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INSURER-HOSPITAL BARGAINING: NEGOTIATED DISCOUNTS IN POST-DEREGULATION CONNECTICUT*

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This paper uses unique data from the state of Connecticut to examine discounting patterns in the state's hospital industry for the years following deregulation (1995–1998). The data provide a rare opportunity to study payer-level differences in negotiated discounts for hospital services. In addition to presenting descriptive evidence on how discounts vary across payers, payer types and hospital types, this study uses matched revenue data to analyze and empirically estimate the economic determinants of discount magnitudes. Payer size appears to affect bargaining power, but the economic significance of the effect is small. Much larger than the effect of payer size is the influence of payers' abilities to 'move market share' by channeling patients to hospitals with which favorable discounts have been negotiated.

I. INTRODUCTION

WHY DO SOME INSURANCE COMPANIES get much better deals than others when negotiating with hospitals? Hospital-insurer bargaining has only become relevant within the last two decades. Prior to the 1980s, almost all hospitals set their charges uniformly and were then reimbursed on a fee-for-service basis, so third-party payers generally paid the same price for hospital services.[1] Over the past two decades, however, deregulation of hospital pricing and the rise of managed care have led to a system in which hospitals typically negotiate reimbursement rates separately for each payer, and the resulting reimbursement rates vary substantially across payers.

Conventional wisdom holds that size confers bargaining power in these negotiations: payers that represent large volumes of patients are able to extract greater price concessions from hospitals than their smaller rivals. Consequently, insurance companies have consolidated and small businesses

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[1] A notable exception was Blue Cross, which in some cases paid 'allowable costs' instead of hospital charges.

have formed purchasing coalitions in order to gain bargaining clout.[2] Economic models suggest bargaining advantages for large payers may result from characteristics of hospitals' production functions or from oligopolistically competitive behavior among hospitals. The models of Stole and Zwiebel (1996) and Chipty and Snyder (1999) show that large buyers have a bargaining advantage over smaller buyers when the seller's gross surplus function is concave.[3] Snyder (1996) shows that large buyers may extract discounts in a dynamic oligopoly setting, since tacitly collusive prices for large purchasers must be reduced to prevent undercutting.[4] In a recent article, Tyagi (2001) argues that discounts to large buyers may also be motivated by the possibility of tacit collusion in the *downstream* market: such collusion would reduce the sales and profitability of the seller, so the seller may implement differential pricing in favor of large buyers in order to magnify asymmetries in buyers' sizes since it lowers the level of collusion buyers can sustain.

Although size is commonly believed to be the principal determinant of bargaining clout, it cannot alone explain observed patterns in negotiated discounts. Pauly (1998) has noted (and the data here confirm) that even very small managed care organizations (MCOs) often negotiate substantial discounts from hospitals. This paper suggests the primary bargaining advantage of MCOs relative to traditional indemnity insurers is the superior ability of MCOs to channel patients to selected providers. Indemnity insurers do not restrict the set of providers whose services they will cover, so patients choose their doctors and hospitals freely. In contrast, MCOs gain control over patients' choices by limiting covered services to a restrictive provider network (so that patients obtaining services from doctors or hospitals outside of the network must do so at a much greater out-of-pocket expense). The degree of control exercised by a given MCO (what I will call the MCO's ability to 'channel patients') depends on factors such as the restrictiveness of its network and the degree to which its coverage rates differ between in-network and out-of-network providers. A payer's ability to

[2] In a recent survey of the changes in healthcare markets, Gaynor and Haas-Wilson (1999) suggest the merger wave of the 1990s was partly driven by hospitals' and payers' attempts to improve their bargaining positions. The perceived importance of size is also reflected in newspaper accounts of hospital consolidations, which commonly cite bargaining clout as a primary objective of the merging parties. (See, for example, (*Wall Street Journal*, 1996) or (*New York Times*, 1998).) Other motives for consolidating are explored in the case study by Barro and Cutler (1997).

[3] Stole and Zwiebel consider whether employees of a firm would rather negotiate collectively (i.e., unionize) or individually, and show that unions are preferred when the production technology is concave. Adapted to the present study, their model suggests that insurers will prefer to negotiate collectively (e.g., by consolidating) if hospitals' surplus functions are concave.

[4] The model is analogous to that of Rotemberg and Saloner (1986), with large buyers representing 'booms' in demand.

channel its patients should play a critical role in bargaining, since it determines the credibility of any threat to withdraw business from high-price providers. Nevertheless, previous empirical research has largely ignored the role of patient-channeling in insurer-hospital negotiations.

Since hospitals and insurers typically regard negotiated reimbursement rates as sensitive market information, data on these rates are rarely made available to the public. Consequently, there has been little empirical analysis of variation in rates across payers. However, a number of previous studies have examined variation across hospitals. Melnick et al. (1992) look at data on negotiated per diem rates across hospitals for California's largest preferred provider organization (PPO), focusing attention on the influence of hospital competition (as measured by Hirschman-Herfindahl indexes) on discounts.[5] Brooks, Dor, and Wong (1997) examine payment rates for a specific hospital service (appendectomies) using a MEDSTAT database consisting of claims from employees of self-insured firms. Since their data cover only a narrow class of payers (for a large number of hospitals), the analysis rightly emphasizes market characteristics (e.g., hospital concentration) and hospital institutional arrangements (e.g., ownership type, affiliations) as determinants of *hospital* bargaining power. Most recently, Town and Vistnes (1999) examined hospital pricing behavior in southern California using a unique dataset containing actual payments from two large health maintenance organizations (HMOs). Like the papers mentioned above, their study focuses on hospital bargaining power, showing how a hospital's importance to an HMO's network (which is the source of its bargaining leverage) is determined by patient preferences, substitution possibilities with other hospitals outside the network, and complementarities among hospitals within the network. Their empirical results, like those presented in this paper, confirm that a hospital's prices depend critically on the insurer's ability to exclude the hospital from its network.

In contrast with the aforementioned studies, this paper uses data for a large number of payers (at a small number of hospitals) and focuses on determinants of insurer bargaining power. To my knowledge, the only published studies that directly address the determinants of insurer bargaining power are those of Staten, Umbeck, and Dunkelberg (1987, 1988). They argue that size alone does not confer the power to extract price concessions from hospitals, and they use revenue data from Indiana hospitals to show that Blue Cross did not pay less than its competitors as a function of its local market share. The authors contend that in order to extract discounts, an insurer must be able *credibly* to threaten to send its

[5] Their finding of higher hospital concentration leading to higher prices (smaller discounts) is confirmed by Dranove et al. (1993). Keeler et al. (1999) address the same sets of questions using a richer panel dataset (again from California), showing that the impact of concentration on price has grown steadily over time.

patients elsewhere. Even managed care organizations may not be able to fully enforce such a threat, since patients may be more loyal to hospitals than they are to insurers.[6] Whether (and to what extent) the ability to channel patients to selected providers is sufficient to endow an insurer with bargaining power is, as the authors note, an empirical question.

This paper empirically examines the outcomes of hospital-insurer negotiations using unique data from the state of Connecticut. In addition to providing an overview of discounting patterns, this study seeks to identify the importance of payer characteristics in explaining variation in discount magnitudes.[7] The basic results are unsurprising: I find that HMOs and PPOs extract larger discounts than traditional indemnity plans, and that discounts are increasing in payer size (as measured by total county charges). However, the data suggest that size *per se* is not the critical determinant of discount magnitudes. I outline a simple bargaining model to illustrate the dependence of discounts on payers' differential abilities to channel patients to selected providers, and I show that patterns in discounts and revenue allocations are consistent with the model. In particular, charges incurred by MCOs tend to be highly skewed toward hospitals with which favorable discounts have been negotiated, and more highly skewed allocations tend to be associated with larger discounts. Indemnity insurers' charges tend to be incurred more symmetrically across competing hospitals in a city.

Results from an econometric model suggest patient channeling is relatively more important than payer size in determining discount magnitudes; in particular, the impact on discounts of a one standard deviation increase in a payer's ability to channel patients[8] is roughly eight times larger than the impact of an equivalent increase in payer size. Concurrent research by Ellison and Snyder (2001) suggests this result is not unique to the hospital industry: in the wholesale market for pharmaceuticals, discounts also appear to be relatively insensitive to buyer size, but very sensitive to buyers' abilities to substitute across competing drug products.[9] Their results, obtained from a separate industry with a similar bargaining

[6] That is, if an insurer removes a hospital from its network of covered providers, patients may choose to switch insurers instead of switching hospitals. See Melnick et al. (1992) for a nice discussion of the role played by patients' allegiance in insurer-hospital bargaining.

[7] Defining discounts is a tricky data issue since they reflect percentages of list prices, which are notoriously problematic. I discuss this in more detail in section II.

[8] As defined by the magnitude of its patient reallocation response to disparities in offered discounts.

[9] For example, hospitals and HMOs receive large discounts (on the order of 10–40%, depending on the status of the drug's patent) relative to drugstores for antibiotics, presumably because their use of restrictive formularies creates better substitution opportunities. From a bargaining standpoint, restrictive formularies in pharmaceutical markets serve the same purpose as the restrictive hospital networks of MCOs, and drugstores' relative inability to substitute among drug products is similar to indemnity insurers' inability to substitute patient demand across hospitals.

environment, complement and strengthen this paper's main finding, which is that substitution opportunities are more important than size in determining insurers' bargaining power.

II. BACKGROUND AND DATA

II(i). *Deregulation*

In 1994, Connecticut became one of the last U.S. states to deregulate hospital pricing. The impetus for deregulation came from a U.S. District Court case, in which the judge ruled that Connecticut's method of shifting the costs of uncompensated care to non-governmental payers conflicted with federal laws. The ruling held that a self-insured union health plan did not have to pay the mandated 19% surcharge on hospital services (for the state uncompensated care pool) because doing so would violate the federal Employee Retirement Income Security Act. As a result of the conflict, Connecticut was faced with the possibility of losing $150 million in federal Medicaid funds.

The state legislature responded quickly with a deregulation plan that was signed into law on April 1, 1994. During the previous two decades, hospital rates had been set by a regulatory board. Discounts were limited to 3.5 percent and had to be offered to all payers if offered at all. After the 1994 legislation, hospitals could set prices freely, and *all* payers could negotiate separately with hospitals.

II(ii). *Discount Data*

The legislation also required that all negotiated agreements between hospitals and payers be filed with a new agency, the Connecticut Office of Health Care Access (OHCA). Although the exact terms of the agreements are confidential, hospitals must file separate schedules listing overall discounts by payer, and this information is public. At the time of the data collection, Connecticut was unique among states in collecting and making available discount information at the payer level.

The data used for this paper come from schedules filed by each of the 32 acute-care hospitals in Connecticut for the years 1995–1998. The schedules list gross charges and payments for every commercial payer with which the hospital had a negotiated agreement. The difference between charges and payments is called the 'contractual allowance,' and is what I will call the 'discount' throughout the remainder of the paper. Here it is important to note that gross charges reflect list prices, which almost never reflect the actual prices paid. However, according to the regulators with whom I spoke, in these data list prices often constitute the benchmark upon which discounts are based. Using the contractual allowance to represent the discount is similar to the approach taken by Dranove et al. (1993) in their study of

California hospital prices. The OHCA sample includes 150 payers that negotiated discounts with one or more Connecticut hospitals during 1995–1998. Payers are identified by company and type: for instance, Aetna's indemnity, PPO, and HMO plans are treated as three separate payers in the data.

The data do not provide details about the specific form of the negotiated arrangements, but some features of the contracts are reported to be fairly general. A typical arrangement will specify a fee schedule based on broad diagnoses, an overall percentage discount off fee-for-service rates, or some combination of the two. Although some agreements may only specify discounts in certain departments, it is more common for the discount arrangements to be comprehensive. Risk-sharing is uncommon, occurring in only 2–5% of the cases.[10]

Although unique in its ability to analyze across-payer variation in hospital discounts, this study suffers from two significant data difficulties relative to the studies mentioned in the introduction. First, Connecticut only makes discount data available at the aggregate level—that is, the discounts are computed as the percentage difference between total charges incurred and total actual payments to the hospital. Thus, the discounts in the data are weighted averages of service-specific discounts. This complicates comparisons of discounts across payers or across hospitals, since the intensity of use for a particular service (the weights in the weighted average) may vary across hospitals for a given payer, as may the service-specific discounts. Ideally, one would like to compare discounts across payers for narrowly defined hospital services.[11]

The second difficulty inherent in this study is that hospitals' listed rates may vary, so that reported discounts may reflect percentages of unequal bases. For instance, if two hospitals charge $200 and $180 (respectively) for the same procedure, and a payer negotiates a 10 percent discount at the first of these hospitals but no discount at the other, the data will indicate that the payer has a more favorable discount agreement with the first hospital even though it pays the same price at either facility. However, for this study the impact of this data problem may be limited. The issue poses no problems for comparing discounts across payers for a given hospital—which is the primary focus of this study—since discounts for different payers at the same hospital are directly comparable as long as they are computed from the same base. In the empirical models, hospital fixed effects can absorb any across-

[10] This information about the form of the discount arrangements was learned in conversations with Maryann Lewis at OHCA, who at the time of the data collection was responsible for reviewing the actual contracts.

[11] The study by Brooks, Dor, and Wong (1997) focuses on appendectomies, so that clean price comparisons can be made. Unfortunately, their data cover only a narrow set of payers, and procedure-specific discount data across a larger number of payers are unavailable (to my knowledge).

hospital variation in list prices. Furthermore, to the extent that differences in list prices reflect differences in hospital quality, the discount may represent precisely the variable we're interested in. In terms of the example mentioned above, even though a payer might pay the same amount ($180) for a service at two different hospitals, the discount at the $200 hospital indicates greater bargaining power *vis à vis* that hospital if its higher list price reflects superior quality in some dimension (e.g., better doctors or more convenient location).

II(iii). *Charge Data*

The schedules hospitals submit to OHCA only list revenues from payers who had negotiated agreements. In order to complete the picture of revenue allocation across hospitals for each payer, I acquired additional data from the Connecticut Hospital Association (CHA) listing charges incurred by all payers at 31 of the 32 hospitals included in the OHCA data.[12] Data on charges were merged with data on discounts for the analysis of discounts as a function of payers' differential abilities to channel patients (Section III.). Because OHCA and CHA use different coding schemes for identifying payers, not all 150 payers in the discount data could be reliably matched with CHA revenue data. Section 3.1 summarizes information from the entire OHCA database (150 payers, 2,740 discount agreements); in the remaining sections, I am forced to use a subsample of 94 payers (2,010 agreements) for which the discounts and revenues data were successfully matched.

III. EMPIRICAL ANALYSIS

III(i). *General Patterns in Negotiated Discounts*

To provide a general idea of the discount magnitudes, Table I shows quantiles of the discount distribution for the 2,740 payer-hospital agreements represented in the OHCA data broken down by year and by payer type. Not every payer negotiates agreements with every hospital; for example, the volume of business done by small payers in some cities may not warrant the cost of negotiating an agreement, so they just settle for paying list prices. Also, aggressive HMOs sometimes negotiate with two competing hospitals in a city, but sign an agreement with only one of them. Since the data report discounts only for hospital-payer pairs that negotiated and filed an agreement with OHCA, either of the above examples would result in a 'missing' hospital-payer pair. The distributions represented in Table I should therefore be interepreted as the distributions of discounts *conditional* on having negotiated and signed an agreement.

As the table indicates, most negotiated discounts in 1995 (the year immediately following deregulation) were modest: over half of the

[12] Revenue information for Griffin Hospital was not available from CHA for 1995–1996.

TABLE I
OHCA DISCOUNT DATA: SUMMARY STATISTICS

	Distribution by year:					
		Discount Quantiles				
Year	Number of Agreements	.10	.25	.50	.75	.90
1995	609	.018	.030	.037	.168	.352
1996	714	.025	.030	.100	.257	.379
1997	711	.030	.049	.159	.336	.459
1998	706	.030	.060	.164	.355	.477

	Distribution by payer type:					
			Weighted	Discount Quantiles		
Type	Number	Mean	Mean[a]	.10	.50	.90
Indemnity	30	.089	.152	.018	.034	.252
HMO	26	.283	.310	.068	.291	.478
PPO	40	.141	.157	.030	.100	.323
Employer	16	.122	.186	.020	.035	.357
TPA	38	.123	.094	.020	.073	.306
Overall	150	.167	.233	.025	.106	.406

[a]Weighted by total revenues upon which discount is based.

agreements resulted in aggregate discounts of less than 4 percent. However, discount magnitudes increased sharply in subsequent years. Large discounts are not uncommon: in 1998, over one quarter of the hospital-payer negotiations resulted in discounts of over 35 percent.

Managed care organizations like HMOs and PPOs negotiate larger discounts (on average) than indemnity insurers. Interestingly, however, Table I indicates that indemnity plans also receive substantial discounts in some cases. One possible reason for this is that many insurers offer multiple health plans, so that some payers can leverage the bargaining clout of their HMO and PPO plans to get discounts for their indemnity patients.[13]

The general perception in the healthcare industry is that negotiated contracts between hospitals and payers are the rule rather than the exception. However, the data suggest that some payers incur charges at hospitals with which no discounting arrangement has been negotiated and signed. Of the payer-hospital pairs represented in the CHA revenue data, roughly 85 percent do not report discount arrangements. However, according to the revenue data, relationships under negotiated agreements

[13] Also, payers labeled in the data as 'indemnity' insurers may not be indemnity insurers in the traditional sense—many plans that are referred to as indemnity plans still make distinctions between 'in-network' and 'out-of-network' providers. Insurers cannot be as cleanly categorized as Table I suggests; because of this, the nominal distinction between indemnity plans, HMOs, and PPOs is essentially dropped in the analysis presented in section III (iii).

account for approximately 60 percent of total non-government charges in the state. The implication is that payers who negotiate tend to represent relatively large patient bases, and they tend to negotiate with the hospitals they use most.

Discounts can vary widely across payers at any given hospital: at most hospitals, the largest discounts are at least 5 times larger than the smallest discounts. Table II reports summary statistics for the hospitals represented in the data, including some information about the range of discounts offered. Though not evident in the table, it is also true that average discounts vary substantially across hospitals.[14]

Table III presents results from linear regressions using the negotiated discount (measured as a percentage) as the dependent variable; the table provides a rough quantitative description of how discounts depend on payer characteristics. Only data from hospital-payer pairs that filed an agreement with OHCA are included, so the results should again be interpreted as conditional on a contract being negotiated and signed. The results confirm the pattern suggested by Table I: HMOs, PPOs, and self-insured employers all negotiate better discounts on average than traditional indemnity plans (the omitted category), while discounts received by third-party administrators[15] are slightly smaller. Agreements negotiated by HMOs lead to aggregate discounts that are on average 14 percentage points larger than those received by traditional indemnity plans. Somewhat surprisingly, payers designated as PPOs in the data do not appear to fare much better than indemnity insurers at the bargaining table: on average, discounts for PPOs are only 2 percentage points better than those for indemnity plans. The results also suggest a time trend: average negotiated discounts increased monotonically in each year following deregulation.

An indicator variable for 'geographically isolated' hospitals is included in the regression as a control for hospital bargaining power. As Staten et al. (1988) point out, hospitals that serve as sole providers of inpatient care in their areas have a strong bargaining position, since even managed care plans will have difficulty persuading their enrollees to travel long distances to alternative hospitals.[16] The regression results confirm this intuition: at hospitals with no

[14] However, note that this variation in discount magnitudes across hospitals may partly reflect differences in the hospitals' 'list prices,' as discussed in Section II.

[15] Third-party administrators are organizations that administer an insurance contract for a self-insured group but do not have financial responsibility for paying claims. They typically contract with self-insured firms, although they also often contract with indemnity insurers to provide claims processing and billing services.

[16] The article by Staten et al. found that hospitals with no within-county rivals were significantly less likely to submit bids for inclusion in the network of a newly formed Blue Cross PPO, presumably because they could expect to be included regardless of whether or not they offered a discount.

TABLE II
HOSPITALS: SUMMARY STATISTICS ($n = 32$)

	1995 Quantiles			1998 Quantiles		
	.10	.50	.90	.10	.50	.90
Beds	76	190	407	74	160	510
Census[a]	45	127	417	41	101	365
Charges[b]	57.5	145.4	298.0	69.6	174.6	431.8
# discount agreements	9	20	29	11	20.5	41
Range of discounts[c]	.12	.39	.49	.28	.46	.55

[a]Census is the average daily number of inpatients receiving care.
[b]In millions of dollars.
[c]Difference between maximum discount and minimum discount at a given hospital.

TABLE III
NEGOTIATED DISCOUNTS: REGRESSION RESULTS[a]

	I	II
Payer types:		
Employer	.043	.053
	(.013)	(.014)
HMO	.154	.142
	(.007)	(.007)
PPO	.020	.024
	(.008)	(.007)
TPA	−.001	.009
	(.009)	(.009)
ln(Payer Charges)[b]	—	.010
		(.001)
Year = 1996	.032	.032
	(.007)	(.007)
Year = 1997	.074	.076
	(.007)	(.007)
Year = 1998	.089	.092
	(.008)	(.008)
No Close Rivals[c]	−.206	−.205
	(.060)	(.056)
Constant	.205	.198
	(.060)	(.055)
N	2,010	2,010
R^2	.468	.487

[a]Regression estimates using the negotiated discount as the dependent variable. Hospital fixed effects are included in each specification, but the estimates are suppressed to save space. Robust standard errors in parentheses.
[b]Payer charges are the total of all charges incurred by the payer in the county, in millions.
[c]Dummy equal to one if there are no rival acute-care hospitals within ten miles of the hospital.

rivals within a 10-mile radius (22 percent of the hospitals in the sample), negotiated discounts are on average 14–20 percentage points lower.

The second column of the table reports results from a specification that includes a measure of payer size. Conventional wisdom in the health care

industry is that 'volume is king'—that is, large payers enjoy substantial bargaining power *vis à vis* hospitals, perhaps because hospitals often have excess capacity to fill. Economists have debated whether size alone can confer market power in hospital-insurer negotiations;[17] the evidence here suggests that larger payers indeed enjoy an advantage in bargaining, but the advantage is small. Here, payer size is measured as the payer's total charges in the hospital's county, and is intended to capture differences in the amounts of potential business different payers could generate for a hospital. The point estimate suggests that increasing a payer's hospital payments in a county by 10 percent (*ceteris paribus*) would enable that payer to extract an additional one tenth of a percentage point in discount negotiations with hospitals. Although this effect is statistically distinguishable from zero, its apparent economic significance is very small.[18]

Since the amount of business a payer generates in a county may depend in part on the discounts negotiated in that county, the payer size variable may be regarded as jointly endogenous with the dependent variable. However, any bias resulting from this endogeneity is likely to be positive: payers that receive big discounts would tend to offer low premiums to consumers, and therefore have a larger market share. Therefore, even though the coefficient on payer size in Table III is quite small, it most likely overstates the true impact of a payer's size on the magnitude of the negotiated discount.

III(ii). *Channeling and Bargaining Clout*

The results of the previous section suggest that size alone cannot explain the wide variation in discounts across payers. Why then are some payers able to extract much larger discounts than their rivals? One straightforward economic explanation of variation in discounts is based on payers' different abilities to channel their patients to one hospital vs. another. As in any bargaining situation, a payer's threat to 'take its business elsewhere' is critical, and an increase in a payer's ability to channel patients is analogous to an increase in the credibility of that threat. Industry insiders often call this the ability to 'move market share,' and its strategic role in negotiating discounts is widely recognized.

Why should payers differ in their abilities to channel patients to chosen providers? The simplest answer is that insurance plans vary in the degree to which members control their choice of hospital: since consumers' preferences over 'freedom of choice' vary, health plans differentiate

[17] See the articles by Staten et al. (1987, 1988) and Pauly (1987).

[18] It is possible that payer size affects discount magnitudes nonlinearly. For instance, payers may enjoy size-related bargaining advantages only if they are very large relative to rival payers. However, results from unreported regressions (available from the author) incorporating various forms of nonlinearity yield very little evidence of this kind of relationship between discounts and payer size.

themselves in consumer markets along this very dimension. The defining feature of a true indemnity plan, for example, is that covered services are reimbursed equally regardless of the provider, thus giving the patient maximal choice. In contrast, consumers who enroll in managed care organizations commit themselves to a more limited set of providers, since MCOs explicitly attempt to direct patients to particular providers. Many MCOs utilize the 'gatekeeper' concept, requiring patients needing hospital services to first go through a primary care provider. These primary care providers can be required to refer patients only to particular hospitals. Also, the health plan can stipulate that charges are fully covered for providers within a defined network, and that charges outside of the network are either covered on less favorable terms or not covered at all.

Even managed care organizations of similar formats generally differ in their abilities to channel. Physicians who refer patients to hospitals may have admitting privileges at multiple hospitals and heterogeneous preferences over where they like to refer their patients. In general, therefore, controlling the referral decisions of participating physicians requires costly implementation of incentives. Directing the choices of patients is also costly, since patients may choose out-of-network providers even if the coverage is less generous. Perhaps most importantly, patients may switch health plans if a plan chooses to exclude their preferred doctor or hospital from its network.

A simple bargaining model illustrates the importance of channeling for extracting discounts. Consider an insurer whose enrollees are expected to require S units of service in a market with two hospitals. Assume both hospitals are equally attractive to patients, and they would share the market equally in the absence of any channeling efforts by the insurer. The insurer solicits bids from the two competing hospitals: each is to offer a discount d, and the winning bidder will receive a proportion γ of the insurer's total patient charges ($\frac{1}{2} \leqslant \gamma \leqslant 1$). The parameter γ indexes the degree to which the payer can channel its patients: $\gamma = \frac{1}{2}$ implies that the payer has no control over patients' decisions; $\gamma = 1$ implies the payer can send all of its patients to one provider, completely excluding the other.

Assume that unit costs (c) are commonly known to be distributed uniformly on the [0,1] interval, but that a hospital knows only its own cost. Normalizing the price of a unit of hospital service to 1, we can write hospital i's expected profits as follows:

$$(1) \qquad E[\pi_i] = \Pr[d_i > d_j]((1 - d_i) - c_i)\gamma S + \big(1 - \Pr[d_i > d_j]\big)(1 - c_i)(1 - \gamma)S.$$

If hospital i wins by offering a discount d_i, it provides γS units to the payer at a price of $1 - d_i$. If hospital j wins the bidding, hospital i serves only $(1 - \gamma)S$ units, but receives the full price. (Assume the payer only signs a discount agreement with the winning bidder.)

It can be shown that the (symmetric) equilibrium bidding strategy in this simple model is as follows:

$$(2) \qquad d_i^* = (1 - c_i)\left(1 - \frac{1}{2\gamma}\right).$$

The discount offered by a given hospital varies between 0 (for $\gamma = \frac{1}{2}$) and $(1 - c)/2$ (for $\gamma = 1$), and is monotonically increasing in γ. That is, payers that can commit to channeling a greater portion of their business to the winning bidder will command larger discounts.[19] Notice that the actual discounts offered depend on the cost parameter c: lower costs imply larger discounts, since the 'prize' (more patient volume) is more attractive (profits per unit are higher) when costs are low.

This model obviously abstracts from the complexities of actual bargaining between hospitals and insurers, but it illustrates how the ability to 'move market share' can influence the bargaining outcome and suggests the kinds of discount versus patient allocation patterns we should expect to see in the data. If discount magnitudes are driven primarily by payers' abilities to channel patients, we expect to see skewed patient allocation patterns for payers that receive large discounts. For instance, a payer with a high γ will have a large discount at one hospital and incur a large proportion of its charges there, while having a zero discount at the other hospital and incurring very few charges there. For payers with low γ's, patient allocation across the two hospitals would be more equal, and the negotiated discount at the favored hospital will be relatively small. The model also suggests patterns we do *not* expect to see in the data: for instance, large discounts associated with unskewed patient allocations, or small discounts associated with skewed patient allocations.

As a simple check of whether the data are consistent with this bargaining story, we can look at the joint distribution of discounts and market shares for different types of payers. Managed care organizations (HMOs and PPOs) can be regarded as having high γ's: that is, these payers' health plans impose constraints on patient choice and enable channeling of patients to selected providers. As argued previously, for these kinds of payers we expect to see large discounts associated with large shares of incurred charges, and small (zero in the model) discounts associated with small shares. Moreover, we expect to see very few of these payers allocating their business evenly across hospitals. In the joint distribution of discounts and shares of charges, we expect to see most of the density in the two extremes: ⟨low discount, low share of charges⟩ and ⟨high discount, high share of charges⟩.

[19] This result is similar to the results in Elzinga and Mills' (1997) model of pharmaceutical pricing. They argue that managed care organizations effectively make the demand for pharmaceuticals more elastic by facilitating substitution between therapeutic equivalents.

Unlike managed care organizations, traditional indemnity plans have low γ's: indeed, a true indemnity plan has virtually no control over patient decisions, and therefore cannot credibly commit to channel its patients to a particular provider. We therefore expect these plans' discounts to be relatively small, and their allocation of charges across hospitals to be roughly symmetric. That is, in the joint distribution of discounts and shares of charges, we expect to see most of the density concentrated in the ⟨low discount, mid-range share⟩ region.

To check for these patterns in the present data, we can consider five cities in Connecticut that can be roughly characterized as having two major competing hospitals: Bridgeport (with Bridgeport and St. Vincent's hospitals), Hartford (Hartford and St. Francis), New Haven (St. Raphael and Yale), Stamford (Stamford and St. Joseph's), and Waterbury (St. Mary's and Waterbury).[20] For payers that negotiated at least one discount agreement in a market, we can use the CHA revenue data matched with the discount data to observe how the allocation of patient charges relates to relative discounts. (If the OHCA data do not show a negotiated agreement between a hospital-payer pair, the payer is assumed to have had a discount of 0% at that hospital.)

Figure 1 shows a bivariate kernel density estimate of the ⟨discount, share of charges⟩ pairs for managed care organizations (HMOs and PPOs combined). The patterns are consistent with what we'd expect based on a channeling story: the density peaks at two extremes: low discounts with low shares of charges, and high discounts with high shares of charges. Relationships in which payers allocate a large share of their charges to a hospital offering a low discount are relatively rare in the data, as are relationships in which a small share is associated with a large discount.[21]

Figure 2 shows an analogous graph for indemnity plans. Here the pattern is much different. Consistent with the proposition that indemnity plans' inability to channel patients weakens their ability to extract discounts, virtually all of the density is in the low discount range. However, allocations of charges appear to be more uneven (across hospitals) than we would expect for indemnity plans. In principle, charges incurred by indemnity payers in a city should be roughly symmetric across hospitals, or at least reflect patients' underlying preferences for the competing hospitals. In some cases, however,

[20] This is indeed a rough characterization, since Connecticut is a small state and each of these hospital pairs faces some competition from other nearby hospitals. However, in each case the two hospitals considered are (a) centrally located and (b) much larger than the remaining area hospitals in terms of revenues and capacity. Moreover, most of the smaller hospitals that could be regarded as competitors tend to be located outside the city centers.

[21] The 'hump' in the center of the graph (relatively large discounts with roughly symmetric patient allocations) may reflect instances in which *both* hospitals in a market acceded to a payer's demand for a discount. This may occur if neither hospital is essential to the payer's network, so that its threat to exclude both hospitals is credible.

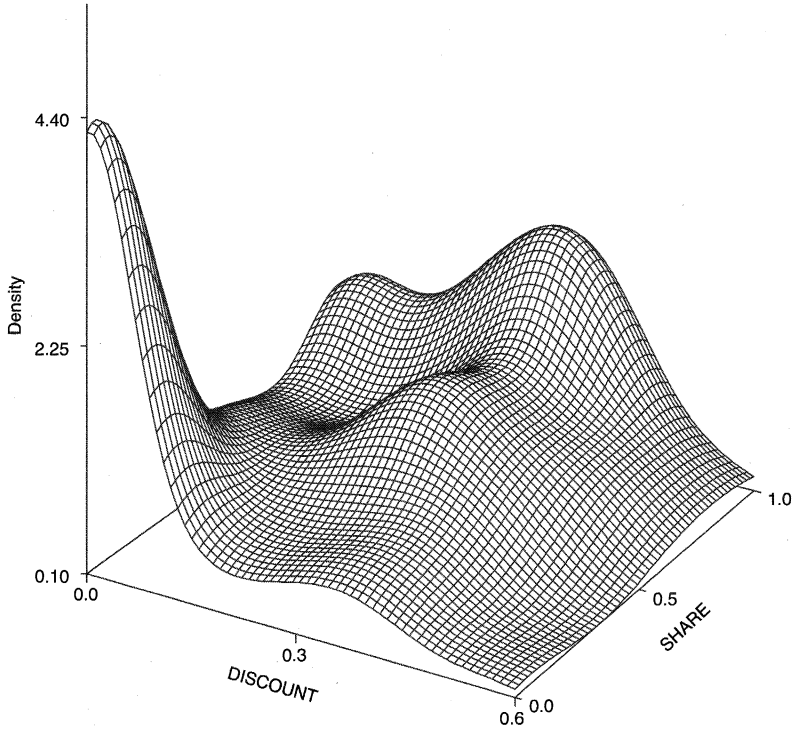

Figure 1
Joint Density of (Discount, Share) for MCOs

payers classified as indemnity plans appear to be allocating nearly all of their charges at one hospital in a city. Such an outcome is unlikely to result from the aggregation of patients' decisions.[22] This apparent anomaly in the data arises primarily among the smallest indemnity payers; the patient allocation patterns of indemnity payers in the top three quartiles of payer size (as measured by total county charges) appear much more evenly distributed across hospitals.

III(iii). *Quantifying the Impact of Channeling on Discounts*

Apart from the occasional unevenness of indemnity plans' charge allocations, the densities in Figures 1 and 2 appear broadly consistent with the predictions of a bargaining model in which payers' abilities to channel

[22] A possible explanation is that these payers are only nominally classified as 'indemnity' plans, and are still able somehow to channel their patients. However, if these plans have an ability to channel patients, this ability should be reflected in higher discounts.

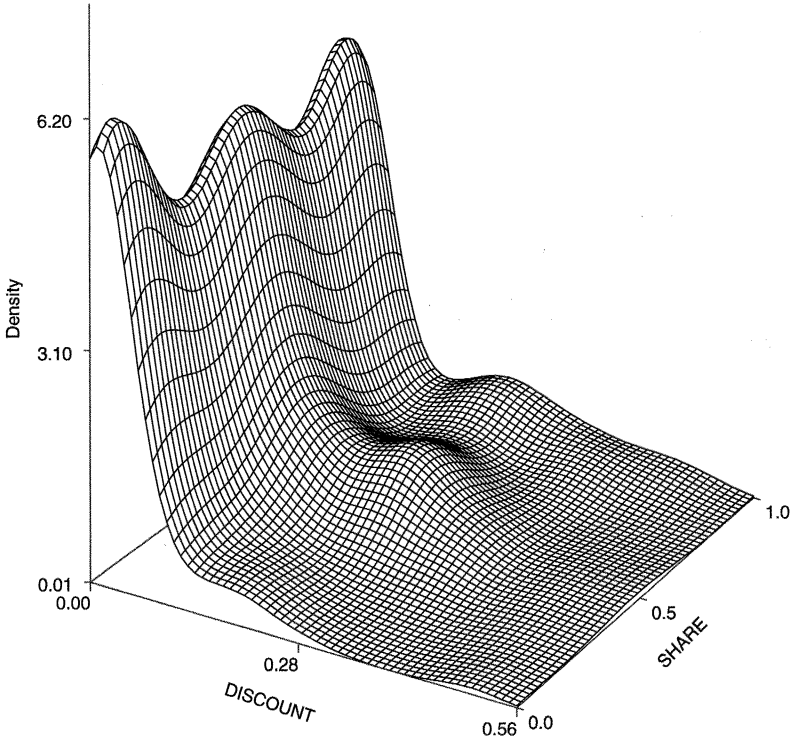

Figure 2
Joint Density of (Discount, Share) for Indemnity Plans

patients are key determinants of discount magnitudes. In order to measure the quantitative impact of channeling ability on discount magnitudes, we can estimate a system in which a payer's ability to channel γ—which is unobservable to the econometrician—is reflected in its responsiveness to discount differences across hospitals within the same market. In particular, consider the following empirical model of discounts and patient allocations across hospitals:

$$(3) \qquad DISCOUNT_{ijt} = \alpha_1 SIZE_{ijt} + \alpha_2 \gamma_i + \sum_{t=1996}^{1998} \phi_t + \sum_{j=2}^{5} \theta_j + \varepsilon_{ijt}$$

$$(4) \qquad \Delta SHARE_{ijt} = \Delta \overline{SHARE}_{jt} + \gamma_i \Delta DISCOUNT_{ijt} + \eta_{ijt}$$

This model is specified as a two-equation system, explicitly acknowledging that discounts are determined jointly with the distribution of payers' revenues across hospitals. In equation 3, $DISCOUNT_{ijt}$ is the maximum

discount negotiated by payer i in market j in year t. The maximum discount received in a market is analogous to the discount offered by the winning bidder in the model outlined previously. Although reality doesn't match the model perfectly here (payers sometimes negotiate discounts with both hospitals in a market), the maximum discount presumably reflects the offer intended to 'win' the majority of the payer's business. $SIZE_{ijt}$ is included to control for the impact of payer size on bargaining power, as discussed in section I., and is measured as the (natural logarithm of) total charges incurred by the payer in market j in year t. The ϕ's and θ's are year and city fixed effects, respectively, and ε_{ijt} is a mean-zero stochastic error.[23]

The dependent variable in the second equation is the difference in the shares of payer i's charges incurred at the two hospitals in market j: $\Delta SHARE_{jt}$ is the share at the hospital offering the largest discount minus the share at the hospital offering the smaller discount. $\Delta\overline{SHARE}_{jt}$ is the 'benchmark' difference in shares we would expect to see in the absence of discounts, and is measured as the difference in the hospitals' overall revenue shares across all payers (including federal programs like Medicare). The share of a payer's charges allocated to the higher-discount hospital depends on the difference in the discounts offered by the city's competing hospitals, $\Delta DISCOUNT_{ijt}$, with the payer's sensitivity to such discount differences indexed by γ_i. This parameter is intended to capture differences in payers' abilities to channel: health plans with tightly controlled provider networks will tend to have relatively high γ's (i.e., have the ability to respond to discount differences by channeling patients to the hospital offering the best discount), while indemnity plans that leave the choice of provider to the patient should have relatively low γ's. The importance of a payer's channeling ability in determining discount magnitudes is represented by the parameter α_2 in the discount equation. Note that the payer-specific γ terms are left as free parameters to be estimated.

The principal difficulty for estimation is the potential endogeneity of $\Delta DISCOUNT_{ijt}$ in the second equation. However, since there is no constant in this equation—if γ is zero and payers don't respond to discounts, we expect $\Delta SHARE_{jt}$ to equal $\Delta\overline{SHARE}_{jt}$ plus noise)—dummy variables for the payers can be used as instruments for $\Delta DISCOUNT_{ijt}$. Using these instruments amounts to estimating each γ_i as the ratio of the sum (across cities and years) of share differences to the sum of discount differences for payer i. If payer i successfully channels its patients to hospitals offering better discounts, this ratio will be large; conversely, for a payer that has little influence on its patients' choices of hospital, the numerator will be close to zero, and the estimated γ will be small.

[23] Note that one year ($t = 1995$) and one city ($j = 1$) are omitted in equation 3. This is due to the fact that the γ_i 'contains' a constant: i.e., in the estimation, γ_i is estimated as a constant plus 20 payer fixed effects.

Estimation of the system in equations 3 and 4 relies on both within-payer and across-payer variation in the data. Intuitively, the channeling parameters γ_i are estimated using within-payer variation in share allocations across years and markets. The estimated γ's are then essentially included as explanatory variables in the discount equation, and the impact of channeling ability on discounts (α_2) is estimated using variation in discounts across payers. The system can be estimated simultaneously using standard generalized method of moments (GMM) techniques.[24]

Table IV reports estimates of the two-equation system using data from the five cities mentioned previously as having two major competing hospitals.[25] The first panel lists the estimated parameters of the discount equation (equation 3), with the specifications reported in columns II and III employing payer dummies as instruments to correct for the potential endogeneity of $\Delta DISCOUNT_{jt}$ in equation 4. The second panel shows averages of the estimated payer-specific channeling parameters (the γ's from equation 4). The estimates reveal substantial across-payer variation in ability to channel (as measured by sensitivity to discount differences), and the differences are statistically significant: Wald tests soundly reject the hypothesis that all the channeling parameters are equal. The magnitudes of the parameters are consistent with what we should expect: HMOs and PPOs are considerably more responsive to discounts than indemnity plans. For instance, the estimates imply that a 10 percentage-point increase in $\Delta DISCOUNT$ would lead roughly to a 2–3 percentage-point increase in the hospital's share of a typical indemnity payer's total charges. This low level of sensitivity is not surprising, given that indemnity plans are structured in a way that limits their ability to channel (e.g., choice of provider is left to the patient). In contrast, a typical HMO's response to the 10 percentage-point change in the discount difference would be to channel 9–10 percentage points more of its business to the hospital offering the favorable discount.

The return to this ability to channel patients is its impact on bargaining clout. The estimate of α_2—the marginal effect of channeling ability on discounts—in column two implies that increasing a payer's ability to

[24] In particular, estimation is based on assumed orthogonality conditions with respect to the error terms ε and η. I assume that $E\begin{bmatrix} Z_1\varepsilon \\ Z_2\eta \end{bmatrix} = 0$, where Z_1 is a matrix including payer size plus year, city, and payer dummies, and Z_2 is a matrix consisting of payer dummies in the instrumental variables specifications (or simply $\Delta DISCOUNT_j$ in the non-IV specification). The GMM procedure simply minimizes $g'Ag$, where g is the sample counterpart of the above expectation, and A is an optimally chosen weight matrix.

[25] In order to reduce the number of parameters to be estimated, only data from 21 of the largest payers in these cities were used in the estimation. When data from all payers are used, the point estimates are very similar to the ones shown in Table IV, but the standard errors are larger. (This presumably results from the number of observations not increasing commensurately with the number of parameters to be estimated, since the data are more sparse for smaller payers.)

TABLE IV
DISCOUNTS AND CHANNELING ABILITY: GMM ESTIMATES

	I	II	III
ln(Payer Charges) [α_1]	0.004	0.027	−0.015
	(0.007)	(0.010)	(0.065)
Channeling parameter [α_2]	0.159	0.137	0.140
	(0.016)	(0.017)	(0.019)
ln(Payer Charges) × Channeling parameter	—	—	0.026
			(0.042)
Year = 1996	0.041	0.055	0.042
	(0.015)	(0.024)	(0.024)
Year = 1997	0.106	0.101	0.088
	(0.017)	(0.025)	(0.026)
Year = 1998	0.122	0.092	0.075
	(0.021)	(0.029)	(0.032)
Instrument for $\Delta DISCOUNT$?	no	yes	yes
Averages and std. deviations for channeling parameters (γ):			
HMO	1.87	1.92	1.92
	(.37)	(.28)	(.23)
PPO	0.94	1.77	1.73
	(.38)	(.39)	(.38)
Indemnity	0.41	0.52	0.57
	(.42)	(.57)	(.32)
Test that γ's are all equal (Wald statistic and asymptotic p-value):			
	130.0	82.0	81.4
	3.88×10^{-18}	1.77×10^{-9}	2.23×10^{-9}

GMM estimates of the system described by equations 3 and 4 in the text. $n = 293$. Standard errors in parentheses. City fixed effects are omitted to save space.

channel (as measured by γ) by one standard deviation would lead to a 10.1 percentage-point increase in the discount that payer could negotiate. The effect is statistically significant, and its economic significance is very large relative to the apparent impact of payer size. In contrast with the 10.1 percentage-point change associated with a one standard deviation difference in channeling, changing a payer's size by one standard deviation implies only a 3.7 percentage-point change in the negotiated discount.

Conventional wisdom in the healthcare industry suggests the impact of channeling ability on bargaining power may be greatest for large payers, and that very small payers may have difficulty extracting discounts from hospitals even if they can commit all of their patients to one hospital over another. The model specification reported in column three of Table IV accounts for this possibility by including an interaction between the estimated discount sensitivity parameters (γ) and payer size in the discount equation. The estimates provide weak support for the conventional wisdom: the coefficient on the interaction term is positive but statistically indistinguishable from zero. Taking the point estimates at face value, the implied role of channeling ability in determining discounts is slightly more pronounced than in the previous specification. An increase of one standard deviation in channeling ability leads to an 11.4 percentage-point increase in

the negotiated discount, compared with a 3.3 percentage-point increase for an equivalent change in payer size. However, it is clear from the noisiness of the point estimate that the data have difficulty identifying the separate effects of channeling ability and its interaction with payer size.[26]

Other patterns in negotiated discounts alluded to in Section I. are confirmed by the results in Table IV.[27] For instance, the time trend in discounts is significantly positive, with discounts negotiated in 1998 being roughly 8–9 percentage points higher than in 1995 (on average). For the present discussion, the important conclusions to be drawn from the estimation results are that payers' abilities to channel vary considerably, and payers that are most responsive to discount advantages extract significantly better discounts than payers that cannot 'move market share.'

IV. CONCLUSION

Deregulation of the hospital industry has led to an environment in which individual payers negotiate separately with each hospital to establish payer-specific payment rates. The basic fact revealed in the data is that negotiated discounts vary widely across payers and payer types. Size (as measured by a payer's total payments to hospitals in a market) appears to affect payer bargaining power, but by itself it cannot explain why some payers get much better deals than others. The econometric results of this study suggest the impact of a payer's size on bargaining clout is small relative to the impact of a payer's willingness and/or ability to channel its patients to selected hospitals. The greater relative importance of patient channeling helps explain why small managed care organizations are often able to extract deeper discounts from hospitals than very large indemnity insurers.

In a deregulated market for hospital services, the effects of selective contracting on bargaining power contribute to the segmentation of the market for health insurance, in particular by facilitating the expansion of managed care plans. Once hospitals begin to set reimbursement rates separately by payer, health insurers who restrict their provider networks can negotiate substantial discounts and offer a lower-cost, lower-flexibility alternative to traditional indemnity plans. Consumer welfare may be increased to the extent that this segmentation helps span the heterogeneity in consumers' preferences for flexibility in the choice of healthcare providers.

The discounting patterns described here are closely related to patterns that arise in other markets involving bilateral negotiations between small

[26] The estimated channeling parameters ($\hat{\gamma}$) are positively correlated with payer size. This multicollinearity would explain the imprecision of the estimated coefficient on the interaction term.

[27] Indeed, the regressions reported in that section could be viewed as reduced-form versions of the two-equation model estimated here.

numbers of buyers and sellers. To mention one prominent example, hospitals and HMOs negotiate discounts from pharmaceutical manufacturers far exceeding the discounts offered to drugstore chains of equal or greater size. The superior bargaining clout of hospitals and HMOs relative to drugstores is attributable to their use of formularies, which enable them to solicit bids from competing manufacturers for an all-or-nothing contract. Drugstores, in contrast, typically stock their shelves with all competing brands of a drug, and cannot credibly threaten to withdraw their business from a manufacturer that fails to offer a discount.[28]

More broadly, the discussion here also relates to vertical contracts between manufacturers and retailers: retailers can increase their bargaining clout *vis à vis* manufacturers by committing to stock only one brand of a product. Moreover, just as a health plan's ability to 'move market share' is limited if patients' loyalties are with providers instead of insurers, the bargaining power a retailer may gain by committing to sell only one brand of a product depends on consumers' willingness to simply patronize other stores.

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[28] See Ellison and Snyder (2001) for a thorough study of this market using data on wholesale prices for antibiotics. Their results essentially echo the main findings here.

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