Hospital Pricing Behavior Under Competition

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HOSPITAL PRICING STRATEGIES UNDER COMPETITION: PRELIMINARY FINDINGS

Over the past decade, major changes have occurred in the way American hospitals price their services. Until the late 1970s, hospitals operated in an environment of cost based reimbursement. Services were priced loosely on a cost plus basis utilizing rudimentary systems of cost accounting. Private insurers paid "list" prices (hospitals' official published prices for services). Discounts were limited to public payers and the indigent. Private insurers, who might have wished to obtain discounts as well, were limited in their ability to do so, by insurance enabling laws. Specifically, these laws prevented insurers from negotiating discounts with individual hospitals.

Since the early 1980s, most states have rewritten their enabling laws to permit insurers to negotiate prices with individual hospitals. In the wake of these changes, the average "net" or transactions price paid by insurers to hospitals has fallen relative to the "list" or gross price charged by hospitals (Dranove, Shanley and White, 1991; henceforth "DSW"). One important consequence is that the true rate of hospital inflation is apparently much lower than the widely publicized hospital price index, which is based on gross prices. This calls into question policy and business strategy studies such as Shortell (1990) and HCIA (1990), who base their analyses on gross prices.

The purpose of this paper is to explore the determinants of both net and list price inflation at the level of the individual

hospital. We analyse changes in prices for private California hospitals for the period 1982-1988. Our main preliminary findings are as follows:

1) During the period net prices have risen less rapidly in more competitive markets. At the same time, there is no apparent relationship between the degree of competition and list prices.

2) There is an apparent relationship between the size of a hospital, and the degree to which it offers specialized services on the one hand, and its rate of net price inflation on the other.

3) There is no evidence of cost shifting using net prices. That is, net price inflation is not related to a hospital's Medicare and Medicaid burden. However, list price inflation is modestly related to the Medicare and Medicaid burden. This suggests that hospitals are trying to raise revenues in response to Medicare and Medicaid cuts but are unable to due to buyer power.

II. Background

As discussed in DSW, changes in California insurance enabling laws that occurred in 1982 appear to have fostered price discounting. Insurers may obtain price discounts by selective contracting; i.e., by playing off one hospital against another, and directing its enrollees towards those hospitals offering the

lowest prices. Examples of organizations using selective contracting are Preferred Provider Organizations, Health Maintenance Organizations, and large self-insured firms.

Clearly, opportunities for using a selective contracting strategy are limited by the degree to which hospitals can exercise monopoly power. Prior to 1982, cost-based reimbursement was the norm, while those patients whose insurers paid charges had little personal interest in shopping around. This implies that the price received by a hospital was essentially independent of the number of competitors in its market and the prices they charged. Since 1982, hospitals have had to compete with other hospitals to obtain contracts, and through contracts patients.

The amount that a hospital has to lower price to obtain contracts depends on the degree of monopoly power it possesses. Monopoly power increases as the number of competitors in a market decreases. We use the conventional measure of market concentration, the Herfindahl, to measure the average degree of monopoly power possessed by hospitals in a given market. We predict that net price inflation will be lower in more competitive markets (i.e., low Herfindahl markets), since competitive pressures will force hospitals to discount prices in order to get contracts with insurers.

Within a market, some hospitals may have more monopoly power than others. This may be due to a number of reasons, such as a locational advantage, superior reputation, or a strong network of admitting physicians. These are difficult to measure and in our

present analysis we proxy for these by using the size of the hospital, as measured by the number of admissions. Another reason why a hospital may possess market power is that it offers specialized facilities not available elsewhere. We employ direct measures of specialized service offerings as an independent measure of market power. We predict that larger hospitals and those offering specialized services will be able to raise net prices more than other hospitals in their market, and thus will have a relatively larger rate of net price inflation.

Hospitals may change prices for reasons other than competitive pressures. One obvious reason is to cover increases in costs. To the extent that there is a stochastic element to prices (either due to measurement error or other factors), we may also expect prices to regress to the mean. Finally, to the extent that hospitals respond to cutbacks in payments from the government for Medicaid and Medicare by raising prices to private patients (i.e., "cost-shifting"), prices may also increase at hospitals with substantial Medicaid and Medicare populations. Dranove (1988) points out, however, that this pricing response will be limited by competitive forces.

III. Data

Hospital price, cost and quantity data comes from the California Office of Statewide Health Planning, and is described in detail in DSW. As we measure competition at the level of the local market, it is necessary to define markets. We use the

same market definitions as in Dranove, Shanley and Simon (1991), and this should be consulted for details. Essentially, our markets are all urbanized areas as defined by the Bureau of the Census, along with all population centers of 5000 or above that have at least one hospital. We have a total of 88 markets. One of these, Los Angeles, accounts for nearly half of the sample. We perform a separate analysis excluding LA from the sample, which are presented along with our main analyses. The base year for our analysis is fiscal year 1982-83. The end year is fiscal year 1987-88.

IV. Calculating prices

In order to compare prices across hospitals in both the cross section and in a time series it is necessary to contruct a price for a representative basket of hospital services. In order to do this, we first calculated list and net prices for each hospital service reported by the state. Prices were obtained by dividing total gross and net revenues for private patients by their respective quantities. Details may be found in DSW.

In order to work with reliable prices, we restricted our market basket in this paper to those services that were available in most hospitals.[1] These include the following: (1) Med/Surg Acute Care; (2) Med/Surg Intensive Care; (3) Surgery and

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[1] We did not have to make this restriction in DSW. In that paper, we used a different basket for each hospital. We needed only to assure comparability over time and not in the cross section.

Recovery; (4) Clinical Lab; (5) Physical Therapy; (6) Inhalation Therapy; (7) Electrocardiology; and (8) Diagnostic Radiology. Together these services account for nearly 60% of all hospital revenues. When determining the price of the market basket we weighted these services according to their relative contribution to total net revenue statewide.[2] We call the 1983 net price of the market basket NETP83. We call the 1988 counterpart NETP88. We call the gross prices for the basket LISTP83 and LISTP88.

We also calculated what it would cost each hospital to provide the market basket. Unit costs were determined in a manner analogous to the calculation of unit prices. One difference is that hospitals do not report costs by insurance type. Thus, we divided cost-center total costs by total quantities in order to get unit costs. We call the cost of the market basket in 1983 and 1988 COST83 and COST88 respectively.

There may be significant noise in our measures of prices and costs. This introduces three problems. First, because the dependent variable (price inflation) is noisy, standard errors will be inflated.[3] Second, because measurement of costs, is noisy, the estimated effect of costs on prices will be biased towards zero. Finally, it is likely that the measurement error is particularly severe for small hospitals. Accordingly, the possibility of heterscedasticity exists. Indeed, we find that the residuals in ordinary least squares (OLS) regression are

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[2] For example, med/surg acute received 40% of the weight.

[3] This does not, of course, bias the estimated coefficients.

larger for smaller hospitals. We control for heteroscedasticity using weighted least squares (WLS), using the standard White correction (Kennedy, 1987). We report both OLS and WLS results.

We measured the degree to which hospitals offer specialized services by computing hospital profiles of offerings across a range of specialized products, such as open heart surgery, neonatology, burn care, etc. Hospitals were grouped into three minimum variance clusters using Ward's method. For details of our approach, see Dranove, Shanley and Simon (1991).

We excluded a substantial number of hospitals from our sample. Most of the hospitals that we exclude from this analysis are the same as those excluded from DSW -- government hospitals, Kaiser hospitals, hospitals reporting negative revenues, and non-reporting hospitals. This left a sample of 327 hospitals out of approximately 500. In addition, we excluded hospitals reporting zero quantities for any of the services in our market basket, as well as six hospitals reporting price or cost levels for 1983 or 1988 that made them substantial outliers. This left us with 270 hospitals in the full sample.

V. Definition of the Variables

We use the following variables in our empirical analysis. Summary statistics of the key variables appear in Table 1.

NETINDEX = NETP88/NETP83.

LISTINDEX = LISTP88/LISTP83.

Note on Table 1 that the values of NETINDEX AND LISTINDEX are very close to the corresponding values reported in DSW.

COSTINDEX = COST88/COST83.

HERF = the sum of squared market shares in the hospital's local market, where market share is based on discharges.

MEDICAID = percent of hospital's total 1983 revenue from Medicaid. California drastically reduced Medicaid payments after 1983, so that hospitals with high Medicaid burdens suffer substantially.

MEDICARE = percent of hospital's total 1983 revenue from Medicare. Medicare payments to hospitals have fallen subtantially relative to inflation since 1983.

RELNET83 = NETP83/(Market Mean of NETP83)

RELLIST83 = LISTP83/(Market Mean of LISTP83)

MSPECIAL = an indicator variable that takes on the value of 1 if the hospital offers a medium degree of specialized services and 0 otherwise.

HSPECIAL = an indicator variable that takes on the value of 1 if the hospital offers a high degree of specialized services and 0 otherwise. (Low specialization is the omitted category.)

VI. Results

Regression results for net price inflation are reported in Table 2. Regression results for list price inflation are reported in Table 3. We report the results of four models. Model 1 uses OLS. Model 2 corrects for heteroskedasticity. Model 3 considers the possibility of cost shifting. Model 4 is identical to model 2 except for the exclusion of firms in the Los Angeles market.

There are several striking results. Inflation in net hospital prices is significantly lower in more competitive markets, as indicated by the negative coefficient on HERF. Based on the estimated coefficient on HERF of .13 in the WLS model, we estimate that a monopoly raised its prices 13% higher than did hospitals in very competitive markets such as Los Angeles during the period 1983-1988. On the other hand, turning to Table 3, inflation in list hospital prices does not appear to be related to competition. These results not only affirm that competition limits the ability of hospitals to increase prices, they also indicate the need for proper measurement of prices to avoid misleading results. It is straightforward to document the effect of competition on prices, but only if prices are measured correctly.

Market power also affects prices. In both the OLS and WLS regressions, larger hospitals and hospitals offering specialized services have higher rates of inflation. The inflation rates are significantly higher in the WLS regressions. Based on the

estimated coefficient on ADMITS of .016 in the WLS regression, a hospital with 15,000 admissions in 1983 raised its prices by approximately 16% more than did a hospital with 5000 admissions in 1983. Based on the estimated coefficient of .15 on HSPECIAL, a hospital offering the highest level of sophisticated services raised prices by 15% more than did hospitals offering only basic services, controlling for the size of the hospital. These results are consistent with the hypothesis that hospitals with market power can better resist pressures to lower prices in order to obtain contracts with HMOS and PPOs.

We confirmed the growing importance of market power as a determinant of pricing by estimating cross-section models of hospital pricing in 1983 and 1988. WLS results are reported in Table 3. These results should be treated with some caution. As Dranove, Shanley and Simon (1991) show, there can be significant bias imparted to cross-section results due to imprecise market definitions. Even so, a comparison of the two cross-section regressions is useful. There are two noteworthy findings. The first is that the (possibly biased) coefficient on HERF switches sign from negative to positive between 1983 and 1988. The second is that the coefficients on ADMITS, MSPECIAL and HSPECIAL all increase in magnitude between 1983 and 1988, suggesting that larger and more specialized hospitals begin to distinguish themselves by exercising their market power.

The results in Tables 2 and 3 for model 3 suggest that net prices are not related to Medicare and Medicaid burdens, but that

list prices are, at least to a limited extent. This suggests that attempts by hospitals to shift their revenue burden to privately insured patients are not proving successful. I.e., hospitals may raise their list prices in response to government cutbacks, but they can not raise the net prices that they negotiate with insurers.

Let us note some other results. Prices increase with costs. The relatively small coefficient probably reflects measurement error rather than a failure to fully pass on costs. This is corroborated by the observation that on average, cost inflation has roughly equalled net price inflation during the period 1983-1988.

There appears to be virtually complete mean regression in prices. Mean regression could indicate convergence of prices within local markets, or it could simply indicate noisy pricing practices and noisy price data. We tested for the former by calculating the coefficient of variation of prices within local markets in 1983 and 1988. We found that the coefficient of variation actually increased slightly. This is inconsistent with price convergence.

Finally, a comparison of models suggest that our qualitative results are not dependent on the use of weights to correct for heteroskedasticity nor are they the results of an "LA effect."

VII. Conclusions

Much has been made of apparent anomolies in pricing behavior in hospital markets. Theories regarding perverse responses to competition developed during a period when patients had primary responsibility to shop around for the best prices. Relevant empirical work was based on list prices, rather than actual transaction prices. When the analysis is updated to a time when selective contracting is widespread, and we use data on net prices, it appears that hospital prices behave similarly to prices in other markets. The fiercer the competition, the greater the constraint on pricing. Conversely, the greater the market power, the less is the constraint on pricing.

To put it another way, two commonly held views are not supported by our analysis. The first is that competition leads to higher prices. The second is that hospital prices respond to government cutbacks with no constraint imposed by the market. Evidence supporting these views appears to stem from improper measurement of prices.

One mystery is how prices were set prior to the development of selective contracting. Much "pricing" was actually passive, due to cost-based reimbursement. Even in the absence of cost-based reimbursement, there was probably little in the way of consumer shopping behavior on the price dimension, because consumers were insured against the costs of care. This further reduced competitive pressure on prices. Our results strongly suggest that competitive pricing pressures were not exerted on

the market until the responsibility for price shopping was placed in the hands of employers and insurers rather than individual patients.

VII. References

LOTS OF SELF-CITATIONS. OTHER REFERENCES COULD NOT BE PREPARED IN TIME TO MEET THE STRINGENT DEADLINES OF THE CHAS STAFF.

TABLE 1: SUMMARY STATISTICS

VARIABLE	MEAN	STANDARD DEVIATION
NETINDEX	1.41	.287
LISTINDEX	1.69	.302
COSTINDEX	1.39	.240
NETP83	123.3	23.2
NETP88	170.5	35.5
LISTP83	134.0	24.3
LISTP88	223.8	44.6
COST83	142.5	27.7
COST88	196.6	41.3
HERF	.202	.32
MEDICAID	.104	.081
MEDICARE	.432	.104
ADMITS	8.156	6.487
MSPECIAL	.34	.47
HSPECIAL	.12	.32

TABLE 2: REGRESSION RESULTS

DEPENDENT VARIABLE = NETINDEX

	MODEL1 (OLS[a])	MODEL2 (WLS[b])	MODEL3 (WLS)	MODEL4 (WLS; no LA)
RELNETP83	-.86*	-.92*	-.96*	-1.12*
COSTINDEX	.21*	.24*	.23*	.18***
HERF	.12**	.13*	.13*	.18*
ADMITS	.003	.016*	.017*	.016*
MSPECIAL	.024	.064***	.064***	.069
HSPECIAL	.11***	.15*	.18*	.19*
MEDICARE			.13	
MEDICAID			-.29	
CONSTANT	1.05	.80	.78	.73
Adjusted R^2	.19	.40	.41	.41
N	270	270	267	149

[a] - Ordinary least squares
[b] - Weighted least squares
* - Significant at $p < .01$
** - Significant at $p < .05$
*** - Significant at $p < .10$

TABLE 3: REGRESSION RESULTS

DEPENDENT VARIABLE = GROSSINDEX

	MODEL1 (OLS[a])	MODEL2 (WLS[b])	MODEL3 (WLS)	MODEL4 (WLS; no LA)
RELLISTP83	-1.03*	-1.08*	-1.09*	-1.26*
COSTINDEX	.23*	.32*	.35*	.29*
HERF	.027	.049	.042	.08
ADMITS	.005***	.019*	.019*	.022*
MSPECIAL	.044	.098**	.088**	.091***
HSPECIAL	.17*	.23*	.20*	.24*
MEDICARE			.30***	
MEDICAID			.26	
CONSTANT	1.28	.93	.76	.75
Adjusted R^2	.23	.50	.50	.53
N	270	270	267	149

[a] - Ordinary least squares
[b] - Weighted least squares
* - Significant at $p < .01$
** - Significant at $p < .05$
*** - Significant at $p < .10$

TABLE 4: CROSS-SECTION REGRESSIONS

DEPENDENT VARIABLE = NETP83 AND NETP88

	NETP83	NETP88
	WLS	WLS
COST83	.36*	
COST88		.38*
HERF	-4.16	7.81
ADMITS	1.70*	2.33*
MSPECIAL	2.85	5.74
HSPECIAL	8.62***	22.94*
CONSTANT	52.40	65.01
ADJUSTED R^2	.57	.52
N	270	270

* - Significant at $p < .01$
*** - Significant at $p < .10$