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THE PRICING OF PRIMARY CARE PHYSICIANS' SERVICES: A TEST OF THE ROLE OF CONSUMER INFORMATION*

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1. Introduction

In a previous paper Satterthwaite (1979) discussed the market for a good which might be termed a "reputation" good. A reputation good, as distinct from the "search" or "experience" goods of Nelson (1970), is a product or service for which (a) sellers' products are differentiated, and (b) consumers' search among sellers is conducted primarily by asking relatives, friends, and associates for recommendations. Satterthwaite showed that if a monopolistically competitive industry sells a reputation good, then an increase in the number of sellers may cause the industry's equilibrium price to rise, not fall as is usually expected. In this paper we report some confirming, though tentative, empirical evidence for that idea, which may be labeled the "increasing monopoly" theory. We show that the pattern of average prices charged in 1973 by primary care physicians (general practitioners, pediatricians and internists) within a cross-section of 92 large United States metropolitan areas is consistent with this theory and inconsistent with a popular alternative, the target income theory.

Primary medical care is an appropriate market on which to test Satterthwaite's theory because it is a reputation good that is sold in monopolistically competitive markets within metropolitan areas. Primary medical care can be defined a reputation good because it satisfies the definition's two criteria. First, each physician delivers a service that is differentiated in place, style, and technical competence from the service provided by any other physician. Second, based on both causal empiricism and the empirical research of Booth and Babchuk (1972), consumers do not typically search for a primary care physician in a direct manner; they depend primarily on the recommendations of those they trust.[1] The markets for primary medical care in

metropolitan areas are classified as monopolistically competitive because physicians are price setters and metropolitan areas contain sufficient numbers of competing physicians to eliminate oligopolistic interactions.[2]

Moreover, the evidence is that price does still play an important role in allocating demand for primary care, unlike the case of surgery where health insurance typically covers almost all of the physician's bill. Specifically, according to a 1973 survey, only 21% of specialists in internal medicine indicated that their patients' insurance generally covers their usual charge for a follow-up office visit. The comparable figures for general practitioners and pediatricians were 14% and 13% respectively.[3] Additionally, based on 1967-68 data, Sloan and Steinwald (1975) estimated that for a typical physician the marginal coinsurance rate for an office visit is about 80%, i.e., on average the patient pays 80% of the fee and the insurance company pays only 20%.[4]

Within the specific context of primary medical care, the increasing monopoly model consists of two propositions and a conclusion. First, if the number of physicians within a community increases, then consumer information about each physician decreases; thus, consumers have a more difficult time in the search for a new physician. Second, if this search becomes more difficult, then consumers become less price sensitive, i.e., each physician's demand curve becomes less elastic. Consequently, an increased supply of physicians, or an increase in any other factor that makes consumers' search more difficult, may cause physicians' equilibrium fees to rise. This is because a general principle of monopolistic competition is that less elastic firm demand curves imply a higher equilibrium price in the industry.

The second proposition and the conclusion are intuitive and need no justification here.[5] The first proposition, however, merits further explana-

tion. Satterthwaite (1979) formally demonstrated that proposition within the context of a particular model of information flow and search. Pauly and Satterthwaite (1980) derived a somewhat different and less formal model. Salop (1977) and Cross (1978) used distinct approaches to show related conclusions. Here we briefly describe the intuition behind Satterthwaite's demonstration of the proposition. This description is given with the caveat that it may be derived in a variety of ways.

If the number of primary care physicians in a community is small--three for example--then each physician has a detailed reputation throughout the community. Each consumer is likely to have friends who go to the three and can remember what the friends have reported about each. If, however, the number of physicians in the community is larger--thirty, for example--then each one's reputation is less defined. Consumers cannot accurately catalog in their minds what they hear about thirty different physicians; they may not remember which bit of information matches with whom. Therefore, as the number of physicians within the community increases, the quality of information consumers have concerning their relative qualifications and prices declines. This makes the consumer's search less efficient, which is the content of the second proposition.

At the policy level, the most commonly discussed alternative model of physician pricing is the "target income" model (see Dyckman, 1978). In its simplest form the target income model states that physicians in a specific area have a target income to which they aspire. When supply increases, providers prevent their incomes from falling by changing their advice to patients and, thus, creating demand for their services. They then increase their prices along that new demand curve. An extended version of the theory (Evans, 1974), drops the notion that there is a single target income, but

hypothesizes that physicians are willing to substitute money income for diagnostic accuracy when supply increases. Thus when income falls, physicians produce less accuracy, shift their demand curves out, and possibly increase price. As indicated by Sloan and Feldman (1979), and as emphasized by Reinhardt (1979), this extended target income model is compatible with literally any relationship between physician supply and price.

It should be emphasized that the increasing monopoly and target income models differ radically in their concepts of patient and physician behaviors, even though both models conclude that an increase in physician supply may be accompanied by a rise in price. In the target income model, consumers are passive and easily manipulated while physicians are willing to sacrifice some money income because they dislike engaging in such manipulation. In the increasing monopoly model, consumers are maximizers who are constrained by significant--but not prohibitive--costs of search; thus it is consumer search itself, rather than additional arguments in physicians' utility functions, that constrains physicians' income-leisure maximizations.

The remainder of the economic literature on physicians' fees falls into two classes: competitive industry models and monopolist models. The first class includes works by Feldstein (1970) and Fuchs and Kramer (1972). These models specify that physicians are price takers, an assumption that the obvious price-setting power of individual physicians contradicts. The work of Sloan (1976), Steinwald and Sloan (1974), Frech and Ginsburg (1975), and Masson and Wu (1974) are examples of monopolist theories. These theories assume that the physician is a price-setting monopolist who maximizes profit (or utility). Each of these papers provides insights into how a physician may react to particular changes in his or her external environment. For example, Frech and Ginsburg present a clear exposition of how different types of insur-

ance are likely to affect the physician's pricing decision. These models, however, cannot determine how an increased supply of physicians affects price because they do not include theories of how increased supply affects the demand each individual physician faces.[6]

All of these models assume that the physician service under discussion is homogeneous. If quality varies, and if increases in quality are associated with higher physician population ratios (or any other independent variable), then virtually any conclusion becomes possible. As Newhouse (1978, p. 60) has noted, the possibility of unobserved quality variation is the Achilles heel in attempts to verify the target income theory from empirical data. The same is true of the increasing monopoly model; if the assumption of constant quality is not accepted, then the predictions of the increasing monopoly theory about the directions of the effect of various information measures on price do not hold. The theory is still supported by a finding that consumer information levels make a difference in explaining price, but the signs of coefficients no longer have firm interpretations and, as a consquence, insignificant coefficients are consistent with the theory.

These problems concerning quality variation arise for two reasons. First, it is always possible (and may frequently be argued with some degree of plausibility) that the empirical confirmation of a predicted relationship between a particular variable and price reflects not the theory being tested but rather an association between the variable and unobserved quality. Second, and more serious, the theoretical predictions of the effect of variables on price are valid only if quality is constant. The prediction that quality-constant price will fall in response to a given variable does not imply that price will necessarily fall when quality is not constant. Instead, depending on the elasticity of demand for quality, price may rise as quality

increases even further. So failure to confirm a prediction from a quality-constant model in a quality-variable world need not be interpreted as disproving the model as a whole, but rather may be interpreted as consistent with quality variation.

Some empirical work has been done on the question of how the quality and attributes of physicians' services vary across communities. Sloan and Lorant (1976) found that there is a positive and statistically significant relationship between physicians per capita and length of visit of waiting time, but that the elasticity is quite small. Sloan (1977) estimated travel time to reach a physician in the central city areas of the country. The range of mean times for all physicians from the lowest to the highest observations was only 11 minutes (from 15 minutes to 26 minutes); in a multiple regression, mean travel time was not significantly related to physician-population ratios. These results indicate that in the dimension of travel time systematic quality variation does exist across communities, but that it may not be very great or important. Consequently, the assumption of uniform average quality across market areas may be acceptable. If it is, then the test we develop below permits the increasing monopoly model to be rejected as well as confirmed. If it is not acceptable, then this test, as pointed out in the previous paragraph, can only confirm the increasing monopoly theory or be silent concerning it; it cannot reject it.

This paper reports tests of the increasing monopoly model and of the target income model. The competitive and monopolistic models are not tested because, as indicated above, the former is clearly inappropriate and the latter is incomplete. The results we obtained are consistent with the increasing monopoly model. Specifically, the variables representing consumer information levels are highly significant and have signs consistent with the

constant quality increasing monopoly model. The target income model performs comparatively poorly. These results that increased consumer information lowers physicians' fees is consistent with the results that Benham (1972), Benham and Benham (1975), and Feldman and Begun (1978) obtained in their studies of how bans on the advertising of optometric services affects the price of that service. Their conclusion has been that banning advertising, which presumably decreases consumer information, causes price to increase even if quality is held constant.

The results of this paper must be considered tentative because, as is described below, proxy variables are used to represent consumer information and we are uncertain as to how well they do their job. Yet the data we have used appears to be the best available without embarking on an expensive primary data collection effort. Therefore, the following conclusion seems warranted. Available data is consistent with the hypothesis that consumers do significantly constrain the pricing decisions of primary care physicians through their choices of which physicians to patronize. This is contrary to the conventional belief that consumers are powerless within the medical care market. In particular, within those metropolitan areas where information about competing primary care physicians appears to be fairly good, the prices physicians charge tend to be relatively low. This suggests that further, more definitive empirical research into the effect of consumer information has on the medical care market is appropriate. This is especially so because of the role consumer information plays in the continuing public policy debate concerning whether regulation in the medical care market should encourage competition or should adopt a public utility or revenue limitation model.

2. Towards Empirical Testing

Both the increasing monopoly and the target income theories predict that an increase in the number of primary care physicans within a community can cause an increase in the equilibrium price level for physicians' services. The two theories, however, are empirically distinguishable because (a) they postulate different mechanisms by which the number of physicians affects price, and (b) these disparate mechanisms have dissimilar empirical manifestations. The purpose of this section is to describe those differences that we use to distinguish the two theories.

The first difference is that the two theories disagree on what precise measure of the number of physicians in a community is most appropriate for explaining the equilibrium price of physicians' services in that community. Specifically, the increasing monopoly model makes the equilibrium price level of primary care physicians' services an increasing function of the difficulty consumers have in searching for an appropriate physician. Moreover, it proposes that a determinant of the difficulty of search is the total number of competing physicians among whom the consumer may choose: more physicians within the market area in which the consumer lives and works means poorer consumer information and therefore more difficult search. This relation between price and the number of physicians within the market area contrasts with the direct relation between price and the per capita number of physicians postulated by the target income theory: more physicians means less demand per physician and therefore higher prices to achieve the target income.

As a consequence, while the two models agree that more physicians cause higher prices, the increasing monopoly theory has as its critical variable the number of physicians within the market area, and the target income model has as its critical variable the per capita number of physicians. Indeed, because

it is based on the maximization of utility in income and leisure, the increasing monopoly model predicts that, total number of physicians held constant, physician price should be inversely rather than directly related to physicians per capita. This prediction follows from the notion that the opportunity cost of physician time decreases as a given total level of demand is spread over a larger number of physicians.

Measuring the number of physicians per capita within a metropolitan area (SMSA) is straightforward since data exists on both the number of physicians and population within the SMSA. Direct measurement of the number of physicians in the market area of a typical consumer within a given SMSA is not easy since no data appears to exist on how large such a market area is.[7] We can, however, propose some proxy variables that allow us to estimate the relative numbers of physicians within a typical consumer's market area in different cities. In all but smaller isolated cities, a consumer's market area will be only a fraction of the geographical area of the community. For example, a west-sider may only consider west-side and downtown physicians, but not east-side physicians. Consequently, except for small cities, the total number of sellers in the SMSA will not be a suitable measure. The simplest case for which a proxy measure could be obtained would occur if travel time per mile were the same in all cities, if consumers sought only sellers who could be reached at a given travel cost from their homes, and if population in each community were distributed at uniform density over the community's land area. These conditions would imply that the number of sellers in a consumer's market area is proportional to the number of sellers per unit area in the community.

In reality, travel time per mile does vary from city to city, and sellers in the downtown area (if the city has a defined downtown) may be accessible to

all consumers while suburban sellers may not be. For example, consumers in a congested city with low travel speed and no well-defined downtown would tend to choose their physicians from a small market area. Two variables that a priori appear to be related to travel time and community geography (existence of a downtown) are the fraction of the work force that takes public transportation to work and population density. These variables, when combined with the numbers of sellers per unit area, are reasonable proxies for the number of physicians within a typical consumer's market area.[8]

The second difference between the two theories that allows us to distinguish empirically between them is that for the increasing monopoly model the linkage between the number of physicians and equilibrium price is indirect via the consumer's difficulty of search. It does not involve a direct dividing up of community demand as is the case for the target income model. This means for the increasing monopoly model, but not for the target income model, we must consider what factors may affect the consumer's difficulty of search in addition to the number of physicians in the market area. Since consumer search for a new physician usually takes the form of a series of inquiries for recommendations, we hypothesize that there are two factors which are appropriate proxies for the flow of information in the community.

First, if the community has a high proportion of recently arrived residents, then on average consumers will have little direct experience with sellers in the community and, compounding the problem, relatively few close friends with whom to compare notes. The result will be a relatively low level of consumer information concerning the physicians in the community, more difficult consumer search, and consequently, a high equilibrium price. Bott (1971) in her classic work, Family and Social Network, discusses how geographic mobility decreases families' "connectedness" within their communi-

ties, though she does not discuss how this decrease affects their health care choices.[9] The specific difficulties new residents face in finding and judging medical services have been discussed by Packard (1972). Goldman and Grossman (1978) in their study of pediatric care use the number of years a family has lived in the community as an indicator of that family's efficiency in searching for a pediatrician.[10]

Second, families that are headed by a single female are likely to have fewer social contacts and less time available for search; therefore, search is likely to be harder for such families. As McKinlay (1972, p. 126) has noted, there has been very little documentation of the role played by kinship and family networks in influencing health care choice, and there apparently has been even less study of its influence on single-parent households. There is, however, a substantial literature on the problems that marital disruption causes in the functioning of individuals and families.[11] Brandwein, Brown, and Fox (1974) have observed that women in female-headed households are more likely than other women to work and less likely to have another adult to help them with family responsibilities. The result is that such women are pressed for time and are likely to be in a permanent "state of process overtime."[12] Glasser and Navarre (1964) believe that this lack of time, together with societal attitudes toward single women heading families, does affect the communication and information of such women. They state (p. 102):

> The female who has taken on the breadwinner role may be cut off from the sources of information pertinent to the female role as she misses out on neighborhood gossip about the symptoms of the latest virus prevalent among the children, events being planned, the best places to shop, etc.
>
> Finally, the solitary parent is likely to be limited in the social ties that are normal channels of communication. Most social occasions for adults tend to be planned for couples and the lone parent is often excluded or refuses because of discomfort of being a fifth wheel. Her responsibilities to home and children tend never to be completed and provide additional reasons for refusing invitations.

Thus, because of their lower level of consumer information, communities that have a high proportion of households headed by females may be expected to have a high equilibrium price for physicians' services.[13] Neither of these factors--the proportion of long-term residents and the proportion of households headed by females--is usually considered by economists to be a significant determinant of the community demand for health care; consequently, neither of them have a place in the target income model.[14]

These differences allow us to compare the two theories empirically. If the proxies for the number of physicians in a typical consumer's market area and for information flow among consumers have significant effects on the equilibrium price level for physician services, then that is evidence for the increasing monopoly theory. If, on the other hand, these variables are insignificant and the physicians per capita variable is important, then that is evidence for the target income theory or, if one does not accept the constant average quality assumption, evidence neutral to both theories.

A cautionary note is necessary concerning our use of proxy variables. It is largely a subjective matter to determine which observable variables should be thought to proxy which notions. Our strategy was to select proxies based on a priori speculation concerning the meaning of those community characteristics for which quantitative measures exist. We specifically avoided any "data mining" or experimentation techniques, and the results reported here represent virtually our first and only specification. There were no equally plausible proxies that were tried and discarded. This strategy is consistent with our goal of providing the best possible comparison of the increasing monopoly and target income models within the limits of currently available data. A primary data collection project that directly measures consumer information would have the potential for yielding more definitive results.

3. Price Equations for the Two Models

For each model we estimated a single equation explaining physician price setting behavior. We did not estimate full, simultaneous systems of equations because, first, we did not have sufficiently rich data and, second, we can accomplish our purpose of testing for the role of information with the single equation approach. This section describes the derivation of the two price equations under the assumption of quality being constant across communities.

In the increasing monopoly model, the physicians' price setting decision is that of a monopolistic competitor: set price so as to equate marginal revenue to marginal cost. Thus the physician picks his price P to satisfy

$$MC = P(1 + \frac{1}{e}) \qquad (1)$$

where the left-hand side is his marginal cost, the right-hand side is his marginal revenue, and e is the elasticity of his firm level demand curve

The determinants of the physician's marginal cost are both the price of inputs he purchases (W) and the implicit price of his own time. This latter price varies with how hard he works--as a physician works longer hours, the value he places on his time presumably rises--and the cost of living in his community. How hard a physician works in a community depends both on the per capita level of demand for physicians' services in his community (Y) and the number of physicians per capita (MP). An example of one component of Y is median family income in the community. The idea behind these variables is that if per capita demand increases, then each physician must work harder if it is to be satisfied; however, if the per capita supply of physicians increases, then the demand each physician serves drops and he works less

hard. Thus MC is a function of W, Y, and MP where W serves the twin role of being an index for both the prices of the inputs the physician purchases for his or her professional practice and for the cost of living.[15]

According to the increasing monopoly model, the elasticity of the physician's demand curve (e) depends on the level of consumer information. As discussed in the previous section, the level of consumer information depends both on the social and demographic characteristics of the community (SOCDEM), such as the proportion of household headed by females, and on the number of physicians in the typical consumer's market area. The number of physicians in a consumer's market area depends both on the density of physicians per square mile (MD) and on geographic and population characteristics (GEO) such as population density. Thus e is a function of MD, SOCDEM, and GEO.

Equation (1) can be solved implicitly for P as a function of the variables on which MC and e depend:

$$P = P_{IM}(MP, MD, SOCDEM, GEO, Y, W). \qquad (2)$$

There are two main features to note about (2). First, MP and MD are endogenous since the price P physicians charge in a community partly determines how many physicians decide to locate in that community. Consequently, estimation should be done by two-stage least squares or some other technique for estimating a single equation within a system of simultaneous equations.

Second, the critical variables with respect to the increasing monopoly theory are MD, SOCDEM, and MP. The predictions are that physician density (MD) and the two SOCDEM variables, proportion of residents who moved in the past five years and the proportion of families having female heads, should have positive signs because increases in each should lead to decreases in consumer information. The physician-population ratio (MP) should have a

negative sign since an increase in it would reduce the level of demand each physician faces.[16]

The modified target income theory, as described by Evans (1974), Sloan and Feldman (1979), and Pauly (forthcoming), differs from orthodox pricing theories in assuming that physicians are only partially constrained by the consumer demand function. Physicians are assumed to be able to induce buyers to purchase more, from each physician and in total, at a given price. This inducement (demand creation) does require some reduction in the accuracy of information provided by the physician, and such reduction has a utility cost to the physician. While there is probably some upper limit to the extent of possible demand creation, within that limit physicians have considerable discretion over the money income they receive. Physicians generally do not reach that limit because to do so would have a psychic cost to them that exceeds the value of the extra income.[17]

The physician thus has two decisions to make: what price (P) to charge and how much demand creation to engage in. Let D be an index of the discretionary influence on demand that he or she exercises. Both of these decisions will depend on the per capita level of demand for physicians' services in the community (Y), the number of physicians per capita (MP), and the price of inputs he purchases and the cost of living (W). These are the variables that determine for his chosen combination of P and D the quantity of care that consumers demand from him, his income, his monetary costs, and his psychic costs. Thus,

$$P = P_{TI}(MP,Y,W) \qquad (3)$$

and

$$D = D_{TI}(MP,Y,W). \qquad (4)$$

Since D is not observable directly, we only estimate (3). As is the case for the increasing monopoly model, MP is endogenous; two-stage least squares is therefore an appropriate estimation technique. The variables that may be critical in distinguishing this theory from the increasing monopoly theory are the physician-population ratio (MP) and the information flow variables (MD, SOCDEM, GEO) that in the increasing monopoly model are predicted to affect e. The modified target income model implies that MP may have a positive sign instead of the negative sign that the increasing monopoly model predicts.[18] It also predicts that the information flow variables (MD, SOCDEM, GEO) should not contribute to the explanation of price because it does not predict a role for information.

4. Variable Definitions and Data Sources

The data from which we have estimated the price equations of both the increasing monopoly model and the target income model is an early 1970's cross section of 92 of the largest SMSAs in the United States.[19] The independent variable is an index of the fee charged for a "routine office visit" from a primary care physician. Primary care physicians are defined as general practitioners, pediatricians, and internists. This is an appropriate and tractable set of prices to use for testing the two theories because, as was discussed in the Introduction, insurance coverage, excepting Medicaid and Medicare, is uncommon for this type of service. This fee information was collected by Mathematica, Inc. through a telephone survey in November and December 1973. Data regarding the number of primary care physicians in each SMSA were obtained from an American Medical Association survey of physicians taken in December 1969. The other variables used, which describe each SMSA's economic, social, and demographic characteristics, were obtained from the

County and City Data Book, 1972. With a few exceptions, all data used from it are based on the April 1970 United States Census of Population. Details of the variables and their sources are contained in the sub-sections that follow. Table 1 summarizes these details. Table 2 lists the means and standard deviations of the variables.

Price of Primary Care Physicians' Services. Data on primary care physicians' fees was obtained from Woolridge's report (1975, Table 2A) on the Mathematica telephone survey of physicians' offices in 100 largest SMSAs. For these SMSAs, her report lists weighted averages of the prices that the general practitioners, internists, and pediatricians reported themselves as charging for a routine office visit in November and December 1973. The weights used in constructing the average for each SMSA were the relative proportions of general practitioners, internists, and pediatricians actually practicing in that SMSA.

Primary Care Physicians Per Capita and Physicians Per Square Mile. The total number of primary care physicians in each metropolitan area as of December 31, 1969 was obtained from American Medical Association data compiled by Haug and Roback (1970, Table 7). That data listed for each metropolitan area both the number of office-based general practitioners and the number of office-based medical specialists; the sum of these two figures provides a measure of the number of office-based primary care physicians. Office-based surgeons and other specialists are not counted as primary care physicians. This sum includes a certain number of medical specialists who are office-based but who do not deliver primary care. Offsetting this bias, to an unknown degree, are those office-based surgeons and hospital-based physicians who deliver some primary care.

The number of primary care physicians per capita (MDPCPC) was obtained by

dividing the estimates of the total number of primary care physicians by the SMSA's total population (Table 3, Item 3, U. S. Bureau of Census, County and City Data Book, 1972; abbreviated (CC, T3, I3) henceforth). The number of primary care physicians (MDPCM2) per square mile within the urbanized parts of each SMSA was calculated by multiplying the primary care physicians per capia (MDPCPC) by the population density of the SMSA within its urbanized sub-areas (ADJDEN: CC, T4, I204). The population density within the urbanized sub-area was used instead of the overall population density because the geographical boundaries of an SMSA, which is defined in terms of counties, may include large amounts of rural land. Urbanized areas, however, are defined in terms of a certain thickness of settlement. Consequently, the urbanized population density gives a much better estimate of how heavily population within an SMSA is concentrated than does the SMSA population density.[20]

Consumer Information Proxies. According to the increasing monopoly model developed above, price is inversely related to the degree of consumer information and directly related to the degree of consumer ignorance. Proxies for the difficulty of consumer search are physician density (MDPCM2) as defined above, the percent of families that have a female head (FEMH: CC, T3, I51), and the percent of occupied housing units whose occupants had moved into the unit during the preceding five years (MOVED: CC, T3, I93).[21] Additionally the proportion of workers who used public transit to reach their jobs during the week preceding the census (PUBTR: CC, T3, I48) and the population density within the urbanized area (ADJDEN) may be indicators of consumer mobility within the SMSA; in other words, a high proportion of workers using public transit or a high population density may indicate that travel speed in the SMSA is low. Consequently, these two variables may be imperfect, inverse measures of the real extent of the market area in which the typical consumer

shops for a provider. In addition, PUBTR may also embody information about the SMSA's geographical configuration.

Per Capita Demand Determinants. Both the target income model and the increasing monopoly model predict that the overall level of demand for medical care in the SMSA may affect the pricing decisions of providers. There are five variables included in the analysis that are determinants of the per capita demand for medical care within each SMSA: median family income (FAMINC: CC, T3, I58), percent of population over 65 and thus eligible for Medicare (AGED: CC, T3, I14), percent of population under 5 (KIDS: CC, T3, I12), proportion of population that is black (BLACKS), percent of persons receiving benefits from the aid to dependent children program and thus eligible for Medicaid (PAFDC), and the median years of schooling completed by persons 25 years old and over (SCHOOL: CC, T3, I24).[22] These variables, especially KIDS and SCHOOL, may also be determinants of the level of consumer information, but our feeling is that their primary effect is on per capita demand. Moreover, since the hypothesis we are testing in the increasing monopoly model is that consumer information is an important determinant of price, classifying KIDS and SCHOOL as demand determinants instead of information flow variables makes our test stricter.[23]

Proportion of General Practitioners. The price data used, as described above, is a weighted average of general practitioner fees, internist fees, and pediatrician fees. Since general practitioners tend to charge lower fees than do primary care medical specialists, we must in our regressions control for the proportion of primary care physicians that are general practitioners. This variable (GPMDPC) was calculated by dividing the number of office based general pracitioners by the total number of primary care physicians as defined above.

In both models GPMDPC is classified as an exogenous variable for the 2SLS estimations. In a more complete model it would be endogenous because the comparative levels of general practitioner fees versus medical specialists fees generally might affect the relative numbers of general practitioners and medical specialists who practice in an SMSA. In this model, however, GPMDPC is considered exogenous because the price index (P) used as the dependent variable is a weighted average of general practitioner and primary care medical specialist fees. Consequently, a high value for P in a particular SMSA does not convey information about the differential attractiveness of that SMSA to general practitioners and specialists. It only means that the SMSA is attractive to primary care physicians as a group, not to one particular speciality or another.

Other Variables. Under both theories, input prices are expected to affect prices primary care physicians charge. The one measure of input prices used was the average hourly industrial wage in the SMSA (W).[24] Providers' location decisions, which determine the physician-population ratio (MDPCPC) and the physician density measure (MDPCM2), are affected by the SMSA's attractiveness as a place to live and work as well as by its income potential. Fuchs (1978) has suggested that hotel receipts per capita (ATT) within the SMSA is a reasonable indicator of attractiveness.[25] His idea is that people visit relatively attractive cities (and spend money on hotel accommodations) more often than relatively unattractive cities. Other variables that influence the attractiveness of a city are the percent of the labor force that are professionals or managers (PROF: CC, T3, I45), the per capita direct general expenditures by local government in 1967 (LOCGOV: CC, T3, I109), the size of the community (POP: CC, T3, I3), and how fast the community is growing (POPCHNG: CC, T3, I5). These attractiveness variables, since they affect

physician location decisions without directly affecting physicians' pricing decisions, are used in the two-stage least square estimates as the excluded exogenous variables.

5. Empirical Results

Table 3 presents the two-stage least squares regression results for the price equations of the two models. Column one, which presents the results for the increasing monopoly model, shows that it is consistent with the data under the assumption of constant quality. Specifically, the four variables that relate to the difficulty of consumer search (MDPCM2, FEMH, MOVED, and ADJDEN) and for which we were able to predict a sign, have their expected signs and are significant at the 5% level. Additionally, the fifth variable (PUBTR) that relates to the difficulty of consumer search is negative and significant at the 5% level. Its sign was indeterminant because a high proportion of workers riding public transit could indicate either a very congested city, reducing the number of physicians among whom consumers choose, or a city with a well-defined downtown and excellent public transportation, increasing the number of physicians among whom to choose. Finally, the coefficient on the physician-population ratio (MDPCPC) is negative and significant. Thus, in accordance with the increasing monopoly theory, a large number of physicians per capita is associated with reduced price, presumably by reducing each physician's workload and, consequently, reducing each physician's opportunity cost for foregone leisure.

The variables that relate to the level of community demand have easily interpretable coefficients. For example, the percent of the population under five has a significant negative coefficient while the percent of the population sixty-five and over has a significant positive coefficient. The negative

sign of the former coefficient may reflect the facts that pediatric office care is less likely to be insured and mothers of young children tend to be unusually aggressive, social consumers of care for their children. The positive sign of the latter coefficient may reflect the facts that care for the aged is largely insured through Medicare and the aged tend to be socially isolated. The coefficient on PAFDC is not significant; this may indicate either that Medicaid does not have a strong influence on price or that PAFDC is an inadequate measure of Medicaid.

The results shown in column two of Table 3 indicate why the target income model is attractive. The price equation of the target income model does not include any variables not present in the increasing monopoly model, but it does omit some of those variables that are included in the increasing monopoly model. The physicians per capita (MDPCPC) variable is positively related to price in the regression, which is consistent with the predictions of the target income model and inconsistent with the increasing monopoly model.

Nevertheless, based on the data set used the target income model must be rejected in favor of the increasing monopoly model. Let the null hypothesis be the target income model and the alternative hypothesis be the increasing monopoly model. The two hypotheses differ only in that the null (target income) hypothesis predicts that the information flow variables (MDPCM2, MOVED, FEMH, PUBTR, and ADJDEN) all should have zero coefficients while the alternative (increasing monopoly) hypothesis predicts that they should have nonzero coefficients. Thus the appropriate test is an F test for the five informational flow variables' joint significance within the increasing monopoly theory's price equation.[26,27] The F value that results (with 5 and 77 degrees of freedom) is 10.82; it indicates that those variables are significant at the 1% confidence level.

6. Conclusions

The results of this study must be regarded as tentative. Direct measures of consumer information on fee levels and better measures of input prices would have been desirable. Good data on the cost-of-living across this sample of SMSAs is unavailable; we were forced to rely on the wage index (W). Nevertheless the conformity of the results with the increasing monopoly model is striking. Not only is the additional measure of physician stock (physician density: MDPCM2) suggested by that model far more useful in explaining price than the physician-population ratio (MDPCPC) taken alone, but the other information flow variables suggested for inclusion by the increasing monopoly model are also significant.

These results are evidence against the target income theory in the following limited sense. The significance of the information flow variables suggests that the modified target income theory is not the sole, or even the main determinant of primary care physicians' prices. However, these results are not grounds for excluding the modified target income theory from further thinking about the medical care market place's workings. We see no reason why the increasing monopoly theory need be considered as a disjoint alternative to the modified target income theory. In fact, it seems clear on the basis of casual empiricism that physicians do have some leeway to generate demand. Thus, a balanced conclusion is that the increasing monopoly model must be regarded as a strong competitor (or complement) to the target income model (and with the neoclassical competitive model) in explaining price formation for physicians' services. Moreover, it is possible that the increasing monopoly model could explain the pricing behavior of other service industries.

The main implication of these results is that consumers, through their market choices, may exert substantial influence over the pricing decisions of primary care physicians. In other words, these results suggest that if consumers have access to comparative information about primary care physicians, then collectively they may be quite powerful in their dealings with primary care physicians. These results, however, do not give practical advice on how to improve consumer access to such information.

TABLE 1
VARIABLE NAMES, DESCRIPTIONS, AND SOURCES

Dependent Variable	Endogenous Variables	Source
P1973	Price index for routine office visit to a primary care physician, 1973	Mathematica, Inc. telephone survey
Consumer Information		
MDPCM2	Primary care physicians per square mile of urbanized area, 1970	American Medical Association Survey and County and City Data Book, 1972 (CC72)
MOVED	% of housing units occupied by residents who moved into unit during 1965-1970	CC72
FEMH	% of families that have female heads, 1970	CC72
PUBTR	% of workforce who uses public transport to reach work, 1970	CC72
ADJDEN	Population per square mile within the urbanized area of the SMSA, 1970	CC72
Input Prices and Cost of Living		
W	Average industrial wage rate for production workers, 1967	CC72
Proportion General Practitioners		
GPMDPC	Proportion of primary care physicians who are general practitioners, 1970	AMA survey

TABLE 1 (continued)

Demand Determinants

MDPCPC	Primary care physicians per capita, 1970	AMA survey and CC72
FAMINC	Median family income, 1970	CC72
KIDS	% of population under 5, 1970	CC72
AGED	% of population 65 and over, 1970	CC72
SCHOOL	Median years of schooling for those 25 and over, 1970	CC72
BLACKS	Proportion of population that is black, 1970	CC72
PAFDC	% of population receiving aid to families with dependent children	CC72

Attractiveness of SMSA

ATT	Hotel expenditure per capita, 1967	CC72
PROFMAN	% of workforce who are professionals or managers, 1970	CC72
LOCGOV	Per capita direct, general expenditures by local government, 1967	CC72
POP	Total population, 1970	CC72
POPCHNG	% population change between 1960 and 1970	CC72

TABLE 2
MEANS AND STANDARD DEVIATIONS OF VARIABLES

	Mean	Standard Deviation
MDPCM2	1.49	.78
MDPCPC	.0004	.0001
MOVED	52.6	7.5
FEMH	11.1	1.9
PUBTR	6.98	7.13
ADJDEN	3220	1230
W	3.02	.47
GPMDPC	.505	.110
FAMINC	1006	121
KIDS	8.52	.709
AGED	9.13	2.36
SCHOOL	12.0	.41
BLACKS	.114	.086
PAFDC	5.03	1.75
ATT	3.20	2.23
PROFMAN	23.9	3.4
LOCGOV	243	70.0
POP	1,180,000	1,630,000
POPCHNG	20.7	17.9
P1973	8.45	1.21

NOTE: Some variables are scaled

TABLE 3
PRICE EQUATION ESTIMATES
(t statistics in parentheses)

	Increasing Monopoly	Target Income
Information Variables		
MDPCM2	4.38 (2.5)	
MOVED	.0925 (6.6)	
FEMH	.226 (2.4)	
PUBTR	-.0526 (2.4)	
ADJDEN	-.00165 (2.0)	
Physician Supply		
MDPCPC	-17340 (2.2)	8290 (2.6)
Input Price		
W	.694 (2.7)	.186 (.57)
GP Proportion		
GPMDPC	-2.23 (2.4)	-1.75 (1.5)
Demand Level		
FAMINC	.00337 (2.2)	.000120 (.07)
KIDS	-.539 (2.4)	.0375 (.1)
AGED	.101 (1.9)	.0907 (1.3)
SCHOOL	-.433 (1.2)	.541 (1.7)
BLACKS	-1.45 (.81)	4.61 (2.5)
PAFDC	.0102 (.16)	.0364 (.5)
Miscellaneous		
CONSTANT	12.6 (1.8)	-2.80 (.5)
Excluded Exogenous Variables	ATT PROFMAN LOCGOV POP POPCHNG	ATT PROFMAN LOCGOV POP POPCHNG

FOOTNOTES

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[1]Gourash (1978, p. 416) in reviewing the literature on help-seeking states: "A parallel body of research has demonstrated the central role of the social network in decision-making and referral to formal services. Investigations in which respondents named the people who influenced their decision to seek health care from a new medical facility (Booth & Babchuk, 1972), to request treatment at psychiatric hospital (Liberman, 1965), and to have illegal abortion (Lee, 1969) revealed that family members, friends, or co-workers comprised at least 75% of the people named as influential. In addition, these same individuals were reported to be instrumental referral agents once the decision to seek professional assistance had been made. In a study of informal community care-givers, Leutz (1976) reported that one of the most frequent forms of assistance supplied to help-seekers was referral to human service agencies."

[2]Conventional wisdom nothwithstanding, there is little evidence that primary care physicians have engaged in price-fixing conspiracies during the recent past.

[3]Figures are from Table 1 (p. 277) of Sloan and Steinwald (1975).

[4]Estimates are from Table 5 (p. 285). Moreover, Sloan and Steinwald go on to state that: "Although Table 5 is based on 1968 data, the . . . marginal co-insurance curves for persons with private health insurance probably match today's."

[5]They are analyzed and justified in detail within Satterthwaite (1979).

[6]Sloan's paper (1976) is a partial exception to this statement. He includes the physician-population ratio (PP ratio) additively in his specification of the demand function for each physician's services. The effect of PP entering additively is that an increase in the PP ratio shifts the demand curve toward the origin in a parallel manner. This causes, for a given price, the demand facing the physician to become more elastic. Therefore, because of Sloan's specification of the demand equation, price must fall as the PP ratio increases, which is exactly what Sloan's a priori expectation was. The increasing monopoly model suggests that an increase in the PP ratio may do the opposite: make demand less elastic and lead the physician to raise his fees. As a consequence, Sloan's specification must be judged too restrictive to test the increasing monopoly model.

[7]The ease of measuring the physicians per capita statistic is perhaps an illusion. If one takes into account the fact that physicians are not distributed uniformly over an SMSA, then one gets into the same problem with physicians per capita statistic that one gets into with the physicians per market area statistic.

[8]Note that the relevant measure here is time to travel a given distance, rather than travel time to the physician used, since the latter measure would be affected by physician density itself. For this reason, Sloan's (1977) measures of travel time were not used.

[9]Bott (1971), in a part of her second edition that was contained in the 1957 first edition, stated (p. 104): "My guess would be that one would not find families with close-knit networks in heterogeneous areas of high population turnover, but that one might find both families with close-knit networks and families with loose-knit networks in relatively homogeneous, stable areas." In the chapter, "Reconsiderations," which she added when the second edition was published in 1971, she states (p. 304) that ". . . we now have a good idea of the variables involved in network density. . . . They are: occupation, geographical mobility, social mobility. . . ."

[10]In the final version of their paper (1978) Goldman and Grossman include essentially no discussion of the use of this information variable. For the little discussion there is, see the text on p. 268 and Table 3 on p. 270. In an earlier version of their paper (1976) they have extensive discussion. See pp. 19-26 and, in particular, pp. 43-44.

[11]See Bloom, Asher, and White (1978, p. 876-79) for a review of this literature.

[12]See Brandwein, Brown, and Fox (1974, p. 505) for a calculation of the magnitude of the time deficit these women face. The quoted phrase is from p. 509 of their article.

[13]In the analysis we control for the proportion of families on AFDC. Therefore the lower time costs of AFDC families should not be confused with impact of female-headed households per se.

[14]This conventional practice of excluding these variables as determinants of the community demand for health care is not supported by the literature concerning the association between stressful life events (family deaths, divorce, etc.) and health, both mental and physical. Bloom, Asher, and White (1978) review this work. With respect to the association between stress and physical health they report (p. 874): "Both the widowed and divorced have higher age-adjusted death rates for all causes combined than do married persons of equivalent age, sex, and race." With respect to the association between stress and mental health they report (p. 869): "Persons who are divorced or separated have been repeatedly found to be overrepresented among psychiatric patients, and persons who are married and living with their spouses have been found to be underrepresented." In both these literatures, questions may be raised as to which direction causation predominantely flows, but to whatever extent that marital disruption does cause poor physical health, a plausible hypothesis is that marital disruption precipitates poor social functioning (e.g., mental illness) to a similar extent.

Thus a conservative course is to classify both the proportion of residents who have moved in the past five years and the proportion of households headed by females as affecting both the community demand for health care and the informational levels of consumers. This then suggests that to construct the most rigorous test of the increasing monopoly model we should treat these two variables as we treat education: classify them as affecting both community demand and consumer information levels. See footnote 26 below for the results of this test.

[15]Both real income and input prices might also be affected by the cost of living. However, we do not explicitly take account of cost-of-living differences in what follows because cost-of-living indexes are available only for a few cities, cost-of-living differentials are probably reasonably controlled by the wage rate, and our preliminary results (see Pauly and Satterthwaite (1980)) indicated little impact of cost-of-living measure for those cities for which measures exist.

[16]A minor point to note about (2) is that the variable MD, physician density, is an interaction term between the variables MP, the physician population ratio, and PD, the population density, which is a GEO variable in (2). This is because, by definition, MD is the product of PD and MP.

[17]The specific version of theory presented here is based on Sloan and Feldman (1979) with no specific assumption about the impact of the physician-population ratio on the marginal utility of discretionary behavior. The theory is <u>not</u> the simple or naive theory that physicians set their incomes and workloads to achieve an income target. The theory also differs from the formulation of Ramsey (1980) in not assuming that demand creation consumes real resources.

[18]Recall, as was stated above, that the modified target income model was shown by Sloan and Feldman (1979) and Reinhardt (1979) to be compatible with any relationship between P and MP.

[19]The original data set had 100 cities, but seven cities in New England and Flint, Michigan were deleted because of missing values.

[20]In some cases there is not a one-to-one correspondence between SMSAs and urbanized areas. For example, the Los Angeles-Long Beach urbanized area is composed of parts of the Los Angeles-Long Beach SMSA, the Anaheim-Santa Ana-Garden Grove SMSA, and the San Bernardino-Riverside-Ontario SMSA. The adjusted density (ADJDEN) value used for the Anaheim-Santa Ana-Garden Grove SMSA was the density value listed for the Los Angeles-Long Beach urbanized area. A separate urbanized area (the San Bernardino-Riverside urbanized area) is defined within the San Bernardino-Riverside-Ontario SMSA. For that SMSA, the density value for the latter urbanized area was used.

[21]In the 1970 census a family was defined as a household that consists of a household head and one or more persons who are related to the head by blood, marriage, or adoption. A family was defined to be headed by a female if a female is regarded to be the head by the other members of the household. See U.S. Bureau of Census (1973, p. xxxvi). Nationally, in 1970 only 10.9% of female-headed families were headed by women who were single; the remaining 89.1% were headed by women who were widowed, divorced, separated, or whose husband was absent. These women had in their households their own children under 18 years in 52.4% of the cases; in 19.9% of the cases, own children under 6 years were present. See U.S. Bureau of the Census (1974, Tables 3, 5,

6). Thus, the great majority of female-headed families had undergone serious disruption (death, divorce, separation) and a majority still had children present. Hence the statistic proportion of families headed by women does carry information about a community's social stability.

[22]PAFDC was calculated by dividing the number of AFDC recipients (CC,T3,I72) by total population (CC,T3,I3).

[23]See footnotes 14 and 26.

[24]W was calculated by dividing total wages for production workers in 1967 (CC, T3, I128) by the total man-hours for production workers in 1967 (CC, T3, I127). This data is based on the 1967 Census of Manufacturers.

[25]ATT was calculated by (a) multiplying total receipts for selected service establishments (CC, T3, I151) by the percentage of those receipts that were collected by hotels, motels, and camps (CC, T3, I154), and (b) dividing by total population (CC, T3, I3). These figures are based on the 1967 Census of Business.

[26]This is a permissible procedure even though the two-stage least squares estimates for the target income model that are presented in column two of Table 3 do not use the six informational variables during the first stage's calculation of predicted price. Thus it would seem the two equations are not nested and the F-test can not be used. The two equations, however, can be made fully nested by the expedient of augmenting the target income model with the five identities: MDPCM2 = MDPCM2, MOVED = MOVED, . . . ,ADJDEN = ADJDEN. The target income model so augmented, then, has precisely the same

set of predetermined variables as the increasing monopoly theory, and the F-test is permissible.

[27] If MOVED and FEMH are considered to be determinants of community demand (see footnote 14), then the appropriate test of the increasing monopoly model is the joint significance of the three variables MDPCM2, PUBTR, and ADJDEN. The F value that results (with 3 and 77 degrees of freedom) is 5.50; it indicates that those variables are significant at the 1% confidence level.

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