler (1982), and to nursing home models analyzed in Bishop (1980) and Palmer and Vogel (1983).

[3] In this paper, we only consider proprietary nursing homes which constitute over 65% of the market. The other major type of firm is the "not for profit" nursing home. "Not for profit" nursing homes constitute approximately 30% of the market, and are primarily operated by religiuosly affiliated organizations. Elsewhere, Gertler (1985), we consider "not for profit" homes, and show that if they are modeled as altruist utility maximizers subject to a break even constraint, then all of the results in this paper apply to "not for profit" homes as well. Further, Gertler (1985) provides empirical evidence that suggests that proprietary homes and "not for profit" homes do not compete in the same market.

[4] The source of statistics referenced in the introduction is The U.S. Department of Health and Human Services' publication, Health, United States 1980.

[5] The CON review boards are not just rubber stamps. Indeed, there is some casual evidence to support the assumption that CON capacity and entry constraint are binding. First, most nursing homes operate at above 90% of capacity. Second, there is a long list of individuals in hospitals waiting for openings in nursing homes. Finally, States such New York have imposed moratoriums on nursing home expansion.

[6] Consider the religious affiliation of a nursing home. It is likely that Jewish patients receive more utility from the fact that they are receiving care in a Jewish home than non-Jewish patients. Hence, the fact that the home is Jewish improves the quality of care specifically to Jewish patients.

[7] Our functional form assumptions, linear utility functions and a uniform distribution of patients, are common choices in the spatial competition literature. For example, see Salop (1979).

[8] Individual i is indifferent between home j and j+1 if $U_{ij} = U_{i,j+1}$. Substitution of (1) into this expression and replacing $D_{i,j+1}$ with $(1/N - D_{ij})$, allows us to solve for (2).

[9] The profit maximizing first order conditions in the "flat rate" case are

$$\pi_P = (P - R)X_P + X = 0$$

$$\pi_Q = (P - R)X_Q - C_Q = 0.$$

Substitution of the "private pay" demand function and its appropriate derivatives, evaluated at the symmetric Nash equilibrium, into these conditions yields

$$\pi_P = -(P - R)(\alpha - P + 1/N) + (1/N)(\alpha - P) = 0$$

$$\pi_Q = (P - R)(\alpha - P) - C_Q = 0.$$

By the implicit function theorem, the slope of the price condition is

$$dP/dQ = -\pi_{PQ}/\pi_{PP} ,$$

and the slope of the quality condition is

$$dP/dQ = -\pi_{QQ}/\pi_{QP} .$$

The second order conditions for a maximum require that the π_{PP} and π_{QQ} terms be negative at the symmetric Nash equilibrium. From the first order conditions the remaining terms are

$$\pi_{PQ} = 0$$

$$\pi_{QP} = (P - R) + (\alpha - P) .$$

Solving $\pi_P = 0$ for $(P - R)$, and substitution of that into the above expression yields

$$\pi_{QP} = (\alpha - P)^2/(\alpha - P + 1/N) \geq 0.$$

Therefore, $\pi_Q = 0$ is upwards sloping.

[10] The proof that $\pi_P^c = 0$ and $\pi_Q^c = 0$ are both upwards sloping follows the same line of arguement as footnote 9 presented for the "flat rate" case. Further, from the second order condition, $\pi_{PP}^c\pi_{QQ}^c - \pi_{PQ}^c\pi_{QP}^c \geq 0$, $\pi_Q^c = 0$ is steeper than $\pi_P^c = 0$.

[11] For example, see Bishop (1980), Frech and Ginsburg (1980), Ullmann (1983), and Palmer and Cotterill (1983).

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