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Physician Fee Inflation: Evidence from the Late 1960s

1. INTRODUCTION

The second half of the decade of the 1960s was one of dramatic change in the physicians' services market. The Medicare and Medicaid programs, instituted in 1966, provided coverage for medical services for post-age 65 and poverty groups. Growth of private insurance coverage for outpatient services was also substantial. Per capita out-of-pocket expenditures on physicians' services actually declined during the 1965–1970 period, in spite of a rise in the physician fee index at a rate almost twice the Consumer Price Index and an even greater rate of growth in money expenditures on physicians' services. Whereas patients' out-of-pocket payments to vendors of medical services constituted 63 per cent of total expenditures on physicians' services in 1965, this percentage was down to 40 by 1970.[1] Two previous studies (Feldstein, 1970; Steinwald and Sloan, 1974) report that insurance coverage has a positive impact on physicians' prices.

During this half-decade the physician-population ratio increased by 7 per cent, reflecting an increased domestic medical school output as well as greater immigration of foreign medical school graduates.[2] One would expect that higher ratios would depress physicians' fees, but several studies (Feldstein, 1970; Huang and Koropecky, 1973; and Newhouse, 1970) report that the physician-population ratio has a zero or even a positive impact. Some research on the demand for hospital and medical services suggests that per capita population use of health care services is greater in high physician-population areas and that use is in part a consequence of physician availability (Davis and Russell, 1972; Feldstein, 1971a, 1971b; Fuchs and Kramer, 1972). If an increased stock of physicians causes both higher prices *and* higher utilization, policy-makers may desire to reevaluate current government medical education policy that favors expansion of medical school capacity.

Product price increases often follow factor price increases. Wages of allied health personnel rose substantially during 1965–1970. Unlike the situation in many manufacturing industries, the growth in money wages was not partially offset by productivity gains.[3] Total visits per physician week (an admittedly crude measure of physician productivity) did not rise during this period. Although there is some interyear variation in the visits per week series, no trend is evident.[4]

Many experts maintain that group practice is a better organizational form than solo practice. Judging from the rapid growth in medical groups (8 per cent per year from 1965 to 1969), physicians are increasingly favoring this mode of practice.[5] Given certain aspects of the internal incentive structure of medical groups, Sloan (1974) warns that physicians practicing in groups may charge higher fees, *ceteris paribus*.[6] If this hypothesis is substantiated empirically, policy-makers would certainly want to question the statements of many experts.

This study develops a model of physician fee-setting and tests the model with state cross-sections covering four years, 1967–1970. The 1965–1970 period logically defines an era for this market, immediate pre-Medicare-Medicaid to the year before price controls (1971), but fee data are not available before 1967. The fee data and information on physician characteristics used in this study come from annual surveys of physicians' practices conducted by the American Medical Association. Other data, available from published sources, are described below.

The empirical analysis emphasizes general practitioners for two reasons: First (and more important), the AMA surveys contain approximately twice as many general practitioners as physicians in any other single field. State means for general practitioners merit more confidence that those of other specialties with relatively few observations for the smaller states.[7] Second, public concern about citizens' access to primary medical care of the type provided by GP's is particularly acute. During 1965–1970, fee increases for primary care procedures were higher than those for other procedures often performed by physicians (herniorrhaphy, tonsillectomy, and adenoidectomy).[8]

In Section 2, I develop a model of physician output and price decisions. Section 3 contains empirical results from the physicians' fee analysis. In Section 4 I compare the results of this study with past research and present conclusions and pertinent policy implications. In the appendix I describe the methods used to construct, and the sources of variation in, several insurance and wage variables that are important to this study.

2. MODEL AND VARIABLE SPECIFICATION

Demand Equation

Let the demand schedule for the physician firm be:

$$(1)\quad P = \underset{\pm \text{ or}}{a_0} + \underset{-}{a_1 Q} + \underset{\pm \text{ or}}{a_2 AT} + \underset{+}{a_3 INS} + \underset{\pm \text{ or}}{a_4 DEM} + \underset{-}{a_5 MDPOP} + \underset{+}{a_6 INC} + \underset{+}{a_7 PO}$$

where P is the physician's fee (or an index of fees); Q, the quantity of services demanded; AT, attributes of the physician affecting demand; INS, private and government health insurance coverage of his potential patients; DEM, demographic characteristics of the physician's potential patients; MDPOP, the physician-population ratio in the physician's market area; INC, income of potential patients; and PO, the price of other providers of ambulatory medical services. Signs below the a's indicate whether the expected effect is positive or negative.

Rather than specifying a demand curve for each type of medical or surgical procedure, Equation (1) represents all services. Patients are likely to judge a physician's overall costliness, not his charge for a specific procedure. They cannot select one surgeon for office visits and another for an appendectomy. A certain number of office and hospital visits are complementary with an appendectomy.[9]

Three variables represent physician attributes: board certification, experience, and foreign medical education. Board certification in a specialty (BRD) should have a positive impact on demand.[10] A proxy for experience is LIC10, a variable indicating that the physician has been licensed less than ten years in his current state of practice. This variable is expected to have a negative effect if it primarily accounts for relative inexperience in physician practice and/or for a lack of patient contacts in his present location. But if recently licensed physicians have been the recipients of a much more technically advanced medical education than other physicians, the net impact of this variable on demand may be positive.[11] The professional education of foreign medical school graduates (FMG) may be regarded by some potential patients as technically inferior, implying a negative impact on demand. All three physician attribute variables are expressed as percentages.

Third-party reimbursement enters in several ways. One specification contains three variables: (1) private health insurance expenditures on health care services other than hospital (PRIVH); (2) Medicare Supplemental Medical Insurance Expenditures (MCARE), representing the part of the Medicare program that covers physicians' services; and (3) Medicaid expenditures on physicians' services (MCAID). Each is divided by state population. In a second specification, the percentage of the population with major medical insurance (MMED) is substituted for PRIVH. There is far less private insurance coverage under basic insurance plans for physicians' office visits, and home visits are typically covered under major medical plans once the deductible has been satisfied.[12] The fraction of medical expenditures paid by insurance (K), the sum of PRIVH, MCARE, and MCAID divided by an estimate of expenditures on medical services in the state per capita population, represents insurance in a third specification. As indicated below, the use of K is associated with a minor modification in Equation (1).

Medical care prices may affect the levels of insurance coverage as well as the reverse.[13] To obtain consistent parameter estimates, predicted values from regressions of PRIVH and K on a set of exogenous variables are used in the empirical analysis of fees. A regression for MMED has also been estimated, but an actual rather than a predicted series represents MMED in the fee analysis. The appendix provides details on reimbursement variable construction, results of PRIVH, K, and MMED regressions, as well as justification for using actual rather than predicted values of MMED.

The Medicare variable (MCARE) primarily reflects the proportion of the state's population over age 65 and demographic characteristics of persons in this age group (and thus may be considered a demographic as well as an insurance variable), characteristics of the state's health delivery system, and, finally, Medicare carrier reimbursement policy. An account of the sources of variation in MCARE is provided in the appendix. Available evidence indicates that determinants of MCARE's variation are outside the model developed in this study, and, therefore, it is appropriate to treat MCARE as exogenous in the empirical analysis. Unfortunately, equally strong evidence is not available for MCAID. However, it too is considered exogenous.

Physicians per 10,000 population is expected to have a negative impact on per physician demand. The empirical analysis includes two measures: the number of physicians in the physician's field per 10,000 population (MDPOP1) and the number of physicians in all other fields per 10,000 population (MDPOP2). The use of a single measure does not permit distinguishing among varying degrees of substitutability of physicians' services in different specialty fields. The within-field cross-elasticity of demand should be higher than the between-field cross-elasticity. In fact, physicians in other fields may be sources of referrals, implying that MDPOP2 may have a positive impact on demand for services of physicians in the field included in MDPOP1. But evidence presented in Shortell (1971, p. 5) indicates that general practitioners receive few patients on referral (3 per cent of all new patients).[14] For this reason, and because MDPOP1 and MDPOP2 are highly collinear, MDPOP2 has been excluded from the general practitioner fee regressions.

State per capita income (INC) should generally have a positive impact on demand. One expects that the price of other providers, such as outpatient departments of hospitals and health maintenance organizations, should have a positive effect. Preliminary regressions with the price of other providers of ambulatory services (PO) were not encouraging. Therefore, the variable has been excluded from the regressions presented in this study.[15]

Cost Equation

There are two cost functions for the physician firm. The first reflects non-physician input costs:

$$(2)\quad C_1 = \underset{\pm\text{ or}}{c_{10}} + \underset{+}{c_{11}\text{WAGE}} + \underset{+}{c_{12}\text{RENT}} + (\underset{\pm\text{ or}}{c_{13}} + \underset{+}{c_{14}\text{WAGE}} + \underset{+}{c_{15}\text{RENT}})Q$$

As Equation (2) is specified, both fixed and marginal costs are functionally dependent on factor prices, which are treated as exogenous to the physician (and to the physician services sector as a whole). Measures of the wage rate of nonphysician personnel (WAGE) and of the per unit cost of space (RENT) represent the factor prices. The method used to construct WAGE (expressed in terms of the weekly wage rate for secretarial-clerical personnel) is discussed in the appendix. The largest part of the inter-physician variation in capital costs probably relates to space. Unfortunately, measures of rental rates available for this study are poor. The available unit cost of space measure proved to be highly collinear with other variables in the regressions. All capital costs, actual and/or imputed, constitute only approximately 10 per cent of total practice expenses, certainly far less of the total than the non-physician labor component. For these reasons, RENT is excluded from the regressions presented in this study.[16]

The principal input to the physician firm is the physician himself. Although there is no transaction between the self-employed physician as buyer and this physician as seller of his own labor, the value he imputes to his own input affects his price and output behavior. The second cost function represents the imputed value of physician effort.

The imputed value of physician's time (C_2) depends on a number of personal and professional factors. Using previous research as a guide, the following personal factors are relevant. As the physician grows older, his personal return to further asset accumulation diminishes. Thus, older physicians are likely to place a higher value on leisure time. Sloan (1975) reports that physician hours of work decline with age. The variable AGE refers to the percentage of physicians by field, state, and year who are aged 55 or over. Judging from Sloan (1973, 1975) physician income from property has a small positive effect on the physician's imputed wage;[17] female physicians with children have higher imputed wages. This is not true of female physicians without children. Unfortunately, data on physicians' property income and children are not available in a form usable for this study.[18] It is possible to distinguish between male and female physicians, but without data on the number of children, a variable indicating the percentage of physicians who are female would serve no useful function.

Although health status would appear to affect the imputed wage *a priori*, Sloan (1975) failed to find a relationship between health status and physician effort. Thus, the lack of suitable data on physicians' health is not disturbing. Feldstein (1970) hypothesized that physicians will work more when their income falls relative to others in the community. However, the variable to measure this ("reference income") effect is significant in only one out of the nine regressions he presents. Sloan (1974b) also found this variable to be unreliable. Therefore, although data for a relative or reference income variable are available, past research has not been sufficiently encouraging to warrant this variable's inclusion.

Several variables related to the physician as a professional may influence the physician's imputed wage. Clearly, some physicians enjoy the practice of medicine more than others, and these physicians impute a correspondingly lower wage to their effort. Unfortunately, it is difficult to find objective factors associated with a "love of medicine."[19] The board certification variable (BRD), included above as a demand variable, may serve this role, assuming that board-certified physicians derive more pleasure from the practice of medicine than others. If so, the positive demand effect of board certification on physicians' fees may be offset by a negative supply effect on fees.[20]

The second cost function, measuring the physicians' imputed wage, is specified as

$$(3) \qquad C_2 = \underset{\pm \text{ or }}{c_{20}} \; \underset{+}{+} \; c_{21}\text{AGE} \; + \; (\underset{\pm \text{ or }}{c_{22}} \; \underset{+}{+} \; c_{23}\text{AGE})Q$$

According to Equation (3), imputed fixed and marginal costs rise with physician age.[21] Because of the aforementioned uncertainty about the use of BRD as a supply variable, it has not been included as part of Equation (3). If it were to be included, it would enter in the same manner as AGE, but it would have a negative rather than a positive effect on C_2. The unavoidable exclusion of property income and female physicians with children is unfortunate.

Output and Price Equations

The model assumes that the physician's objective, given equations (1) through (3), is to maximize profit, defined as his earnings above his imputed wage. Including the imputed wage allows for physician preferences for leisure as well as goods. Empirical evidence to support the profit maximization assumption is given in Steinwald and Sloan (1974).[22]

$$(4) \qquad \pi = P \cdot Q - C_1 - C_2$$

Differentiating π, one obtains the following expressions for optimal quantity and price (Q^* and P^*).

$$(5) \qquad Q^* = (1/2a_1)(-a_0 - a_2AT - a_3INS - a_4DEM - a_5MDPOP - a_6INC - a_7PO + c_{13} + c_{14}WAGE + c_{15}RENT + c_{22} + c_{23}AGE)$$

and

$$(6) \qquad P^* = (1/2)(a_0 + a_2AT + a_3INS + a_4DEM + a_5MDPOP + a_6INC + a_7PO + c_{13} + c_{14}WAGE + c_{15}RENT + c_{22} + c_{23}AGE)$$ [23]

If K is the proportion of the fee paid by both private and public third parties, then Equation (1) may be rewritten as $P = a_1Q + bX + KP$, (1)′, where X stands for all exogenous demand variables. KP replaces a_3INS in Equation (1). Letting the sum of the two cost equations be

$$(7) \qquad C = C_1 + C_2 = d + eQ$$

$$(8) \qquad Q^* = [e(1-K) - bX]/2a_1$$

and

$$(9) \qquad P^* = [e + bX/(1-K)]/2$$

According to Equation (9), each exogenous demand variable is divided by the proportion of the out-of-pocket fee paid by the patient. This specification implies that patients possess perfect knowledge of their insurance coverage before purchasing medical services and hence base utilization decisions on the price *net* of insurance. But if patients gain precise information about their coverage after the fact, equations (5) and (6), which allow a higher utilization response to gross price than to insurance, may provide better explanations of observed behavior than equations (8) and (9).[24] With one modification, equations (6) and (9) provide the basis for the empirical analysis of physicians' fees.

Group Practice

A substantial number of physicians share costs and/or revenues with other physicians.[25] If one could be certain that decisions involving practice price, output levels, and input purchases were made collectively by group members, a model appropriate for the solo practitioner would fit group medical practice equally well. But if these decisions are made by individual physicians within the group, the model must be modified. Sharing costs reduces the incentive to minimize non-physician costs in that the individual physician member bears an increasingly smaller proportion of the financial consequences of his failure to control costs as group size rises. If both revenues and costs are shared, the financial return to individual effort decreases as group size rises. Although an arrangement such as one in which physicians share both revenues and costs equally results in equal reductions in both marginal revenue *and* the marginal cost associated with non-physician inputs, sharing does not reduce the marginal cost associated with individual physician labor, the cost represented by Equation (3). If c_{22} and c_{23} of Equation (3) were zero, output and price given by equations (5) and (6) would be unaffected, but this is very unlikely.[26]

As demonstrated formally in Sloan (1974a), under the assumption of no economies of scale arising from better use of non-physician labor and capital inputs, it is appropriate to multiply both c_{22} and c_{23} by the number of physicians (n) in the group if net income of the practice is divided equally among its physician members. When net income is divided into unequal shares (θ_i, a fraction signifying the share to the i^{th} physician), c_{22} and c_{23} should be multiplied by $1/\theta_i$. Intuitively, smaller shares of net income are greater disincentives to individual effort. Although a price equation containing age/group-size interaction terms would be desirable on conceptual grounds, the sample size limits the number of variables that may usefully be included. Regressions in the empirical section contain two group-size variables entered in a linear, noninteractive fashion (GRP1 = percentage of physicians by field, state, and year practicing in groups of three to ten physicians; GRP2 = percentage of physicians in groups of eleven or more physicians).

Proponents of group practice stress potential economies of scale resulting from more efficient use of non-physician labor and sophisticated capital equipment. Scale economies from these sources may offset disincentives to individual physician effort. Kimbell and Lorant (1973) report increasing returns to scale for small to medium-size groups relative to solo practice and decreasing returns for large groups. Results made available to this author by Kimbell and Lorant indicate maximum efficiency for single-specialty groups with six physicians and a slow decline in the efficiency of single-specialty groups thereafter. Multispecialty groups, which generally include more than ten physicians, appear on the basis of Kimbell and Lorant's work to be inefficient relative to single-specialty groups, which usually have fewer than this number. On the basis of Kimbell and Lorant's research, one would expect GRP1's and GRP2's parameter estimates to be negative and positive, respectively.

Usual Fees Versus Average Revenue

Two types of price variables serve as dependent variables: the fee usually charged by the physician; and average revenue, which is the physician's gross annual revenue divided by an estimate of his total annual visits. The usual fees analyzed correspond to the physician's follow-up office visit, hospital visit, and appendectomy. These procedures are frequently performed by physicians and reflect the physician's mean fee level.

For purposes of empirical analysis of physician fee inflation, however, usual fees have two potential deficiencies. First, if there is price discrimination and/or related behavior (e.g., a collection ratio less than 1), the usual price overstates the physician's average price. If such behavior is unrelated to the fee equation's explanatory variables, this presents no problem. Some experts contend, however, that a major effect of increased third-party reimbursement has been to reduce price discrimination. Judging from data presented in Owens (1973), the dollar value of "free and reduced-fee services" in 1971 was from 1 to 2 per cent of gross billings. Since this percentage is so low, price discrimination is not likely to be an important factor in a 1967–1970 cross-sectional study.

Second, although the AMA requests usual fees for specific procedures in its annual mail questionnaires, some ambiguity from the standpoint of the responding physician undoubtedly remains. For example, it may be customary for some physicians to include routine laboratory services as part of the office visit charge. Instead of raising his fees, physicians may decide to bill separately for laboratory work and hold the usual charge for the office visit constant. To the extent that this type of behavior is unrelated to the independent variables, the only consequence is a relatively poor fit for the regression equation as a whole. But evidence presented in Sloan and Steinwald (1975) suggests that the structure of basic insurance plans does encourage the physician to bill separately for minor tasks that might otherwise be included in office visit, hospital visit, and/or surgical charges.

The average revenue measure overcomes these objections, but it too has deficiencies. First, it does not hold the physician's procedure mix and the number of procedures performed per visit constant. Research by Bailey (1970) indicates that group-practice physicians perform more procedures per visit than their colleagues in solo practice. Lab tests, for example, may be performed by the group physician who owns the necessary equipment. The solo physician may refer the patient to a commercial laboratory for testing. This implies that group-practice coefficients in average revenue equations may be biased upward. Second, there are probably measurement errors in visits, the denominator of the average revenue series. Visit data appear to be particularly difficult to collect by mail questionnaire. Although errors in visits may affect goodness of fit, no potential biases are apparent.

In sum, neither measure is fully appropriate. Analysis of both is likely to be more informative than analysis of either one in isolation. Dependent variables and all monetarily expressed explanatory variables are deflated by a state price index.[27]

3. EMPIRICAL RESULTS

Tables 1 and 2 present fee regressions based on general practitioner, surgeon, and internist data. All regressions are weighted by the square root of state population.

Table 1 Regressions

The performance of the reimbursement variables in the Table 1 regressions is mixed. The private health insurance benefits variable (PRIVH) has a consistently implausible negative sign in preliminary office and hospital visit fee regressions and is therefore excluded from the office and hospital visit fee regressions presented in Table 1. The PRIVH variable includes basic insurance payments, and, as stated above, there is some evidence that basic insurance encourages the physician to submit bills for more narrowly defined procedures. A visit that does not include lab tests and the like is likely to cost less than one that does. This "billing effect" may have introduced a negative bias into the PRIVH parameter estimates. Future surveys should make particular efforts to ensure that physicians' responses to fee questions refer to homogeneous procedures. By contrast, PRIVH is always positive and significant in the average revenue equations, with implied elasticities at the means of the observations of 0.75 (general practitioners) and 1.20 (internists). The average revenue measure does not reflect the billing effect.

Major medical insurance (MMED) demonstrates a greater impact on average revenue than on usual fees. This variable is highly collinear with INC, however, and for this reason one should examine MMED and INC together. Without INC, Regression (1) of

TABLE 1 Price Equations: General Specification[a]

Dependent Variable	INC	PRIVH	MMED	MCARE	MCAID	INS	MDPOP1	MDPOP2	BRD
				General Practitioners					
1. Office	—	—	0.020[c]	0.088[c]	—	—	−0.11	—	—
visit fee	(—)	(—)	(0.005)	(0.014)	(—)	(—)	(0.08)	(—)	(—)
2. Office	0.00095[c]	—	−0.0015	0.069[c]	0.0033	—	−0.22[c]	—	—
visit fee	(0.00017)	(—)	(0.0058)	(0.014)	(0.0076)	(—)	(0.08)	(—)	(—)
3. Office	0.0010[c]	—	—	—	—	0.0098	−0.23[c]	—	—
visit fee	(0.0002)	(—)	(—)	(—)	(—)	(0.0056)	(0.09)	(—)	(—)
4. Hospital	0.0011[c]	—	0.013	0.162[c]	—	—	−0.39[c]	—	—
visit fee	(0.0003)	(—)	(0.010)	(0.025)	(—)	(—)	(0.14)	(—)	(—)
5. Hospital	0.00092[c]	—	0.0036[c]	0.161[c]	0.022	—	−0.36[b]	—	—
visit fee	(0.00030)	(—)	(0.0010)	(0.025)	(0.015)	(—)	(0.15)	(—)	(—)
6. Average	−0.00035	—	0.054	0.436[c]	0.036[c]	—	−1.65[c]	—	—
revenue	(0.00080)	(—)	(0.031)	(0.075)	(0.011)	(—)	(0.44)	(—)	(—)
7. Average	−0.0011	0.25[c]	—	0.50[c]	0.059	—	−1.93[c]	—	—
revenue	(0.0077)	(0.06)	(—)	(0.07)	(0.104)	(—)	(0.44)	(—)	(—)
				Surgeons					
8. Appen-dectomy fee	—	—	0.21	0.84	0.061	—	−29.81[c]	6.67[c]	—
	(—)	(—)	(0.19)	(0.63)	(0.322)	(—)	(10.11)	(1.25)	(—)
9. Appen-dectomy fee	−0.014	—	0.49[b]	0.97	−0.076	—	−31.84[c]	7.56[c]	—
	(0.008)	(—)	(0.24)	(0.64)	(0.331)	(—)	(10.53)	(1.36)	(—)
				Internists					
10. Average	—	—	0.091[b]	0.78[c]	—	—	−1.94[c]	—	—
revenue	(—)	(—)	(0.042)	(0.10)	(—)	(—)	(0.64)	(—)	(—)
11. Average	−0.0022	0.48[c]	—	0.87[c]	−0.052	—	0.46	−0.40	−0.005
revenue	(0.0014)	(0.12)	(—)	(0.12)	(0.185)	(—)	(1.86)	(0.47)	(0.009)

[a] Standard errors in parentheses.
[b] Indicates 5 per cent significance level (two-tail test).
[c] Indicates 1 per cent significance level (two-tail test).

Table 1, MMED has a significant impact on the general practitioner's office visit fee. The implied elasticity at the means of the observations is small, 0.17. With INC included, Regression (2), MMED's parameter estimate becomes negative with a high standard error. The elasticity associated with INC in all office and hospital visit fee regressions presented in Table 1 is around 0.6. The coefficients of MMED are positive and larger than their standard errors in both hospital visit regressions ([4] and [5]). As before, the implied elasticities are small. Steinwald and Sloan (1974), an empirical analysis of physicians' fees at the level of the individual physician using 1971 data, reports low MMED (defined as in this study) elasticities derived from GP office and hospital visit fee regressions. However, the Steinwald-Sloan

LIC10	FMG	WAGE	AGE	GRP1	GRP2	Constant	
			General Practitioners				
−0.0006	0.0047	0.048[c]	—	—	—	−0.35	$R^2 = 0.52$
(0.0037)	(0.0046)	(0.007)	(—)	(—)	(—)	(0.63)	$F(6,182) = 32.31^c$
—	—	0.038[c]	−0.006[b]	−0.010[b]	0.016	−0.82	$R^2 = 0.61$
(—)	(—)	(0.007)	(0.003)	(0.004)	(0.014)	(0.62)	$F(9,179) = 30.5^c$
−0.0015	0.0014	0.041[c]	−0.009[c]	−0.009[b]	0.021	−1.12	$R^2 = 0.55$
(0.0040)	(0.0052)	(0.007)	(0.003)	(0.004)	(0.016)	(0.67)	$F(9,179) = 24.7^c$
—	—	0.049[c]	—	—	—	−2.14[c]	$R^2 = 0.54$
(—)	(—)	(0.012)	(—)	(—)	(—)	(1.09)	$F(5,182) = 42.7^c$
—	—	0.049[c]	0.035	−0.024	0.026	−1.33	$R^2 = 0.59$
(—)	(—)	(0.012)	(0.048)	(0.006)	(0.026)	(1.09)	$F(9,178) = 27.9^c$
—	—	0.035	0.004	0.047[c]	−0.0013	2.43	$R^2 = 0.39$
(—)	(—)	(0.031)	(0.014)	(0.018)	(0.0072)	(3.09)	$F(9,133) = 9.4^c$
−0.0013	−0.0070	0.049	0.010	0.036[b]	0.0057	1.32[c]	$R^2 = 0.45$
(0.018)	(0.023)	(0.030)	(0.015)	(0.018)	(0.069)	(0.42)	$F(11,131) = 9.7^c$
			Surgeons				
—	—	1.88[c]	—	—	—	−35.97	$R^2 = 0.58$
(—)	(—)	(0.25)	(—)	(—)	(—)	(26.5)	$F(6,163) = 32.7^c$
—	—	1.95[c]	—	—	—	−14.04	$R^2 = 0.59$
(—)	(—)	(0.26)	(—)	(—)	(—)	(29.3)	$F(9,160) = 25.3^c$
			Internists				
—	—	−0.66	—	0.027	0.010	8.13	$R^2 = 0.35$
(—)	(—)	(0.46)	(—)	(0.024)	(0.020)	(4.60)	$F(8,118) = 7.8^c$
−0.016	0.055	−0.47	0.006	0.043	0.007	8.23	$R^2 = 0.42$
(0.023)	(0.042)	(0.54)	(0.023)	(0.024)	(0.020)	(5.53)	$F(13,113) = 6.4^c$

parameter estimates are significant at the 5 per cent level or better in all instances whereas those in Table 1 are not. The higher precision of the Steinwald-Sloan estimates probably reflects a lower degree of collinearity between the income measure and MMED. The elasticities associated with the MMED coefficients in the Table 1 appendectomy fee equations (based on surgeon data) are also small, 0.1 and less. Major medical insurance has a much greater impact on average revenue. MMED elasticities based on regressions (6) and (10) are 0.48 and 0.52, respectively.[28]

Medicare supplemental insurance benefits per capita population (MCARE) is significant in all but the appendectomy fee equations. If MCARE primarily reflected usual fee levels, it would probably perform better in the office, hospital, and the appendectomy fee

TABLE 2 Price Equations: Effect of the Proportion Covered by Third Parties[a]

Dependent Variable	INCK	MDPOP1K	MDPOP2K	FMGK	LIC1OK	1K	WAGE	AGE	GRP1	GRP2	Constant	
1. Office	0.00055[c]	−0.096	—	−0.0037	0.0051	−1.88[c]	0.045[c]	—	−0.010	0.033	1.66	$R^2 = 0.63$
visit fee	(0.00010)	(0.053)	(—)	(0.0030)	(0.0028)	(0.39)	(0.011)	(—)	(0.007)	(0.020)	(1.19)	$F(8,87) = 18.3$[c]
2. Hospital	0.00089[c]	−0.127	—	0.0066	−0.0013	−3.37[c]	0.043[b]	−0.011	−0.020	0.062	4.71[b]	$R^2 = 0.61$
visit fee	(0.00018)	(0.093)	(—)	(0.0062)	(0.0056)	(0.69)	(0.020)	(0.010)	(0.012)	(0.035)	(2.27)	$F(9,86) = 15.0$[c]
3. Lab	0.00013	−0.004	−0.018[c]	0.0013	−0.0024	−0.49	0.022[c]	−0.004	−0.003	0.020	1.13	$R^2 = 0.39$
fee	(0.00008)	(0.035)	(0.009)	(0.0026)	(0.0021)	(0.27)	(0.008)	(0.004)	(0.004)	(0.014)	(0.86)	$F(10,85) = 5.5$[c]
4. Average	0.0018[c]	−1.14[c]	—	−0.030	0.017	0.005	0.063	—	0.065	0.073	−6.93	$R^2 = 0.34$
revenue	(0.0007)	(0.36)	(—)	(0.021)	(0.017)	(2.46)	(0.060)	(—)	(0.038)	(0.112)	(6.69)	$F(8,63) = 3.99$[c]
5. Average	0.0017[c]	−1.18[c]	0.084	−0.043	0.024	−0.242	0.052	—	0.070	0.021	−5.79	$R^2 = 0.35$
revenue	(0.0007)	(0.36)	(0.080)	(0.024)	(0.018)	(2.47)	(0.061)	(—)	(0.038)	(0.122)	(6.77)	$F(9,62) = 3.67$[c]

[a] Standard errors in parentheses.
[b] Indicates 5% significance level (two-tail test).
[c] Indicates 1% significance level (two-tail test).

equations than in the average revenue equations. This clearly is not the case. Elasticities from average revenue equations are far higher (0.6 to 0.75) than are those from the usual fee equations (around 0.1). As explained in the appendix, MCARE reflects the state's demographic characteristics, features of its health care delivery system, and deliberate policies of the Medicare carriers. These exogenous influences have clearly had an impact on physicians' price and output behavior, particularly on average revenue. In some preliminary regressions, the percentage of persons in the state aged 65 and over was substituted for MCARE. That variable performed relatively poorly. Steinwald and Sloan (1974) report similarly inconclusive results using the percentage over age 65 variable in usual fee equations.

The Medicaid (MCAID) variable demonstrates no impact on fees in the Table 1 regressions. Table 1's Regression (3) contains INS, the sum of PRIVH, MCARE, and MCAID. Although almost significant at the 5 per cent level, the associated elasticity is low (0.05). This result principally reflects the poor performance of PRIVH and MCAID, as demonstrated by other regressions.

Coefficients of MDPOP1 are significant in the general practitioner regressions. GP regressions containing both general practitioners per 10,000 population (MDPOP1) and physicians in other fields per 10,000 population (MDPOP2), not reported, have also been estimated. Sums of the coefficients of the two physician variables are negative and significant at the 1 per cent level.[29] The MDPOP1 and MDPOP2 coefficients in the appendectomy fee equations for surgeons are also significant (negatively) individually and as a sum. The physician-population coefficients in the internist regressions are implausible. Elasticities associated with MDPOP1 are generally small (under −0.2), with the exception of general practitioner average revenue, in which they are around unity. The parameter estimates corresponding to board certification (BRD), the newly licensed physician (LIC10), and the foreign medical school graduate (FMG) are unreliable. Similar results have been obtained previously (Steinwald and Sloan, 1974).

Wages affect office, hospital visit, and appendectomy fees in the expected manner; associated elasticities range from 0.66 to 0.92. Although insignificant at conventional levels, the wage parameter estimates in the average revenue equations imply similar elasticities (0.63 to 0.68). The only implausible wage coefficients are in internist average revenue equations. In these, reimbursement dominates the effects of the other variables. Age coefficients (AGE) are often negative and, as a rule, imprecise.

Judging from Kimbell and Lorant (1973), the GRP1 and GRP2 parameter estimates should be negative and positive, respectively. If increased scale does not result in better utilization of aides and equipment, Sloan's assumption (1974a), then both GRP coefficients should be positive and GRP2's should exceed GRP1's coefficient. The GRP signs in Table 1 are too erratic to lend strong support to either view. Moreover, significance tests on the sum of Table 1's GRP coefficients are never significant.

Table 2 Regressions

The equations in Table 2 are based on the alternative specification of insurance. All five regressions are based on general practitioner data. The lab fee regression pertains to urinalysis, a frequently performed laboratory procedure.

As above, the effect of third-party reimbursement on average revenue is much more obvious than on usual fees. From Equation (9), it is evident that

(10)[30] $$\partial P^*/\partial K = [bX/2(1-K)^2]$$

where X represents all exogenous demand equation variables. Based on (10), the elasticity of average revenue with respect to the proportion paid by third parties, evaluated at the means of the observations, is slightly above unity.[31] The derivative $\partial P^*/\partial K$ corresponding to the usual fee equations is negative at the means of the observations (at which the derivative is evaluated), an implausible result but one that is consistent with the implausible behavior of PRIVH in Table 1's usual fee equations. PRIVH accounts for about three-fourths of total third-party reimbursements, K's numerator.

As shown in the appendix, income's coefficient in the K equation is negative. Therefore, the coefficients of INC overstate the impact of income on both usual fees and average revenues. The following adjustment procedure considers the indirect effect of INC through K on P as well as the INC's direct effect on P. Let $\hat{b}_1$ be the parameter estimate of INC and $\hat{b}_2$, the parameter estimate of other exogenous demand variables interacting with K, and X_1 be the other exogenous (noninsurance) demand variables.

Then,

(11) $$\partial \hat{P}^*/\partial INC = \hat{b}_1/2[1 - K(INC)] + \{\hat{b}_1 INC/2[1 - K(INC)]^2\}(\partial K/\partial INC) + \{\hat{b}_2 X_1/2[1 - K(INC)]^2\}(\partial K/\partial INC)$$

Evaluating $\partial\hat{P}^*/\partial INC$, using Equation (11) at the observational means, reduces the estimated impact of income from Regression (1) by about 12 per cent and its impact from Regression (4) by about 24 per cent. Using the adjusted measures of income's impact, the Table 2 office and hospital visit fee elasticities are similar to Table 1's. However, unlike the Table 1 regressions, the average revenue INC coefficients are positive and significantly different from zero with associated elasticities in excess of unity. One would expect INC to perform somewhat better in the K equations because other reimbursement variables collinear with INC (PRIVH and MMED) are not included. Moreover, the sample differs since estimates of K are not available for all states. But even considering these factors, the implied impact of income on average revenue appears high and should be interpreted cautiously.

Estimates of impact of the physician-population ratio (MDPOP1) are approximately the same as Table 1's. The number of physicians in other fields per 10,000 population (MDPOP2) enters the lab fee and one of the average revenue equations. The sum of the MDPOP1 and MDPOP2 coefficients is significant (negatively) at the 1 per cent level in the average revenue but not in the lab fee equation. As before, parameter estimates of the FMG and LIC10 variables are generally insignificant. The WAGE coefficients in the office and hospital visit regressions are virtually the same as those in corresponding Table 1 regressions. Those in the average revenue equation are somewhat higher. The GRP coefficients are not significant individually but are positive and significant at the 5 per cent level or better in four out of five regressions. Although significant, the associated elasticities are low.[32] Those corresponding to the sum of GRP1 and GRP2 in the office and hospital visit fee regressions are in the 0.1 range. The higher of the two group elasticities from the average revenue regressions is almost 0.3.

Fee-setting Dynamics

Although the data base covers only four years, an attempt was made to study fee-setting dynamics. Fees may move toward P* with a lag because physicians are uncertain about P*'s precise level or they may be motivated by a desire (based on ethical considerations) to spread price changes over a period of years. A simple adjustment mechanism is provided by the partial equilibrium adjustment model.

$$(12) \quad P_t - P_{t-1} = \lambda(P^* - P_{t-1}) \qquad 0 < \lambda \leq 1$$

As is well known, λ is estimated by including a lagged dependent variable as an explanatory variable. Ordinary least squares (OLS) results in estimates that are both seriously biased and inconsistent.[33] Eliminating the 1967 observations and using OLS, the implied values of λ for general practitioner office and hospital visit fees are 0.41 and 0.22, respectively, with associated t ratios in excess of 9.0. Employing a method developed by Nerlove for obtaining consistent estimates of λ (described in Nerlove and Schultz, 1970), the implied values of λ exceed 0.9, with associated t ratios below 1.0 in all regressions. The results presented in the above tables are based on the assumption of immediate adjustment. The estimate of λ using the Nerlove technique supports this assumption. But in view of the low t value associated with this estimate, this finding does not merit much confidence. Transformations of the data required by the Nerlove procedure clearly reveal that there is relatively little information of a temporal nature in this sample.

4. DISCUSSION, CONCLUSIONS, AND POLICY IMPLICATIONS

The empirical results indicate that third-party reimbursement has a much more consistently positive and a greater impact on average revenue than on usual physician fees. The Medicare variable is the only consistently reliable reimbursement variable in the usual fee equations, but the elasticities associated with the Medicare parameter estimates in these equations are low. This finding implies that health insurance principally affects the type of care rendered under such standard headings as a follow-up office and/or hospital visit, the extent to which price discrimination is practiced, collection ratios, as well as the number and complexity of procedures performed per visit. Unfortunately, it is not possible to determine which of these is relatively important. As mentioned above, price discrimination is quantitatively unimportant and cannot *per se* be held responsible for the observed patterns.

Two previous studies provide conflicting evidence on the impact of health insurance on physicians' usual fees. Using aggregate time series data, Feldstein (1970) reports a long-run elasticity (based on significant insurance parameter estimates) of a measure of the average price of physicians' services with respect to an insurance variable in the 0.3 to 0.5 range. Feldstein's results are consistent with the results for average price reported above. Steinwald and Sloan (1974) report that insurance has an impact on general practitioner, surgeon, and internist fees but not on those of obstetricians-gynecologists or pediatricians. The significance of major medical insurance receives particular attention in that study. The major medical coefficients are similar to those reported here, but the Steinwald-Sloan coefficients are far more significant. Both studies find small usual fee-major medical elasticities. Although Newhouse (1970) does not present the results of usual fee regressions that contain an insurance variable (in that study, the percentage of population with insurance), he points out that this variable has an insignificant effect on his usual fee measures.

Although previous studies of physicians' fees have reported some significant income parameter estimates, the implied responsiveness of fees to income varies. Parameter estimates reported in Feldstein (1970) and Steinwald and Sloan (1974) imply a lower degree of responsiveness than do those for office and hospital visit charges in this study. Newhouse (1970) reports price elasticities in the 0.7 to 0.9 range, a somewhat greater impact. However, Newhouse's estimates come from regressions that include only one to three independent variables. Since several potential influences on fees are not represented in Newhouse's regressions, such as factor prices, it is almost certain that his income parameter estimates are biased upward. Based on available evidence, it would appear that usual fee-income elasticities in the 0.5 to 0.6 range are more likely. Unfortunately, no conclusion on the impact of per capita income on average revenue is warranted on the basis of this study's empirical evidence.

Medical school enrollments have increased substantially in recent years, as have the number of graduates of foreign medical schools practicing in the United States. One factor responsible for public support of medical education is the presumption that increases in the physician-population ratio will at least temper physician fee inflation.

Some past research tends to contradict this rationale for public support of medical education. The physician-population ratio has a positive impact on the average physician fee in the Feldstein (1970) study, but the t ratios associated with the physician-population ratio parameter estimates are always less than 1. In Huang and Koropecky (1973), the rate of change of the physician-population ratio has a positive impact on the rate of change in physicians' fees, but the associated t ratio is far less than 1. In regressions with the rate of change in Medicare physicians' fees over the period 1967–

1969 as the dependent variable, physician-population ratio has a negative, insignificant impact in one equation, but is positive and significant in another. Huang and Koropecky (1973) emphasize the second results, concluding that "the reasons might be that supply creates its own demand; physicians reduce their working hours; physician density correlates with better information about markets and what they will bear" (p. 35). According to the way the model (on which these conclusions are based) is specified, not only does the physician-population ratio force the physician's price up, but since the ratio is specified to interact with last year's price, the positive effect of the ratio on fees is strengthened with each successive price increase. This pessimistic implication is not plausible since it implies that fees in high-ratio states will continue to diverge from fees in low-ratio states without end.

Newhouse (1970) reports that the physician-population ratio has a positive and significant impact on usual physicians' fees. His results would provide the strongest case for a positive impact, but since his model omits several plausible fee determinants, in particular factor prices, it is not clear that his positive sign on the physician-population ratio coefficient truly represents the partial effect of the physician stock.

The results presented in the preceding section support the view that increases in the physician stock will temper fee increases, at least in the general practitioner and surgeon submarkets. However, the magnitude of the fee response is low. Steinwald and Sloan (1974) show a similar result. Given the policy importance of this finding as well as the contradictory evidence from past studies, it would be useful to conduct additional tests on the influence of the physician-population ratio on fees.

Many policy-makers and experts on health care delivery advocate group medical practice. Tests presented in this study for the impact of group practice on fees are inconclusive. A significantly positive group-practice effect appears in regressions with relatively few explanatory variables. But even the elasticities associated with these estimates are low.

An objective of this study at its outset was to study fee-setting dynamics. Although there is some descriptive evidence to suggest a slow adjustment speed, there are no reliable estimates of the lag structure based on statistical analysis. Unfortunately, analysis of a time series of four cross-sections has not improved the state of knowledge on this subject.

Although variables expressing such physician characteristics as age, board certification status, and location of medical school have been measured with precision in this study, these variables demonstrate no systematic effect on fees. Given a similar pattern in Steinwald and Sloan (1974), it appears that these variables have at best a minor influence on physician fees. Nevertheless, studies that include a more comprehensive list of physician characteristics variables (for example, physician property income and children) should be conducted.

APPENDIX: REIMBURSEMENT AND WAGE VARIABLES

This appendix describes the reimbursement and wage variables more fully.

Methods for Constructing Three Reimbursement Variables

Three reimbursement variables have been constructed: private health insurance benefits per capita population (PRIVH); the fraction of medical expenditures paid by insurance, both private and public (K); and the percentage of the population with major medical insurance (MMED).

An explicit expression for PRIVH is:

$$(13) \quad \text{PRIVH} = \frac{\text{BLUSBEN} + \gamma_B \cdot Z \cdot \text{BLUBEN}}{\text{POP} \cdot \text{PI}}$$

$$+ \frac{\gamma_C(\text{COMBEN} - \text{DISPAY} - \text{INDBEN}) + \gamma_I \text{INDBEN}}{\text{POP} \cdot \text{PI}}$$

where BLUSBEN = Blue Shield health insurance benefits; BLUBEN = Blue Cross plus Blue Shield health insurance benefits; COMBEN = commercial health *and* disability insurance benefits; DISPAY = disability insurance benefits; INDBEN = insurance benefits of independent health insurance plans (for example, union plans, prepaid group practices); γ_B, γ_C, and γ_I = the fraction of health insurance benefits for expenses *other* than hospitalization (therefore, primarily for physicians' services) with subscripts identifying Blue Cross-Blue Shield, commercial insurers, and independent plans, respectively. State population and the state price index are POP and PI. Although Blue Cross usually reimburses hospital services, Blue Shield's reimbursements are primarily for physicians, except in a few states. In some of these states there is no Blue Shield organization, and Blue Cross makes payments to physicians; in a few others, Blue Shield financial data contain payments to hospitals. In either of these two cases, Blue Cross-Blue Shield benefit payments to physicians are multiplied by γ_B. The variable Z assumes the value of 1 in such cases. When Blue Shield adequately represents reimbursement for physicians' services (as in most states), Z equals zero.[34]

Direct estimates of commercial health insurance benefits are not available and must therefore be constructed from a published series that provides commercial health *and* disability insurance benefit payments by state and year (Health Insurance Institute, 1968–1971). Estimates of disability payments (DISPAY)[35] and benefits of independent plans (INDBEN) are subtracted from COMBEN.[36] All data with the exception of the γ's are for states and the years 1967–1970.[37] The γ's are national averages constructed from Mueller (1971).[38]

$$(14)\qquad K = \frac{\text{PRIVH} + \text{MCARE} + \text{MCAID}}{\text{EXP}}$$

where EXP is an estimate of private and public expenditures on physicians' services in the state. Explicitly,

$$(15)\qquad \text{EXP} = \frac{\text{PEXP} + \text{OPDEXP}}{\text{POP} \cdot \text{PI}}$$

PEXP and OPDEXP are expenditures on physicians' services in private practice and expenditures on physicians' services in hospital outpatient departments.[39]

$$(16)\qquad \text{MMED} = \frac{\text{COMMED} + \mu\text{BLUCOV}}{\text{POP}} \cdot 100$$

Unpublished estimates of persons with commercial major medical coverage by year and state (COMMED) have been provided by the Health Insurance Institute. Comparable data for 1967–1970 for the Blues are not available. Therefore, estimates of Blue Cross-Blue Shield major medical are derived by multiplying Blue Cross-Blue Shield enrollment by state and year (BLUCOV) by the *national* ratio of the Blues' major medical to basic plan enrollment (μ), which is available for the years 1967–1970.

Insurance Regressions

Most of the variation in each of the above three reimbursement variables may be explained by per capita income (INC), the percentage of employees who are members of unions (UNION), the percentage of manufacturing firms with 2,500 employees or more (SIZE), the percentage of persons employed in nonfirm occupations (NONAG), the percentage of nonagricultural employees who work in manufacturing (MANU) or government services (GOV), the number of restricted activity days per capita population (RAD), the percentage of persons in the state aged 65 and over (PAT65), and dummy variables for the years 1968, 1969, and 1970.

Several mechanisms underlie the relationship between income and demand for health insurance. If risk aversion diminishes at higher income levels, so should the demand for health insurance. However, as Feldstein (1973) points out, higher income generates an increased demand for medical care; insurance companies are not likely to take this positive income elasticity on utilization into account when establishing premium schedules. Moreover, tax savings from insurance purchases favor the more affluent. (Feldtein and Allison, 1972; Mitchell and Vogel, 1973.) Group purchases of health insurance are much cheaper than those by individuals, and even among group purchases, there are scale economies. This places unions, large firms, and governmental agencies at an advantage. Persons employed in agriculture are least likely to be able to purchase group insurance. Since the health insurers do not (or cannot at a reasonable cost) fully control adverse selection by adjusting rates and/or by the sale of the policies themselves, persons with lower-health status (measured by RAD) are expected to demand more insurance.

The population age variable (PAT65) performs a different role in each of three health insurance equations. The PAT65 coefficient in the PRIVH (private health insurance benefits) equation may be negative since older persons have less private health insurance coverage. It is likely to have a positive impact on K since Medicare reimbursements are part of K's numerator. The PAT65 variable has been excluded from the MMED equation because it is not clear what effect it would have. Although coverage for persons over age 65 is not included in commercial major medical coverage, it was not possible to completely eliminate enrollment of those over age 65 from the estimated series for the Blues.[40]

Both private and public coverage for physicians' services expanded rapidly during 1967–1970. Growth in private coverage may reflect the very rapid increase in physicians' fees relative to the Consumer Price Index during 1966 and 1967; or, since the increase in major medical insurance was particularly dramatic, an increasing realization by the public that "first dollar" coverage under basic plans offers inadequate protection against serious risks. Dummy time variables account for (but do not explain) structural changes in the demand for insurance during this period.

Table 1 contains the insurance regressions. The K regressions are based on fewer observations since expenditure data are not available for several states and years. Judging by the R^2's, the equations explain most of the variation in all three dependent variables.

Per capita income has a significantly positive impact on both PRIVH and MMED, with respective elasticities (at the means) of 0.66 and 1.07. The most likely reason for INC's negative coefficient in the K regression is that the income elasticity of non-covered medical expenditures is relatively high. Per capita income obviously has a positive impact on PRIVH, and other studies (Feldstein, 1973; Stuart, 1972) indicate that MCARE and MCAID, the other components of K's numerator, respond positively to income.

The variables UNION, SIZE, and NONAG outperform the other two variables related to group insurance purchasing (MANU and GOV). The first three variables exert positive impacts in all but one case (SIZE in the MMED equation). But the elasticity associated with SIZE in that case is virtually zero (−0.04). The health status variable (RAD) is never significant. PAT65 behaves as expected. The year dummy variables reveal a dramatic increase in coverage for physicians' services, particularly in 1969 and 1970.

Predicted values from the PRIVH and MMED equations represent these variables in the empirical analysis of fee determinants. Given the high degree of association between INC and MMED ($r = 0.78$), use of predicted MMED values in the fee regressions would increase multicollinearity unduly. Therefore, actual values were used.[41]

Medicare

Medicare supplemental medical insurance per capita (state) population (MCARE) is best described as the product of three ratios: (1) the fraction of the population age 65 and over; (2) the fraction of the age group over 65 that is enrolled in the supplemental insurance program; and (3) supplemental insurance expenditures per enrollee. The first of the three is a demographic variable. As is well-known, medical needs increase with age.

Appendix

TABLE 1 Insurance Equations[a]

Dependent Variable	INC	UNION	SIZE	NONAG	MANU	GOV	RAD	PAT65	1968	1969	1970	Constant	
1. PRIVH	0.0039[c]	0.23[a]	11.2[c]	0.065	0.042	0.13	0.34	−0.15	−0.15	1.61[b]	3.97[c]	13.26	$R^2 = 0.66$
	(0.0009)	(0.03)	(2.1)	(0.083)	(0.040)	(0.07)	(0.24)	(0.16)	(0.64)	(0.66)	(0.65)	(8.05)	$F(11,180) = 32.0$[c]
2. K	−0.00007	0.0017	0.37[c]	0.014[b]	−0.0004	0.0056	0.0005	0.030[c]	0.058[b]	0.082[c]	0.139[c]	−0.33	$R^2 = 0.59$
	(0.00004)	(0.0012)	(0.09)	(0.006)	(0.0019)	(0.0062)	(0.0096)	(0.006)	(0.025)	(0.026)	(0.026)	(0.37)	$F(11,84) = 10.9$[c]
3. MMED	0.0132[c]	0.092	−6.96[b]	0.31[b]	0.082	−0.18	−1.41[c]	—	0.53	2.90[c]	7.22[c]	8.95	$R^2 = 0.78$
	(0.0014)	(0.048)	(3.36)	(0.14)	(0.067)	(0.12)	(0.40)	(—)	(1.04)	(1.08)	(1.07)	(12.9)	$F(10,181) = 64.4$[c]

[a] Standard errors in parentheses.
[b] Indicates 5% significance level (two-tail test).
[c] Indicates 1% significance level (two-tail test).

According to Feldstein (1971a), the second component reflects a number of factors—the proportion of individuals over 65 who are white, over age 75, live in cities of over 100,000 population, Medicaid payments of Medicare deductibles and coinsurance, state per capita income, and the proportion of the current population under age 65 with surgical and medical insurance—"a measure of habit persistence in the purchase of insurance" (Feldstein, 1971a, p. 6).

Variations in supplemental expenditures per enrollee, the third component of MCARE, reflect both the quantity of services rendered to enrollees and reimbursement per unit of service under the program. Reimbursement policies are particularly important, because if the program operated according to congressional intent, it would be impossible to argue that MCARE is an exogenous determinant of physicians' fees.

The law establishing Medicare requires that physicians be reimbursed on the basis of "customary, prevailing, and reasonable" criteria. For purposes of this discussion, the essential part of this formula involves the "prevailing" charge. If Medicare carriers, commercial insurance firms, or Blue Cross-Blue Shield organizations followed the congressional intent, they would define "prevailing" charges by applying a standard percentile to the community's cumulative distribution of physicians' fees. All fees below or at the percentile would satisfy the "prevailing" criterion. Also, the carrier would update community fee profiles frequently so that its profile would adequately represent the current distribution. Then as fees rose, so would reimbursement per unit of service.

But there is fairly conclusive evidence that Medicare carriers generally lacked the necessary data for constructing "prevailing" charges for specific procedures at the outset of the program.[42] As a result, fee schedules were often used to determine the reasonable charge.[43] When prevailing charges were based on a community fee distribution, carriers employed varying percentiles in the community fee distribution to define "prevailing," from the 75th to the 95th percentile. Judging from AMA data on the distribution of fees, these differences in percentiles imply substantial differences in "prevailing" charges. In 1967, for example, the 75th percentile of the national distribution of fees for a follow-up office visit and a routine hospital visit corresponded to between \$7 and \$8 for an office visit and between \$9 and \$10 for a hospital visit. Fees at the 95th percentile were \$14 and \$15, respectively. Fee schedules established by Blue Shield for reimbursing hospital visits under their regular plans were generally \$5.[44] Huang and Koropecky

(1973) indicate that carriers also differed with respect to updating fee schedules and/or community fee profiles.

Intercarrier variation in reimbursement methods during the early years of the Medicare program justifies considering MCARE exogenous in analyzing fee behavior covering the 1967–1970 period. Actual reimbursements reflect deliberate carrier policies to a far greater extent than physician fee levels existing in the community.

Wages

The U.S. Department of Labor, in its *Area Wage Surveys*, provides data on wages for selected occupations. Physicians typically employ female personnel with nursing skills and/or with secretarial-clerical skills. Wage data are available for metropolitan areas, not states. To convert the wage series into a usable state series, industrial nurse and secretarial wages (by metropolitan area) have been regressed on the population of the metropolitan area and dummy variables to represent the years 1967–1970 and the nine census divisions.[45] The regressions (not shown) explain most of the variation in both series ($R^2 = 0.72$ for nurses and 0.51 for secretaries). Given parameter estimates of these equations, a wage series by physician field, state, and year has been constructed. Each field-state-year observation reflects the distribution of physicians by community size for that observation, the year, and the appropriate census division. Since secretarial-clerical employees represent the dominant non-physician labor input to physicians' practices (Kehrer and Intriligator, 1974), the secretary wage represents WAGE in the fee equations.

NOTES

1. U.S. Department of Health, Education, and Welfare (1972).
2. Monroe and Roback (1971).
3. U.S. Department of Commerce (1973).
4. Alevizos, Walsh, and Aherne (1973).
5. See Fein (1967), for example, on the alleged advantages of groups. Todd and McNamara (1971) provide data on the formation of groups.
6. That study is an extension of a suggestion in Newhouse (1973); namely, that large medical groups may be relatively inefficient.
7. Number of observations in the 1967–1970 AMA sample: general practitioners, 3,404; surgeons, 2,225; internal medicine, 1,895; obstetrics-gynecology, 774; and pediatrics, 754.

An alternative to aggregating is to conduct the analysis at the level of the individual physician. However, data corresponding to the physicians' market area are needed for several independent variables. If data for an inappropriately defined area are merged with records on individual physicians, the parameter estimates will be biased toward zero. This bias is less likely to occur if the observational unit is the state. An analysis of physicians' fees based on another AMA sample and a somewhat different method has been conducted at the micro level (Steinwald and Sloan, 1974). A useful by-product of the present investigation is a comparison of the results at two different levels of aggregation. There are certain conditions under which aggregation is inappropriate. Theil (1971) states the precise conditions under which aggregation bias will arise.

8. U.S. Department of Health, Education, and Welfare (1972).
9. The quantity of services demanded is specified to depend on the mean fee. There are other dimensions of physician costliness, but in view of the information available, it is not possible to consider these. For example, some physicians are more likely to recommend revisits for a specific diagnosis and/or admit patients to a relatively expensive hospital.

   The physician's fee structure may reflect differences in the relative marginal costs of providing specific services. For example, the hospital visit fee may increase relative to a routine office visit fee as the distance between the hospital and the physician's office increases. Unfortunately, the data are not yet available in sufficient detail to capture variation in the marginal costs of providing specific services.
10. Unless otherwise indicated, the data are from the American Medical Association.
11. There are alternative measures of physician experience. Among these are years since graduation from medical school, years practiced in current specialty, and age. The principal advantage of LIC10 is that it reflects experience in the geographic area of current practice as well as years in medicine and current specialty. It represents experience in the area imperfectly since some physicians may secure licenses in several states soon after graduation (particularly in those states known to be restrictive, such as California and Florida). No single measure of physician experience is fully adequate, but fortunately all are positively correlated. So as an empirical matter, it does not make much difference which variables are selected.
12. For statistical evidence, see Health Insurance Association of America (1972). The percentage of population with basic insurance was included in regressions not presented in this paper. The variable tended to enter with a negative sign. A possible explanation of this result is given below.
13. This point is discussed in greater detail in Phelps (1975). He argues there that the direction of causation (positive or negative) from medical care prices to insurance cannot be deduced.
14. The proportions for other major fields are higher: pediatricians, 5 per cent; obstetricians-gynecologists, 19 per cent; internists, 22 per cent; and general surgeons, 55 per cent.
15. Davis and Russell (1972) indicate that hospital admissions are positively related to the price of hospital outpatient services. The same measure was used in this study.
16. The 10 per cent estimate is based on Goldstein (1972). Capital costs, particularly those relating to space, have traditionally been considered relevant only in the long run. However, some economists have correctly questioned the

premise that labor is always variable whereas capital varies only in the long run. (See Oi, 1962, for example.)

17. The dependent variables in both studies are measures of the physician time input. The negative effect of income on the physician's time input implies a positive effect on the physician's imputed wage.
18. The AMA has included questions on both property income and children on its most recent survey of physician's practices (PSP8 conducted in late fall 1973).
19. Some sociological and psychological evidence related to physicians' choice of speciality is available (see Sloan, 1968). This body of literature might be useful for predicting specific types of cases the physician prefers, but is not really relevant for studying output and price decisions.
20. Feldstein (1970, 1972) emphasizes that physicians' price and output decisions are motivated by a desire to select interesting cases. Although it is clear that the physician would on balance prefer to have some variety in the cases he treats, and, like other professionals, probably seeks to avoid disagreeable customers, the *empirical* importance of this factor to an inquiry into physician price and output setting is questionable. The references Feldstein cites (Friedson, 1971; Martin, 1957) do not specifically model the case selection process, nor does one gain from these studies the impression that case selection is a particularly important variable of choice, once the physician is established in a particular setting. The Martin study refers to medical students, not to physicians in private practice. If the physician wanted to make meaningful changes in the mix of patients he sees, he would probably do better to change his specialty and/or practice mode, since there are substantial interspeciality and intermode differences in patient mix. Data presented in Sloan (1973) indicate that "type of patient" has a role in practice mode choice, but is less important than other factors such as "professional independence," "regularity of hours," and "income potential."
21. Fixed costs in this context pertain to those associated with maintaining even the smallest-scale practice. These are probably relatively unimportant in comparison to the marginal costs. As seen below, the model as specified predicts that marginal, not fixed, costs affect the physician's price.
22. Studies of physician fee-setting before Steinwald-Sloan found that several variables in their regressions behaved in a manner inconsistent with a "standard" maximizing model of the type generally used by economists. The Steinwald-Sloan study, using better data than had previously been available, reports signs on such variables as patient income and the physician-population ratio that are consistent with profit maximization.

    Equation (4) results in a price equation that may be readily estimated. This would not be the case for a price equation derived from a utility function. Nonlinearities arise with the use of plausible utility functions when price-setting behavior is assumed. The comparative statics solutions, assuming an objective such as Equation (4)'s or a utility function, are essentially the same. To calculate π as defined by (4), the physician subtracts the value he assigns to C_2 from his net practice earnings. Both π and C_2 are measured in dollars.
23. A reasonable objection to the model presented in this section is the assumption that the total cost function is linear. It is easily seen that this simplifying assumption does not alter the essential form of the model. Let $C = d + eQ + fQ^2$. Then $\pi = Q(a_1Q + aX) - d - eQ - fQ^2$, where X stands for the demand shift variables specified above. Differentiating with respect to Q, $Q^* = (-aX + e)/[2(a_1 - f)]$ (I). The general form of the numerator is unchanged; the denominator contains the term $(a_1 - f)$ instead of a_1. $P^* = [a_1e + a(1 -$

$a_1)X]/[2(a_1 - f)]$ (II). The term $(a_1 - f)$ appears in both the numerator and denominator of (II), but not (6). However, the functional form of the price equation is unaffected, and regression analysis cannot be used as a basis for choosing between (6) and (II).

The terms a_1 and f correspond to Professor Huang's β_1 and α_1. (See his comment on this paper.) The essential difference between the model he proposes and the one presented in this paper is that his assumes that the physician is a price-taker in a competitive market whereas mine assumes he has some monopoly power and sets prices. The latter assumption is a more plausible one. My $(a_1 - f)$ may be negative in much the same way that his $(\beta_1 - \alpha_1)$ may be negative.

24. Equations' (8) and (9) specification implies that the average equals the marginal coinsurance rate. The assumption is made necessary because of the lack of data by state and year to develop marginal rates. Sloan and Steinwald (1974) present data on the relationship between average and marginal coinsurance rates. The average is much less than the marginal coinsurance rate for the appendectomy fee. The two rates are much closer in the case of office visits. The fee equation would optimally contain a marginal coinsurance rate and a variable measuring physician firm demand schedule shifts attributable to indemnity coverage. This latter point is discussed in greater length in Sloan and Steinwald (1975) and in a forthcoming physician fee study by these authors (using AMA data specifically collected to measure the effect of third-party reimbursement methods on physicians' fees). Insurance variables defined similar to K have been used in Davis (1974), Feldstein (1970, 1971b), Fuchs and Kramer (1972), and Rosett and Huang (1973). Probably no one is fully satisfied with this type of variable, but it is the best available.
25. According to an AMA survey, almost 39,000 physicians practiced in groups in 1969 compared with about 188,000 in patient care, office-based practice. See Todd and McNamara (1971) and Haug and Roback (1970).
26. Some groups have apparently recognized potential disincentives inherent in group practice and have centralized decision making to some degree. See Sloan (1974a).
27. Price level data come from the U.S. Department of Labor (1971). This source gives cost-of-living data for selected cities and for nonmetropolitan locations by census area. The index is constructed as follows: (1) for states for which only one city is listed, cost-of-living data for the city are taken as representative of all metropolitan areas in the state. Data for the census area in which the state is located are used for nonmetropolitan location. The index is then constructed by multiplying the metropolitan data by the percentage of population living in urban areas of the state and the nonmetropolitan data by 1 minus this percentage. Finally, the index is annualized by dividing the state index by the Consumer Price Index for the year (1967 = 100). The resulting index varies by both state *and* year; (2) for states for which two cities are listed, the larger one is assumed to be representative. All other calculations are the same as #1; (3) for states for which no cities are listed, the closest city is taken to be representative. All other steps are the same.

    In a few preliminary regressions, the price index was included as a separate independent variable as an alternative to deflating. The index's coefficient was not significant, and including this variable has little effect on the other estimated coefficients.
28. If fees have a positive impact on major medical coverage, the MMED elasticities reported in the text are biased upward. There are two reasons for

believing that there is little or no upward bias. First, in the Steinwald-Sloan study, individual physician fees are regressed on MMED, which is defined for the physician's state, as in the present study, and the MMED elasticities are virtually the same. It is unlikely that the fee of the individual physician feeds back onto a state average, particularly in view of the intrastate variation in fees. Second, Phelps (1976) includes a medical care price variable in a regression with the maximum payment under major medical insurance as the dependent variable. The t value associated with the medical care price and its square is 0.91. This evidence suggests that major medical coverage is not sensitive to medical care prices.

29. The test is from Kmenta (1971), p. 372.
30. No cost-side (or equivalent supply) variables enter Equation (10).
31. Regression (4), 1.08; Regression (5), 1.11.
32. The fact that there are fewer variables in the Table 2 regressions probably accounts for the increased significant levels.
33. Monte Carlo experiments reported in Nerlove (1971) demonstrate that this bias is severe.
34. The source of the Blue Cross-Blue Shield data is Blue Cross-Blue Shield, *Fact Book*, 1967–1970.
35. These data are available for the years included in the analysis in the January issues of the *Social Security Bulletin.*
36. Independent plan benefit data come from Reed, Anderson, and Hanft (1966) and Reed and Dwyer (1971). The surveys refer to 1965 and 1969. Data for 1967, 1968, and 1970 were obtained by linear interpolation.
37. Plus the exception noted in the preceding note.
38. Table 15. These data correspond to 1969. Judging from similar tables in other years, the γ's change very slowly. $\gamma_B = 0.296$; $\gamma_C = 0.390$, and $\gamma_I = 0.586$.
39. Sources of PEXP and OPDEXP are U. S. Department of the Treasury *Business Income Tax Returns*, 1970–1972; and American Hospital Association, *Hospitals*, "Guide Issue," 1969–1971. When only a single value for a given state was missing, the missing value was filled by linear interpolation. If more than one value is missing, the state has been eliminated from regressions using K.
40. Marmor (1968), U.S. Senate, Committee on Finance (1970), and Huang and Koropecky (1973).
41. See Note 28 for further discussion of this issue.
42. According to Huang and Koropecky, the vast majority of Medicare carriers used fee schedules in 1967.
43. Huang and Koropecky (1973).
44. Reed and Carr (1970). Medicare fee schedules may have been somewhat higher than schedules for regular business. See U.S. Senate, Committee on Finance (1970).
45. The nurse and secretary regressions are based on 255 and 300 observations, respectively.

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8 COMMENTS

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In his paper, Professor Sloan developed a model of physician fee-setting that he tested with a four-year time series of state cross-section data. The physician was treated as a firm that produces health services for consumers. That is, facing the consumers' demand function and his own cost curves, the physician determines the quantity and the price of his services that will maximize his business profit.

The explanatory variables that Professor Sloan employed in his demand function included insurance reimbursement factors such as the reimbursement of private health insurance for physicians' services; the major medical insurance population; Medicare part B reimbursements and Medicaid expenditures for physicians' services, or the overall proportion of the physicians' expenditure that was reimbursed (K); and some selected socioeconomic demand factors of the physicians' potential patients.

In his cost functions, besides the quantity of services produced, Professor Sloan included the physician's age and wages paid to non-physician personnel as independent variables.

The price equation employed can be derived in terms of all the independent variables in the demand and cost functions after the physician's business profit is maximized. In the empirical study, average annual revenue per visit and average usual charge were used as dependent variables representing the price variables. Several regressions were estimated. The results indicated that third-party reimbursement has a relatively greater impact on average revenue than on usual physicians' fees. Among the reimbursement factors, only the Medicare variable was consistently reliable in the usual fee equations, although the impact elasticities associated with the Medicare parameters were generally very low. Among other socioeconomic variables, only the physician-population ratio and the non-physician wage factor were relatively consistent and reliable.

In general, as in his other studies, Professor Sloan's paper has many noteworthy aspects, including a clear statement of the hypotheses to be tested and a careful comparison of the results with those reported by other investigators. However, I am not sure what policy implications can be derived from this research since the empirical results were generally insignificant or inconsistent.

In this paper, I would like to offer the following criticisms with respect to Professor Sloan's paper.

1. THE BASIC MODEL

Sloan's treatment of the physician as a health service firm and his use of the traditional profit maximization theory to explain the physician's behavior pattern are inappropriate. Here, I agree with Professor M. Feldstein's argument (1970) that "the physician is an individual who determines his quantity and price to maximize utility and not profit," and, "a simple profit maximization model does not allow for the physician's preferences for leisure time as well as income." The physician's utility function can be defined as follows:

$U = f$ (business profit, leisure time, professional ethical feeling, number of medically interesting cases, etc.)

His behavior pattern is affected by the several variables in the utility function, and business profit is only one of these. It is generally agreed that the marginal utility of leisure time to a physician is very high because of his income status. The profit maximization model ignores the physician's professional ethical feeling, precluding the refusal of care to certain cases or considering patients' costs when prescribing treatments. Nor can this model explain the fact that some physicians apply price discrimination to select medically interesting cases for the purposes of training and research. Profit incentive could be a strong factor in his utility function, but the physician's behavior is too complicated to be explained by the simple model of profit maximization.

Professor Sloan's demand function included some supply factors as independent variables, such as the physician-population ratio, physician qualification status, and the percentage of various sizes of group practice. This created an identification problem in his real demand function; namely, that it is not possible to distinguish the demand from the supply function.

The traditional model of demand and supply market determination that follows should not be ignored in this study:

$$D = \beta_1 p + \beta_2 X_1 \qquad \beta_1 < 0$$

$$S = \alpha_1 p + \alpha_2 X_2 \qquad \alpha_1 > 0$$

$$D = S$$

where D and S represent the quantity of physicians' services demanded and supplied, respectively, and X_1 and X_2 signify the exogenous demand and supply variables. X_2 may include non-physician cost inputs (e.g., wage, rent, and capital), the physicians' relative income factors, the physicians' qualification status, the physicians' average time input, the physician-population ratio, and the medical school enrollment, etc. From this model, the physician fee equation is derived as:

$$P = \frac{1}{\alpha_1 - \beta_1}(\beta_2 X_1 - \alpha_2 X_2)$$

This is a reduced-form equation in which the variation in P is explained in terms of the totality of exogenous demand and supply variables. In this equation $(\alpha_1 - \beta_1)$ is positive. If β_2 is positive, then the increase in the exogenous demand factors will tend to increase the physician fee. If α_2 is positive, then the increase in the exogenous supply factors will tend to lower the physician fee. Sloan's final price regressions are, in fact, the estimation of this type of model, although he started from a profit maximization hypothesis.

This type of model is most commonly employed in market research. Fuchs and Kramer (1972) have successfully applied this type of model to estimate the demand and supply functions for physician services. Their data was composed of a cross-section sample of thirty-three states. M. Feldstein (1970) also used this model, but he failed to obtain the proper signs for price parameters in the demand and supply equations. However, as he stated clearly in his paper, his "estimates are based on the rather small sample of quite imperfect data," and "the conclusion should be treated as preliminary and subject to revision." Feldstein had a time series sample of only nineteen years. Besides, his price and insurance factors could be overly massaged. Fuchs commented that Feldstein's result probably is "the failure to take account of technological change" (1970).

The AMA's data used by Sloan include a much larger sample of time series and cross-section data than were used by Feldstein and Fuchs. Probably, by using the above model, Sloan could have obtained completely different results.

2. THE EMPIRICAL RESULTS

In Sloan's paper, three reimbursement variables have been selected: private health insurance benefits per capita (PRIVH); a fraction of medical expenditures paid by insurance—both private and public (K); and the percentage of population with major medical insurance (MMED). The parameters of these coefficients are hardly significant. The results contradicted almost all the previous studies, including Huang and Koropecky (1973), M. Feldstein (1970), and Fuchs and Kramer (1972), each of which indicated that the insurance reimbursement factors have significant impact on the demand for physicians' services and fees.

Sloan's measurement of the third-party insurance reimbursement variables may contain serious errors, and therefore the true impact relationships were disturbed and biased. For example, he defined:

$$\begin{aligned} PRIVH = \{&BLUSBEN + \gamma_B \cdot Z \cdot BLUSBEN + \gamma_c(COMBEN \\ &- DISPAY - INDBEN) + \gamma_I\, INDBEN\} \\ &\div (POP \cdot PI) \end{aligned}$$

where BLUSBEN equals Blue Shield insurance benefits, BLUSBEN represents Blue Cross plus Blue Shield health insurance benefits; COMBEN is commercial health and disability insurance benefits; DISPAY is disability insurance benefits; INDBEN signifies insurance benefits of independent health insurance plans; and γ_B, γ_C, and γ_I represent the fraction of health insurance benefits for expenses other than hospitalization, with subscripts identifying Blue Cross-Blue Shield, commercial insurors, and independent plans, respectively. Since Professor Sloan did not have any information concerning the value of γ_B, γ_C, and γ_I by state and year, the national averages were used for all the samples. If the interstate variations of γ_B, γ_C, and γ_I are significant, then the measurement error of PRIVH is serious. Similar measurement errors and distortions of the true impacts arose for K and the major medical insurance enrollment (MMED).

Also, Sloan's insurance benefit payments were deflated by each individual state's consumer price index. State consumer price indexes vary substantially from one state to another. In the regression analysis of the pooling of time series and state cross-section data, it could be more appropriate to use a time dummy variable in order to hold the time factor constant, rather than to use each individual state's CPI as a deflator.

In his general specification price equation, Sloan also brought in such Medicare and Medicaid factors as the reimbursement variables and found that the Medicare variable was the only reliable and consistent one. This indicated that Medicare reimbursement and other private health insurance reimbursements have different impacts on the inflation of the general physician's fee. The results could be attributable to the Medicare methods of reimbursement or psychological impacts of the governmental system. Huang and Koropecky (1973) obtained similar results. They used the 1952–1969 BLS physician fee index and found that the insurance reimbursement, inflation factor, and Medicare dummy variable could explain the increase in physicians' fees up to 88 per cent. All the coefficients in their model are stable and significant, and the Medicare system contributed roughly 3 per cent of the increase in physicians' fees per annum by increasing the coverage of population and introducing the Medicare methods of reimbursement. In fact, these methods alone may have contributed 1.8 per cent to the increase in overall physicians' fees per annum. More careful investigation of the Medicare impact on physicians' fees and more detailed analysis of its causes are needed in Sloan's paper.

One of the most controversial conclusions in Professor Sloan's paper is that the physician-population ratio has a statistically significant negative impact on physicians' fees. The conclusion implied that the increase in medical education and the supply of physicians can at least temper fee inflation. In empirical studies of this type, this conclusion is unique and important. Previously, Feldstein (1970) found that the increase in the physician-population ratio is inclined to have a positive impact on the increase in physicians' fees. Fuchs and Kramer (1972) found that this ratio has a very significant positive impact on the demand for physicians' services, causing a positive impact on the increase in physicians' fees. Huang and Koropecky (1973) found that the ratio of physicians in private practice to population has a statistically significant positive impact on the increase in Medicare physicians' fees. They applied a nonlinear type of price adjustment model and found that the physicians' population ratio has a positive impact, and last year's price has a negative impact on the increase in Medicare physicians' fees. In a total of eight regressions these results are all statistically significant and consistent (pp. 30–31). These empirical results imply that the physicians' population ratio may push up the price, but the price will rise at a decreasing rate. Given other socioeconomic factors, the physicians' fees in the high-price state will converge to the fees in the low-price state. In his paper, Professor Sloan made two comments on Huang and Koropecky: First, that they obtained some negative and insignificant impacts of physicians' population ratio on the growth in Medicare physicians' fees; second, that their result implies that the fees in high-ratio states will continue to diverge from fees in low-ratio states without end. Both of these comments could be misinterpretations of the model and the results in Huang and Koropecky's study.

The positive impact argument of the physicians on the increase in physicians' fees was expressed mainly in three hypotheses: permanent excess demand for physicians' services (Feldstein, 1970), self-generation of demand by physicians (Fuchs and Kramer, 1972; Huang and Koropecky, 1973), and the physicians' maintenance of target income levels (Newhouse, 1970).

In Huang and Koropecky's study, the factors influencing the increase in Medicare physician fees were investigated. The data base consisted of a 5 per cent sample of Medicare physicians' actual charges grouped by state for the period of 1966–1969. They found that different methods of Medicare reimbursements, the standard deviation of the physicians' fees, the previous year's fees, and census region to be very important determinants. The standard deviation of physicians' fees had a consistently significant positive impact on the increase in Medicare physicians' fees in all the regressions they estimated. This implies that a large dispersion of price distribution will generate a significant incentive for physicians who charge lower fees to catch up to physicians charging higher fees. This would cause prices to rise faster where the dispersion was greater. If this argument is verified, the policy implication is profound. Fee inflation can be reduced if a method of regulation or reimbursement can be designed so as to narrow the dispersion of physicians' fees.

Huang and Koropecky used a dummy variable to indicate geographic region in their estimation of Medicare price equations. They found that during the three-year period surveyed, given all other social, economic, and insurance factors, western states had an 8 per cent higher rate of change than nonwestern states in Medicare physicians' fees.

With the exception of the methods of reimbursement, Sloan's AMA data were comparable to those used by Huang and Koropecky. I believe that he could have obtained results similar to Huang and Koropecky's given the use of the variables that they employed.

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Frank Sloan's paper is an interesting attempt to estimate empirically physician fee-setting behavior. But because of a variety of problems, most of which can be attributed to less than ideal data, it is not clear whether many of the results from this paper can be accepted *per se* with much confidence. The study does, however, provide some interesting comparisons with a previous study carried out by Steinwald and Sloan on a less aggregated basis.

I have two general reservations about the approach taken in the paper plus a few difficulties either with the way a variable is constructed or with the way a result is interpreted.

The first reservation involves the use of data that are aggregated at the state level. The rationale for the aggregative data base is clear. It permits the pooling of data from a variety of sources. In addition, reimbursement data are available only on an aggregate basis. Finally, it eliminates the need for explaining all unexpected signs in terms of errors in attributing aggregative data to the micro level. On the other hand, the use of aggregate data makes it more difficult to interpret the results. The most serious problem involves the construction of a third-party reimbursement variable. One specification contains three variables: private health insurance expenditures on health care other than hospital in the state (PRIVH), Medicare SMI expenditures, and Medicaid expenditures on physicians. Another involves the sum of the above three divided by per capita health expenditures in the state. Obviously neither specification is a true price for a given case and it is not clear what effects you are observing when you aggregate.

There are essentially three distinct problems with the private health expenditure variable, although not all of these are aggregation problems *per se*. The first problem is that the approximation is at best an average price rather than a marginal price, even though we generally postulate that behavior is influenced by what occurs at the margin. The existence of a variety of limits, floors, and exclusions could cause the marginal price to deviate substantially from the average price. The second and perhaps most important problem is that it is unlikely that the level and/or type of insurance is invariant across individuals. This means that the only "price" variable we can observe is the percentage of private health expenditures in a particular state covered by insurance, even though there is reason to believe that the distribution of net prices across individuals may be important. Third, even if everyone had the same insurance package, the use of the average percentage of the nonhospital health bill in the state covered by insurance would produce measurement errors, since the physician's fees against which this percentage would apply would differ. Thus, I believe that there are substantial problems with the third-party reimbursement variable as it now stands. Nonetheless, I would agree with the author that his variable is an improvement over using the percentage of the population with some form of insurance coverage, the latter being a variable that has been used in several earlier studies.

The second reservation involves the lack of a very well-specified model of physician fee-setting. Although not all that much being done here is different from what is being done elsewhere, in part by the author, the lack of a well-specified model makes some of the estimation appear to be more ad hoc than I think was the case and increases the difficulty of interpreting some of the results. In addition, I am very uneasy about the treatment of major medical insurance (MMI). First, we are told that major medical insurance is endogenous to the system and then that actual rather than predicted values of major medical insurance are used in the Table 1 regressions because of collinearity between MMI and income. Irrespective of the sign and significance of the variable, the primary conclusion one is left with is that a serious identification problem remains.

In addition to the above two points, I have difficulty with a few other variables or their interpretation. The most important one involves the private health expenditure variable. In some initial estimations, Sloan found that the PRIVH variable was consistently negative in the office and hospital visit fee regressions although it was always positive in the average revenue equation. Since the negative coefficient was regarded as being highly implausible, the decision was made to exclude it from the final regressions for office and hospital visit fees. First, it is unclear whether or not the variable was significant. Second, the seriousness of this finding, given the purpose of the study, is not made sufficiently explicit. A major purpose of the study is to estimate the impact of third-party reimbursement on the physician's fee-setting. In the first specification of third-party reimbursement, there are problems with all three components. The Medicaid variable performs poorly. The Medicare variable is generally significant but it is a proxy for several distinct factors and is therefore difficult to interpret. Finally, PRIVH, which represents three fourths of third-party reimbursements, has an implausible sign and is excluded from the fee regressions. Thus I find it difficult to accept the suggestion that the impact of private third-party reimbursement on usual charges is relatively unimportant and the major effect is reflected in average revenue. Aside from the fact that the variable was not a good reflection of the net price or average cost that a physician's patients faced, it seems to me that we just do not understand the effect of PRIVH on usual charges. I was also disturbed that no attempt was made to explain the negative coefficient, given the importance of this variable. Was it just inadequate data or a reflection of something else that was going on? For example, one possibility is that there is a relatively long lag between the time Blue Shield or other private carriers increase their rates and inflationary pressures in the medical sector, particularly during this period. If physicians feel obligated to stick to the established fee schedule but bill separately for component services that previously had been included in their "office visit" fee or which they previously had not done, we could justify the positive coefficient for average revenue and a negative or insignificant relationship to fees.

At a considerably lesser order of importance, I find the experience variable and the age variable a little strange. Approximating experience in terms of whether or not a physician has been licensed less than ten years in his current state of practice does not seem very promising. In the first place, it makes little sense unless you assume that the physician's current state of practice was also his first state of practice. In addition, it is unclear why a binary variable of this nature should be particularly helpful. Similarly, it is not obvious why we would want to use the percentage of physicians over age 55 as a variable. Although it is essentially a human capital equation, it could be that there are a lot of physicians over 55 because the area is a geographically declining one, in which case it is not a human capital equation at all. The use of at least the percentage over 55 and the percentage under 40 would seem to be an improvement. Any information about the age distribution in an earlier year would also be helpful.

As indicated at the outset, I think that this is an interesting attempt to explain variations in fee-setting, but in the end, I do not think very much can be said about either the impact of reimbursement or about fee-setting dynamics, two of the major interests of the study. The major difficulty in both cases I think is data inadequacies. Perhaps the most interesting finding both here and in Sloan's earlier disaggregative study is a small but negative relationship between physician-population ratio and physician fees. The implication is that the physicians' services market, at least for general practitioners, may work a little more like an ordinary economic market than others have found.

Finally, I believe that the only way we will be able to estimate the relationship between third-party reimbursement and physician fees is when the private health insurance expenditure data are available on a disaggregative basis. In particular, what is needed is a weighted average of the average price, or better yet the net price prevailing in a physician's market area. Such information is difficult to collect, would require a well-designed survey, and could probably only be derived accurately from physicians' billing records.