Physicians' Fees and Public Medical Care Programs

Robert H. Lee and Jack Hadley

In this article we develop and estimate a model of physicians' pricing that explicitly incorporates the effects of Medicare and Medicaid demand subsidies. Our analysis is based on a multiperiod model in which physicians are monopolistic competitors supplying services to several markets. The implications of the model are tested using data derived from claims submitted by a cohort of 1,200 California physicians during the years 1972–1975. We conclude that the demand for physicians' services is relatively elastic; that increases in the local supply of physicians reduce prices somewhat; that physicians respond strategically to attempts to control prices through the customary-prevailing-reasonable system; and that price controls limit the rate of increase in physicians' prices. The analysis identifies a family of policies that recognize the monopsony power of public programs and may change the cost-access trade-off.

A primary objective of Medicare and Medicaid has been to make office-based physicians' services affordable for poor and elderly populations. To a large extent this objective has been met [1]. As might have been expected, however, these subsidy programs have been accompanied by rapid increases in medical care prices and expenditures. Between 1970 and

---

The research for this paper was supported by Contract No. 600-76-0054 and Grant No. 18-P-97008/3-01 from the Health Care Financing Administration, DHHS.

We wish to thank our colleagues Judith Feder, John Holahan, William Scanlon, and Judith Wagner for their helpful comments. We also thank James Bluck for his excellent research assistance. The opinions and conclusions expressed in this paper are those of the authors and are not necessarily those of either the Urban Institute or the Department of Health and Human Services.

Address communications and requests for reprints to Robert H. Lee, Research Associate, the Urban Institute, 2100 M. St. N.W., Washington, D.C. 20037. Jack Hadley is Senior Research Associate, the Urban Institute.

0017-9124/81/1602-0185/$02.50/0

1977, Medicare's expenditures for physicians' services increased by about 175 percent, and Medicaid's by over 210 percent [2].

To counteract increasing program costs, the federal and state governments have sought ways to limit payments to physicians. Thus far, the primary strategy has been to limit the rate of increase in program fees. While this reduces the rate of increase in program costs, it does so in part by reducing the supply of physicians' services to the target population.

Underlying this dilemma is the pursuit of two objectives with only one policy tool. Both increases in access to care and limits on prices and spending are sought, yet manipulation of program fees is the only policy instrument used. Consequently, a trade-off between access and cost control goals has emerged.

In this article we develop and estimate a model of physicians' pricing that explicitly incorporates the effects of Medicare and Medicaid demand subsidies. In addition to focusing the analysis on policy-relevant variables, this approach sidesteps the difficulties of relating price to marginal cost when an unobservable, the physicians' implicit wage, is the primary determinant of marginal cost.

Our analysis is based on a simple multiperiod, multimarket model of pricing in which physicians are seen as monopolistic competitors. Excepting the special case in which physicians are perfect competitors, prices will exceed marginal costs. As a consequence, limits on private prices need not imply shortages [3]. In this context we examine the effects of two programs designed to limit the rate of increase in physicians' fees: limits on Medicare and Medicaid fees and general price controls.

In addition to focusing on the structure of current public policy, the empirical portions of this article rely on a unique data set: claims paid by Medicare and Medicaid to a large sample of office-based, solo practitioners in California. Unlike earlier studies' data, which consisted of crude measures of average revenue per patient or price for some prototypical service, these data permit a complete accounting of the price and quantity of the dozens of individual outputs that a physicians' practice produces. As a result, not only are more precise tests of behavioral hypotheses possible, but some clear implications for the design of physician reimbursement systems emerge.

Multiple Markets and Price Discrimination

As is now standard, we view a physician's practice as a monopolistically competitive firm that sells services in several markets.[1] Each physician faces a downward sloping demand curve comprised of privately insured and self-paying patients, plus demands from patients insured by Medicare and Medicaid.[2] These programs have two distinctive features relevant to our model: (1) fees paid by the programs are fixed for the current period, and (2) future fixed fees depend on physicians' current period charges. A physician who participates in fixed fee markets engages in price discrimination by definition, because the physician *receives* different payments for the same services, even though a single fee is *charged.*[3]

A brief description of pre-1976 Medicare and Medicaid reimbursement procedures will make these relationships clearer.[4] Medicare bases its payments on the *reasonable* charge defined for each physician for each procedure. This reasonable charge is the minimum of the actual amount billed, the *customary* charge, and the *prevailing* charge. In practice, physicians' billed charges almost always exceed both the customary and prevailing charges, so the smaller of these two determines the physicians' Medicare reasonable charge. A physician's customary charge represents the median amount he or she billed for the procedure in question during the previous calendar year. A physician's prevailing charge is set at the 75th percentile of customary charges within a prevailing charge area. So, for most physicians, the median amount they billed last year determines their reasonable fee this year. For those physicians whose charges for a particular service fall in the upper quartile, however, the reasonable charge will be equal to the prevailing charge. In the first case the reasonable fee for the procedure in question will be physician-specific. In the second case the reasonable fee will be area-specific. Consequently, Medicare reasonable fees will vary among physicians.

Assuming that the patient has satisfied the deductible requirement, Medicare will pay 80 percent of the physician's reasonable charge. Two billing arrangements are permitted and may be chosen on a claim-by-claim basis. If the physician is willing to accept the reasonable charge as payment in full, he or she may "assign" the claim and bill Medicare directly.[5] After Medicare pays its share of the reasonable charge, the physician bills the patient for the remainder. If, on the other hand, the physician is unwilling to accept the reasonable charge as payment in full, he or she bills the patient directly, as with any other private patient. The patient must pay the entire amount but will be reimbursed by Medicare for its share of the reasonable charge. In either case, the Medicare payment is determined by the reasonable fee.

California Medicaid also calculates a reasonable fee for every procedure for each physician. In theory, these reasonable fees are determined by a system similar to Medicare's. In practice, the link between last year's prices and this year's reasonable fees has been severed. During the years covered by our study, reasonable fees were increased only once. Aside from the 2.5 percent across-the-board increase, reasonable fees were fixed at levels determined by physicians' 1968 billings. This basis insures that reasonable fees are not the same for all physicians.

The programs also differ in that Medicaid patients bear none of the cost of services provided through the program. Not only is the Medicaid fee payment in full, but it is paid entirely by the program. A patient cannot be billed for the difference between the amount billed and the reasonable fee. The physician must accept Medicaid's fee or refuse to treat the patient.

We now show how Medicare and Medicaid reasonable fees affect physicians' prices. We first examine a simple case in which there is only one fixed-fee market. Choosing Medicaid as an example, we let f = Medicaid fee (exogenous to the physician); p = private patient fee; T = quantity of services provided to Medicaid patients; D = quantity of services provided to private patients; $Q = D + T$ = total output; X = exogenous demand shift factors; and Z = exogenous cost shift factors (input prices). X, Z, and f are exogenous, while p and T are endogenous choice variables. Demand in the private or fee-setting market is assumed to be downward sloping for each physician, hence

$$D = D(p,X) \text{ and } D_p < 0. \tag{1}$$

$D(p,X)$ incorporates the effects of insurance on the demand for services. Even though most patients are insured, they are usually at risk if the physician's fee exceeds the maximum allowed by the insurance program [4]. So, even though the price elasticity of demand is likely to vary across both market areas and individual physicians, $D_p < 0$ for all physicians.

Costs to each physician are governed by a cost function that has output and a vector of exogenous input prices as arguments:

$$C = C(D,T,Z), \tag{2}$$

with $C_T > 0$ and $C_D > 0$. Optimal values of p and T are chosen as a result of maximizing the following profit function:

$$\Pi = f \cdot T + p \cdot D(p,X) - C(D,T,Z). \tag{3}$$

The first-order conditions require that

$$\partial\Pi/\partial T = f - C_T \leq 0, \tag{4a}$$

and

$$\partial\Pi/\partial p = D + p \cdot D_p - C_D \cdot D_p = 0. \tag{4b}$$

Equations (4a) and (4b) merely state that, if the physician participates in both markets (i.e., $T > 0$), equating marginal revenue to marginal cost in each market maximizes profits.

Assume for analytic simplicity that $C_T = C_D$. For all physicians for whom optimal $T > 0$, it is then the case that

$$p^* = C_D/(1 - 1/\epsilon) = f/(1 - 1/\epsilon), \tag{5}$$

where ϵ is the price elasticity of demand in the private market, and p^* is the optimal price. Equation (5) merely notes that a price-discriminating firm should equalize marginal revenue across markets. Equation (5) also implies that an increase in the fixed fee leads to a higher private price, with the extent of the increase depending on ϵ. Since both p^* and f are observable, (5) should let us calculate ϵ and test the hypothesis that physicians are monopolistic competitors. Unfortunately, that calculation depends on the assumption that $C_D = C_T$.[6] In any event, (5) implies that the reduced-form equation

$$p^* = g(f,X) \tag{6}$$

can be estimated, with the demand shift variables X approximating variations in ϵ.

Equation (5) holds for the simple case in which there is only one fixed-fee program and the physician participates. In fact, there are two fixed-fee programs (Medicare assignment and Medicaid), and physicians may participate in both, one, or neither. Letting r represent the Medicare reasonable and f the Medicaid reasonable and recognizing that for most physicians $r > f$, permits us to characterize three groups. Physicians who participate in both programs face $r > p^*(1 - 1/\epsilon) = f$ and are inframarginal Medicare assignment participants. Physicians who participate only in Medicare assignment face $r = p^*(1 - 1/\epsilon) > f$ and are nonparticipants in Medicaid. Physicians who participate in neither face $p^*(1 - 1/\epsilon) > r > f$.

For physicians who participate in either of the programs, a substitution similar to (5) defines the relationship to be estimated. For physicians who participate in neither, however, another equation must be analyzed:

$$p^* = h(C_D, X). \tag{7}$$

For the solo practitioners in our sample, though, the principal determinant of marginal cost is likely to be each physician's implicit wage. Although we observe market and personal characteristics, which account for much of the variation in the implicit wage, our best proxy is likely to be the Medicare reasonable, which is based on price at $t - 1$.[7]

Rather than estimate separate price equations for participating and nonparticipating physicians, we use a slope and intercept covariance approach to estimate a reduced-form equation for the billed charge (P)[8]:

$$p^* = P(r,f,X,Z), \tag{8}$$

where r and f are Medicare and Medicaid reasonable fees. We expect that $P_r > 0$, $P_f > 0$, $P_z > 0$, and $P_x < 0$. Our specification incorporates the assumption that prices (hence r and f) and physician stocks adjust to cross-sectional variations in demand.[9]

Equation (8) must be modified slightly to account for the impact of the Economic Stabilization Program (ESP), which was in effect for part of the observation period. If price controls are binding, their effects may be summarized by a shift term λ. In fact since the structure of price controls differed from year to year, λ should be viewed as a vector.

$$p^* = P(r,f,X,Z,\lambda). \tag{8'}$$

It is clear that $P_\lambda \leq 0$.

Multiperiod Price Effects

Increases in demand subsidies tend to result in higher prices. It is not surprising, therefore, that our model predicts that increases in program reasonable fees should lead to higher prices among physicians who participate in the programs. Several authors have further suggested that a "reasonable" fee system, in which future fees are based on current prices, creates an additional inflationary effect [5,6]. In this section, we show that a reasonable fee system creates such an incentive. We also show that a reasonable fee system may result in current prices being affected by physicians' expectations about rates of increase in costs and reasonable fees.

To demonstrate these points, we consider a case in which there are two periods and two markets. In one market fees are fixed. In the other market the physician sets prices to maximize profits given conventional demand and cost functions. Let f be the fixed fee; T, services supplied to the fixed fee market; p, the private price; $Q(p,Y)$, the demand function; and $C(Q,T)$, the cost function. Profit in the first period is

$$p_1Q(p_1,Y_1) + f_1\, T_1 - C\, [Q(p_1,Y_1),\, T_1]. \tag{9}$$

Second-period profits are discounted by a factor δ, and costs are expected to grow by a factor γ:

$$\delta\{p_2Q(p_2,Y_2) + f_2\, T_2 - \gamma C\, [Q(p_2,Y_2),T_2]\}. \tag{10}$$

The reasonable fee system requires that the second-period reasonable fee not exceed some multiple of first-period price:

$$f_2 \leq \theta p_1. \tag{11}$$

The physician maximizes the sum of (9) and (10), subject to the constraint (11). Writing this as a Lagrangian yields the following first-order conditions:

$$Q(p_1,Y_1) + p_1\, Q_p - C_Q\, Q_p + \mu\theta = 0 \tag{12}$$

$$f_1 - C_T \leq 0 \tag{13}$$

$$\delta\{Q(p_2,Y_2) + p_2\, Q_p - \gamma C_Q\, Q_p\} = 0 \tag{14}$$

$$f_2 - \gamma C_T \leq 0 \tag{15}$$

$$\theta p_1 - f_2 \geq 0 \tag{16}$$

Because our emphasis is on the effects of a reasonable fee system on current prices, we focus on (12). If current prices limit the next period's fixed fee, so that (11) is an equality, (12) may be rewritten as

$$p_1 = [C_Q - \mu\theta/Q_p]/(1 - 1/\epsilon). \tag{12'}$$

As before, ϵ denotes the price elasticity of demand. This may be compared to a situation in which current prices do not determine the next period's reasonable fee,

$$p_1' = C_Q/(1 - 1/\epsilon). \tag{12''}$$

It is clear that $p_1 \geq p_1'$, because $-\mu\theta/(1 - 1/\epsilon)Q_p \geq 0$.

In short, because current prices determine the next period's reasonable fee, there is an incentive for physicians to set current prices above levels that would maximize current profits. Doing so increases future profits, but reduces current profits. The amount by which prices should exceed levels that maximize current profits depends on physicians' expectations about the price elasticity of demand, expectations about increases in costs (γ), and expectations about increases in reasonable fees (θ).

Unlike the inflationary impact of basing program reasonables on lagged prices, the effects of γ and θ on current prices are not straightforward. Even in our simplified model, the signs of $dp_1/d\theta$ and $dp_1/d\gamma$ depend on offsetting terms.

Of these two effects, $dp_1/d\theta$ is the more interesting. Not only are physicians' expectations about program reasonables likely to be affected directly by policy decisions, but the implementation of ESP should provide a good example of such effects.

Reasonable fees were directly affected by ESP. In 1973 only 40 percent of the calculated increase in Medicare reasonable fees was permitted; in 1974, 55 percent [3]. It seems plausible that these restrictions should have affected θ.

We expect that $dp_1/d\theta \leq 0$, although this cannot be shown unambiguously. Indeed, a case can be made that $dp_1/d\theta > 0$, because as θ falls, more current profits must be given up to increase the next period's profits. Our expectation is, however, that reductions in θ increase physicians' incentive to widen the gap between list and transaction prices. We expect, in other words, that limits on reasonable fees may encourage physicians to raise their fees but give discounts more often. We expect that $dp_1/d\gamma \geq 0$. As with $dp_1/d\theta$, the comparative statics are ambiguous, but, unless physicians plan to cease supplying services to the fixed fee program, expectations of high rates of inflation should lead to higher current prices.

Lacking direct measures of θ and γ, we use the lagged rate of increase in Medicare reasonables to approximate changes in θ and the lagged rate of increase in the wages of medical personnel to approximate changes in γ. Data limitations force the assumption that only values for $t - 1$ enter the lag structure.

Even though it is clear theoretically that basing reasonable fees on lagged prices should increase current prices, the present data do not permit empirical tests of this hypothesis. Reasonable fees were based on lagged prices throughout the sample period. Thus limited to testing our hypotheses about θ and γ, we write the final version of the price equation as

$$p^* = P(r,f,X,Z,\lambda,\gamma,\theta). \qquad (8'')$$

Econometric Results

Table 1 lists the variables used in the empirical specification. The billed charge, p, and program reasonable fees, f and r, were defined above. Two dummy variables, MCRE and MCD, define participation in Medicare assignment and Medicaid. MCRE and MCD are used to implement the covariance approach outlined in the section "Multiple Markets and Price Discrimination," where we suggested that, by altering the price elasticity of demand, demand shift variables would affect optimal prices. Of particular interest is the hypothesis that increases in the number of physicians per capita would increase the price elasticity of demand faced by individual practitioners. Because the number of physicians per capita is strictly exogenous for the individual practitioner, we directly include two county-level measures of physician supply: physicians per capita in the same specialty as the physician (OWNMDS) and physicians per capita in other specialties (OTHMDS). Consistent with our hypothesis that reasonable fees and physician stocks adjust to equilibrate cross-sectional variations in demand (so that additional demand proxies would be redundant), we exclude per capita income from the equation with no significant loss of explanatory power.

We record each physician's country of medical training and years of experience. These are used to create dummy variables identifying physicians trained outside the United States (FMG); physicians with less than 17 years of experience (LITTLE); and physicians with more than 35 years

Table 1. Variables Used in the Analysis

Symbol	*Definition*	*Source*
p	Billed charge per CRVS Unit	Claims data
f	Medicaid reasonable per CRVS unit	Claims data
r	Medicare reasonable per CRVS unit	Claims data
WAGE	Average payroll per employee, offices of physicians and surgeons	County business patterns
MPRM	Malpractice insurance premium for \$1,000,000/\$3,000,000 by specialty and area	Johnson and Higgins of California and Marsh & McLennon, Inc.
OWNMDS	Physicians in the same specialty in the same county per capita	AMA, distribution of physicians in U.S.; State of California, Population Research Unit
OTHMDS	Physicians in other specialties in the same county per capita	Same as OWNMDS
MCRE	Equal to 1 if the physician supplied more than 750 CRVS units of service to Medicare assignment patients	Claims data
MCD	Equal to 1 if the physician supplied more than 750 CRVS units of service to Medicaid patients	Claims data
LITTLE	Equal to 1 if the physician had less than 17 years of experience*	California Blue Shield physician file
MUCH	Equal to 1 if the physician had more than 35 years of experience*	California Blue Shield physician file
FMG	Equal to 1 if the physician graduated from a foreign medical school	California Blue Shield physician file
DR	$100(R_t - R_{t-1})/R_{t-1}$	
DWAGE	$100(\mathrm{WAGE}_t - \mathrm{WAGE}_{t-1})/\mathrm{WAGE}_{t-1}$	

*The values 17 and 35 are one standard deviation above and below the mean of reported experience.

of experience (MUCH). We hypothesize that these influence patients' assessments of quality and hence the price elasticity of demand.

Two cost proxies are also included in the equations. They are the average payroll per employee in physicians' and surgeons' offices, WAGE, and the average premium for a $1 million/$3 million malpractice insurance policy, MPRM. WAGE refers to the physician's county, while MPRM varies by medical specialty (internal medicine, general surgery, general practice–no surgery, general practice–surgery) and premium area. The principal component of a solo practitioner's marginal cost, however, is the physician's implicit wage, which varies with demand factors.

The multiperiod pricing model in the section "Multiperiod Price Effects" suggested that physicians' fees would be affected by expectations about rates of change in program reasonables and practice expenses. These are approximated by DR and DWAGE, the rates of change in the Medicare reasonable fee and average office employees' salaries, respectively. Negative and positive signs are predicted. Finally, year dummies for 1973 and 1974 are included to determine whether the ESP succeeded in lowering physicians' fees.

Table 2 presents the means and standard deviations for the variables. These data show that 83 percent of general practitioners, 65 percent of general surgeons, and 90 percent of internists participate in Medicare assignment. For Medicaid, the corresponding percentages are 67, 51, and 53.

Table 3 compares the 1975 prices and reasonables of program participants and nonparticipants.[10] As predicted by our model, nonparticipants' prices tend to be higher than participants' prices, although there is enough intraclass variation that the differences are not significant. Our primary interests, however, are the differences between price and the Medicare and Medicaid reasonables. In the section "Multiple Markets and Price Discrimination," we showed that the price elasticity of demand for an individual physician's services was a simple function of price and the relevant reasonable fee. For a Medicaid participant,

$$\epsilon = p/(p - f). \tag{5'}$$

Among Medicaid participants we calculate elasticities of 3.17 for internists and general surgeons and 3.58 for general practitioners.[11] Our estimates tend to refute the hypothesis [7] that individual physicians face demand elasticities similar to the market price elasticity of demand. These estimates are also consistent with the proposition that general practitioners, for whom all physicians are substitutes, face larger elasticities than do other physicians.

Table 4 reports ordinary least squares parameter estimates for linear

Table 2. Means and Standard Deviations of Variables in the Regression

	General Practice	*General Surgery*	*Internal Medicine*
PRICE	0.6835	0.7353	0.7290
	[0.1197]	[0.1371]	[0.1308]
RNP*	0.1018	0.2168	0.0650
	[0.2255]	[0.3032]	[0.1922]
RP*	0.4781	0.4000	0.5465
	[0.2283]	[0.2991]	[0.2009]
MCRE	0.8270	0.6532	0.8953
	[0.3784]	[0.4762]	[0.3063]
FNP*	0.1755	0.2731	0.2550
	[0.2533]	[0.2808]	[0.2725]
FP*	0.3509	0.2768	0.2759
	[0.2490]	[0.2762]	[0.2659]
MCD	0.6708	0.5061	0.5267
	[0.4701]	[0.5003]	[0.4996]
DP	2.8887	3.4472	3.9831
	[8.5458]	[13.2670]	[15.2560]
DWAGE	19.5688	20.5141	19.7500
	[17.3733]	[16.1010]	[16.2332]
1973	0.3161	0.3002	0.3163
	[0.4651]	[0.4586]	[0.4653]
1974	0.3409	0.3456	0.3367
	[0.4742]	[0.4759]	[0.4729]
MPRM	18.2606	33.1924	33.6089
	[14.2180]	[3.7739]	[4.2607]
WAGE	2.6980	2.7851	2.8024
	[0.6337]	[0.6095]	[0.5994]
OWNMDS	0.3052	0.4056	0.3568
	0.0842]	[0.1699]	[0.2300]
OTHMDS	0.9134	0.9391	1.0884
	[0.4878]	[0.3994]	[0.4058]
LITTLE	0.1416	0.1348	0.2628
	[0.3488]	[0.3417]	[0.4404]
MUCH	0.2372	0.1311	0.0819
	[0.4255]	[0.3377]	[0.2744]
FMG	0.0949	0.1054	0.0580
	[0.2932]	[0.3072]	[0.2339]
No. Obs.	1370	816	879

The suffix NP refers to nonparticipants while P refers to participants. R and F are the Medicare and Medicaid reasonable fees, respectively. RNP, therefore, equals R(1 - MCRE), while RP equals R* MCRE.

Table 3. 1975 Prices and Program Reasonables for Participants and Nonparticipants*

	General Practice	*General Surgery*	*Internal Medicine*
Medicaid Participants†,‡			
N	371	177	166
P	0.737	0.810	0.782
	(0.12)	(0.14)	(0.13)
R	0.596	0.645	0.635
	(0.08)	(0.08)	(0.08)
F	0.531	0.552	0.535
	(0.05)	(0.05)	(0.05)
Medicaid Nonparticipants†,‡			
N	202	159	186
P	0.776	0.810	0.817
	(0.14)	(0.17)	(0.14)
R	0.619	0.644	0.648
	(0.08)	(0.11)	(0.08)
F	0.543	0.564	0.543
	(0.06)	(0.07)	(0.06)
Medicare Assignment Participants†,‡			
N	388	177	278
P	0.737	0.797	0.785
	(0.12)	(0.15)	(0.12)
R	0.602	0.638	0.637
	(0.07)	(0.08)	(0.07)
	0.535	0.549	0.536
F	(0.05)	(0.05)	(0.05)
Medicare Assignment Nonparticipants†,‡			
N	185	159	74
P	0.767	0.825	0.859
	(0.15)	(0.16)	(0.16)
R	0.608	0.654	0.659
	(0.09)	(0.10)	(0.06)
F	0.535	0.566	0.554
	(0.09)	(0.07)	(0.06)

*1975 data are used because price controls were not in effect. Focusing on one year also eliminates variation over time.

†Participation denotes supplying 750 or more CRVS units to the program.

‡N refers to the number of physicians in a classification; P, to price; R, to the Medicare reasonable fee; and F, to the Medicaid reasonable fee. Numbers in parentheses are standard deviations.

price equations. A covariance approach is adopted to account for differences between participants and nonparticipants in the two programs.

In the section "Multiple Markets and Price Discrimination" we showed that physicians who participate in Medicare assignment or Medicaid should have lower fees than those who do not, *ceteris paribus*. Hence we expect $\beta_{MCRE} < 0$ and $\beta_{MCD} < 0$, with $\beta_{MCD} < \beta_{MCRE}$ because Medicaid's reasonable feees are lower than Medicare's. Nevertheless, participating physicians should be more responsive to variations in program reasonables. Hence we predict that $\beta_{RP} < \beta_{RNP}$ and $\beta_{FP} > \beta_{FNP}$, where R and F are the Medicare and Medicaid reasonable fees and P and NP identify program participants and nonparticipants.[13]

The slope-intercept covariance specification of the regressions in Table 4 permits this pattern to appear and significantly reduces the sum of squared residuals for each specialty (although only at the 0.1 level for internists). The predicted pattern emerges for all three specialties for the Medicaid variables. The pattern also holds for Medicare assignment for general practitioners and general surgeons, but not for internists, an anomaly that may arise because so few internists are nonparticipants in Medicare assignment; the results, however, are generally consistent with expectations.

In the section "Multiperiod Price Effects" we developed the hypotheses that $\beta_{DR} < 0$ and $\beta_{DWAGE} > 0$. Support for the DR hypothesis is reasonably good, as β_{DR} is negative and significant at the 0.01 level in the general surgery and internal medicine equations, and at the 0.05 level in the general practice equation. This is consistent with the proposition that physicians increase prices in response to limits on the growth of program reasonables. Although β_{DWAGE} is always of the sign predicted, it is never significant at conventional levels. It may be, of course, that DWAGE does not approximate inflationary expectations very well.

The variables 1973 and 1974 are standard price control dummies. We expected $0 > \beta_{1974} > \beta_{1973}$. This pattern holds consistently. Not only are these coefficients negative and significant at the 0.01 level in all three equations, but β_{1973} is roughly twice as large as β_{1974}. These results support the contention that price controls limited the rate of growth of physicians' prices [3].

MPRM and WAGE are proxies for the input price vector. MPRM is positive and significant as expected. WAGE, however, confounds expectations by being negative in the only case in which it is significant (even though the zero order correlation between WAGE and PRICE is 0.21). The multiple correlation coefficient between WAGE and all other independent variables ranges from 0.64 for general practice to 0.76 for internal medicine. Although WAGE is significantly correlated with 1973, 1974, OWNMDS, OTHMDS, and DWAGE, omitting WAGE from the price

Table 4. Price Regression Equations

	General Practice	*General Surgery*	*Internal Medicine*
RP	1.0140†	1.0180†	0.9678†
	[0.036]	[0.050]	[0.042]
RNP	0.8939†	0.8946†	1.1451†
	[0.054]	[0.056]	[0.096]
MCRE	−0.0749*	−0.0837*	0.0892
	[0.034]	[0.040]	[0.063]
FP	0.4462†	0.6482†	0.6683†
	[0.055]	[0.081]	[0.060]
FNP	0.2456†	0.4341†	0.2805†
	[0.054]	[0.066]	[0.064]
MCD	−0.1302†	−0.1106*	−0.2164†
	[0.036]	[0.051]	[0.043]
DR	−0.4284E-3	−0.8316E-3†	−0.6540E-3†
	[0.23E-3]	[0.23E-3]	[0.17E-3]
DWAGE	0.1564E-3	0.7329E-4	0.2394E-3
	[0.12E-3]	[0.21E-3]	[0.20E-3]
1973	−0.0808†	−0.0869†	−0.0662†
	[0.006]	[0.010]	[0.009]
1974	−0.04114†	−0.0499†	−0.0347†
	[0.005]	[0.009]	[0.009]
MPRM	0.3175E-3*	0.1748E-2*	0.1628E-2*
	[0.14E-3]	[0.91E-3]	[0.71E-3]
WAGE	−0.8665E-2*	−0.1129E-2	0.4754E-3
	[0.369E-2]	[0.668E-2]	[0.63E-2]
OWNMDS	−0.0935†	−0.0373*	−0.0068
	[0.023]	[0.018]	[0.012]
OTHMDS	−0.0139†	—	—
	[0.004]		
LITTLE	0.0103*	−0.0167*	−0.2951E-2†
	[0.005]	[0.008]	[0.006]
MUCH	−0.0168†	0.0040	−0.0143
	[0.005]	[0.008]	[0.009]
FMG	0.9252E-2	−0.0116	−0.0155
	[0.006]	[0.009]	[0.011]
Constant	0.1555	0.0451	−0.1280
R^2	0.6980	0.6845	0.6728
Std. Error	0.0662	0.0778	0.0755
Degrees of Freedom	17/1352	16/799	16/862
F-Statistic	183.855	108.389	110.810

Note: Numbers in brackets are standard errors.
*Denotes significance at the 0.05 level.
†Denotes significance at the 0.01 level.

equation results in no changes in sign or significance for the other variables. Only β_{1973} and β_{1974} change by as much as one standard deviation.

In any event, a solo practitioner's implicit wage constitutes the principal determinant of marginal costs. Much of this variation should be captured by Medicare reasonables, which reflect price at $t-1$. If, however, consumers perceive that a physician's characteristics predict "quality," physicians with undesirable characteristics should face more elastic demand. Our measures of characteristics include experience and country of medical school graduation. Experience is likely to incorporate both vintage and on-the-job training effects, so no clear sign predictions can be made. The qualitative variables LITTLE and MUCH identify recent graduates and very experienced physicians.[14] The pattern for general practice is $\beta_{\text{LITTLE}} > 0 > \beta_{\text{MUCH}}$, which contrasts with $\beta_{\text{LITTLE}} < 0 = \beta_{\text{MUCH}}$ for the other specialties. Evidently, vintage effects dominate for general practitioners, but experience dominates for others. We expected that $\beta_{\text{FMG}} \leq 0$. In fact, β_{FMG} was never significant.

A positive correlation between physician supplies and price has been noted on several occasions. Although some of this relationship may be attributed to measurement error, neither a competitive nor a monopolistically competitive model makes a straightforward prediction about the correlation between price and the number of suppliers per capita [8,9]. A standard model of monopolistic competition (with perfect competition as the limiting case) predicts that the greater the number of suppliers per capita, the larger the price elasticity *for the services of any particular supplier.*

Our data permit us to test this hypothesis, since the greater the price elasticity of demand, the smaller the difference between price and the reasonable fee in a program in which the physician participates. Hence one should observe $\beta_{\text{OWNMDS}} < 0$ *for primary care practitioners.* For physicians who obtain their patients through referral, the picture is less clear. A distinction between competing referral physicians and complementary referring physicians must be made. We cannot make that distinction, unfortunately, so our data do not correspond exactly to the variables of theoretical interest.

All physicians are general practitioners' competitors. Indeed, we estimate $\beta_{\text{OWNMDS}} < \beta_{\text{OTHMDS}} < 0$ as expected. The measurement problem described above clearly biases our estimates for the other specialties toward zero. Even so, β_{OWNMDS} is negative in both cases, although not significant in the internal medicine equation. Measurement problems aside, it was not possible to estimate OTHMDS parameters for general surgery or internal medicine. The zero order correlation between OWNMDS and OTHMDS exceeded 0.93 in both cases.

Our estimates of β_{OWNMDS} have the predicted negative sign. The practical implication of these results is less cheering. Focusing on the results for general practice (because they are based on better measures of the number of competitors), we calculate a reduced form elasticity of -0.04 for OWNMDS and -0.02 for OTHMDS. Even a standard model suggests that increases in physician supply are likely to increase per capita consumption of services through a reduction in time costs. It appears, therefore, that increases in physician supply will not appreciably reduce total expenditure, given present market structure.[15]

CONCLUSIONS

This paper has analyzed variations in physicians' prices using data derived from claims from more than 1,200 California physicians over a four-year period. The paper has focused on the effects on physicians' prices of (1) the customary-prevailing-reasonable system of fee setting used by Medicare and many state Medicaid programs and (2) direct price controls imposed by the Economic Stabilization Program. The empirical analysis was based on simple models of multimarket and multiperiod pricing and yielded four principal results: (1) the demand for individual physicians' services was relatively elastic; (2) increases in the local supply of physicians reduced prices by a small, but significant, amount; (3) physicians responded strategically to attempts to control prices through the customary-prevailing-reasonable system; and (4) price controls limited the rate of increase in physicians' prices. These findings, combined with relatively straightforward models of physicians' behavior, provide the foundation for a reassessment of public policy.

A customary-prevailing-reasonable system of setting program fees is not tenable if physicians correctly perceive that public programs function as monopsonists. Attempts to increase program fees will be perceived as demand subsidies and lead to increases in private charges. Since Medicare and Medicaid institutionalize price discrimination between program beneficiaries and other patients, any widening of the gap between public and private fees will reduce physicians' willingness to treat program beneficiaries [10,3,11]. Hence, customary-prevailing-reasonable systems embody an ineluctable conflict between the goals of containing costs and improving access to care.

Most current schemes for reimbursement reform are similarly flawed. Proposals such as the Medicare Economic Index or statewide fee schedules eliminate some of the inflationary bias of a customary-prevailing-reasonable system but fail to address the institutionalization of price discrimination, so the cost-access trade-off is not resolved.

Two of the findings in this paper suggest a resolution of the cost-access dilemma. Taken together, the evidence on demand elasticities and responses to price controls implies that imposing limits on physicians' charges to all patients could limit spending without a concomitant reduction in willingness to treat program beneficiaries. Collusion with private insurors, negotiation with physicians' organizations, or legislated fee controls could change the cost-access trade-off.

A final conclusion is that increasing the supply of physicians per capita does not appear to represent a means for altering the cost-access trade-off. Although more physicians per capita leads to lower prices, the effect is small. Any effect on total spending is likely to be swamped by increases in demand resulting from reduced-time prices.

This article has presented theory and evidence that encourage eliminating customary-prevailing-reasonable fee systems. It also points the way toward a family of policies that recognize the monopsony power of public programs and may change the terms of trade between controlling costs and improving access to services.

Notes

1. The alternative is to view physicians as utility maximizers. Doing so does not change equation (5), the relationship we analyze econometrically. The work-leisure decision, after all, does not affect the allocation of output to different markets. Had we used a utility maximizing model, we would have written
$$\eta p^* = C_D/(1 - 1/\epsilon) = \eta f/(1 - 1/\epsilon). \tag{5'}$$
This of course reduced to
$$p^* = f/(1 - 1/\epsilon)$$
since η (the marginal utility of income) appears on both sides of the equation.
2. The demand for services by patients covered by Medicaid and Medicare assignment may be modeled as a horizontal portion of the demand curve. Unlike the conventional competitive model, however, this demand is seen as limited, even for the individual physician.
3. This is more direct evidence of price discrimination than that cited by Newhouse (1970). There is, however, evidence that physicians *charge* all patients the same amount [11,12]. The model outlined by Kessell [13] is not applicable.
4. A number of changes were made in the California system in 1976. The basic structure of the customary, prevailing, and reasonable fee setting system was retained.
5. Some Medicare patients are also eligible for Medicaid. Medicaid pays their deductibles and coinsurance based on the Medicare fees, but physicians must accept assignment if the patient is treated.
6. More generally, $\gamma C_T = C_D$ with $\gamma > 0$. That would make (5) $p^*(1 - 1/\epsilon) = \gamma f$ and the analysis could proceed. There is no evidence that $\gamma \neq 1$.
7. Like Goldman and Grossman [14] we assume that patients associate quality differences with characteristics differences.

8. For simplicity, we limit the slope adjustments to the program fee variables. As can be seen in the definition of MCRE and MDC in Table 1, we define participation in terms of the quantity of services supplied to each program. We do not equate nonparticipation with supplying no services. Even though a physician may not choose to provide services to patients in the fixed-fee programs, either medical emergencies or charitable motives may lead the physician to provide some services. Hence, nonparticipation means $T < T'$, with $T' > 0$.
9. In fact, we tested this hypothesis. The partial correlation of per capita income with price was not statistically significant.
10. We focus on 1975 to avoid potential problems raised by price controls and to abstract from variation over time.
11. A similar calculation can be made for Medicare assignment participants, but not with the data presented here. The calculations for Medicare assignment participants shown here include inframarginal participants for whom $r > \rho(1 - 1/\epsilon) = f$. Limiting consideration to physicians who participate in Medicare assignment shows, for general practice, a price per CRVS unit of 0.776, a Medicare reasonable of 0.623, and an elasticity of 5.07. For general surgery the comparable figures are 0.792, 0.639, and 5.18. For internal medicine they are 0.793, 0.641, and 5.22. Those elasticities seem implausibly high. If we assume that physicians who assign cases expect to collect only the 80 percent payable by Medicare, however, elasticities of 2.80 for general practice, 2.82 for general surgery, and 2.83 for internal medicine emerge. In any event, the elasticity estimates for Medicare assignment participants are less straightforward than the estimates for Medicaid participants as the probability of collecting the coinsurance amount is not known.
12. See Table 1 for a definition of participation in Medicaid (MCD) or Medicare assignment (MCRE).
13. We do not predict that $\beta_{RNP} = \beta_{FNP} = 0$. Because reasonable fees are linked to past charges and because past charges are likely to be correlated with the physician's current implicit wage, intercorrelation among R, F, and P is almost guaranteed. By extension, it is uninteresting that R and F are significant in a regression with P as the dependent variable. Only variations in response to R and F, e.g., $\beta_{RNP} < \beta_{RP}$, merit discussion, even though both must be in the equation.
14. Because we must deal explicitly with qualitative variations in human capital, the standard model of experience and its square need not be appropriate. In fact, our dummy variable model leads to a larger reduction in the sum of squared errors.
15. Green [15] draws the same conclusion from a macro model with the population-physician ratio (the inverse of our measure) appropriately specified as an endogenous variable (which it must be in a macro model).

References

1. Davis, K. and R. Reynolds. The Impact of Medicare and Medicaid on Access to Medical Care. In R. Rossett (ed.), *The Role of Health Insurance in the Health Services Sector*. New York: National Bureau for Economic Research, 1976.

2. United States Bureau of the Census. *Statistical Abstract of the United States: 1978*, 99th edition. Washington, D.C.
3. Hadley, J. and R. H. Lee. Toward a physician payment policy: Evidence from the economic stabilization program. *Policy Sciences* 10:105, 1978–79.
4. Steinwald, A. B. and F. Sloan. Determinants of physicians' fees. *Journal of Business* 47(4), Oct. 1974.
5. Sloan, F. A. Physician fee inflation: Evidence from late 1960's. In R. Rossett (ed.), *The Role of Health Insurance in the Health Services Sector*, pp. 321–354. New York: National Bureau of Economic Research, 1976.
6. Lien-Fu, H. Controlling inflation of Medicare physicians' fees. *Policy Analysis*, Summer 1977.
7. Newhouse, J. A model of physician pricing. *The Southern Economic Journal* 37(2), Oct. 1970.
8. Sloan, F. and R. Feldman. Monopolistic Elements in the Market for Physicians' Services. In W. Greenberg (ed.), *Competition in the Health Care Sector: Past, Present and Future*, pp. 57–131. Washington, D.C.: Bureau of Economics, Federal Trade Commission, Mar. 1978.
9. Reinhardt, U. Comment on Competition among Physicians. In W. Greenberg (ed.), *Competition in the Health Care Sector: Past, Present and Future*, pp. 156–190. Washington, D.C.: Bureau of Economics, Federal Trade Commission, Mar. 1978.
10. Lee, R. H. and J. Hadley. Supplying physicians' services to public medical care programs. Working paper no. 998–17, Urban Institute, Washington, D.C., Apr. 1979.
11. Sloan, F., J. Cromwell and F. B. Mitchell. *Health Insurance, the Physician and Public Policy*. Lexington, MA: Lexington Books (in press).
12. Bluck, J. and R. H. Lee. Inter-program variations in physicians' billing behavior. Working paper no. 998-6, Urban Institute, Washington, D.C., Oct. 1977.
13. Kessel, R. A. Price discrimination in medicine. *Journal of Law and Economics* 1, Oct. 1958.
14. Goldman, F. and M. Grossman. The demand for pediatric care: An hedonic approach. *Journal of Political Economy* 86:(2), Apr. 1978.
15. Green, J. Physician-induced demand for medical care. *Journal of Human Resources*, Supplement 13:21, 1978.