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COMPETITION AND THE COST OF CAPITAL
REVISITED: SPECIAL AUTHORITIES AND
UNDERWRITERS IN THE MARKET FOR
TAX-EXEMPT HOSPITAL BONDS

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We are extremely grateful to Abeni Crooms for her prodigious efforts as the research assistant who had the major responsibility for carrying out our survey of health care financing authorities. We are also grateful to Patricia Kocagil, Sara Markowitz, Mitch Strohminger, and Christian Lomax for additional research assistance. We are indebted to a number of people for making data available to us, for advising us with regard to the use of the data and the interpretation of certain variables, and for discussing the tax-exempt hospital bond market with us: Marc A. Katz, Melissa Marsh, Lou Herman, John H. Van Gorkom, Joe Tannenbaum, Jack Ashby, Stephen J. Stern, Terry Partington and Lisa Winkler-Pieta. Papers based on some of the material in this study were presented at the 1994 and 1998 North American Meetings of the Regional Science Association International and at the 1996 Meetings of the Urban Affairs Association, as well as the 1998 Barnard Columbia Urban Issues Workshop. We would like to thank the participants in those sessions for useful comments. In particular, we received helpful comments and support from Roger Bolton and Ester Fuchs. Finally, we are grateful to two anonymous referees for additional insight. The research was supported by a grant to the National Bureau of Economic Research from the Agency for Health Care Policy and Research, USDHHS, grant No. R01 HS06095-04. Of course, responsibility for all errors and interpretations lies solely with the authors, not with either NBER or AHCPR. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

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ABSTRACT

We explore the effects of two kinds of competition on the cost of capital in the tax-exempt bond market: (1) competition amongst underwriters and (2) competition amongst issuers (most of which are quasi-public special authorities sanctioned by state governments). The first kind of competition--essentially, competitive versus negotiated bidding processes--has received considerable attention in the literature. The second kind of competition, the number of potential issuers available to a beneficiary of a bond issue, has received far less attention and is related to the level of decentralization of the market for issuing bonds. Studies of the effects of competition have often used small samples of bond issues--often in one or a few states and for one or a few years--to reach their conclusions. Using a national database covering fourteen years, we find that both kinds of competition lower interest rates, at least in the hospital sector.

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Competition and the Cost of Capital Revisited: Special Authorities and Underwriters in the Market for Tax-exempt Hospital Bonds

This study explores the effects of two different kinds of competition on the cost of capital in the tax-exempt bond market: (1) competition amongst underwriters and (2) competition amongst issuers. The first kind of competition--essentially, competitive versus negotiated bidding processes--has received considerable attention in the literature. The second kind of competition, the number of potential issuers available to a beneficiary of a bond issue, has received far less attention. Most bond issues are now done through special authorities sanctioned by state governments, and some states allow more competition among these authorities than others; consequently, the bond market in some states is more concentrated than in others. Studies of the effects of competition have often used small samples of bond issues--often in one or a few states and for one or a few years--to reach their conclusions. This study presents results based on a large and comprehensive database for tax-exempt hospital bonds from 1980 to 1993 in all 50 states and the District of Columbia.

Regarding competition among underwriters, earlier investigations (e.g., Joehnk and Kidwell, 1979; Kessel, 1971; Kidwell and Rogowski, 1983) tended to find higher costs through negotiated bidding processes. Some later studies (Bland, 1984, 1985, 1986) assert that mitigating circumstances, such as the level of an underwriter's experience, help off-set the costs from a lack of competition. Finally Simonsen and Robbins (1996) found that, for the State of Oregon, the cost of capital for competitive sales was lower compared to negotiated sales.

Regarding competition among issuers, Hildreth (1993, 44) paints an excellent descriptive picture of the bond-issuing environment and mentions "the extensive expansion of special districts and other statutory authorities," but neither he nor other analysts have provided

systematic explorations of the impact that levels of competition inherent in state-level tax-exempt bond markets have on the cost of capital. This study continues the debate over the impact of competition in the municipal bond market and, using a national database covering fourteen years, finds that both kinds of competition do in fact lower borrowing costs, at least in the hospital sector.

Competition in State-level Bond Markets and the Role of Special Authorities

Municipal bonds are generally issued either (1) by state and local governments or (2) by quasi-government entities usually known as financing authorities (e.g. the New York State Dormitory Finance Authority or the Texarkana Health Facilities Development Corporation). Finance Authorities are created by state and local governments specifically to issue tax-exempt bonds. The generic term for both types is “financing agency,” and we use the word “authorities” to refer specifically to the quasi-government entities. Approximately two-thirds of all municipal bond financings 1980-1993 were originated by financing authorities. For hospital bonds, the figure is 80 per cent.

Hildreth (1993, 44) explains the popularity of finance authorities as a critical component of “avoidance strategies” that state and local governments use to overcome “structural hurdles” in the process of financing infrastructure:

“... [Finance Authorities are] often termed off-budget entities—empowered to issue revenue bonds without placing at direct risk the taxing capacity, or full-faith-and-credit guarantee. In fact, many off-budget entities serve as ‘conduits,’ defined as a governmental issuer of securities with an ultimate credit source being a private profit-making or nonprofit organization [e.g., a hospital].”

Authorities help governments circumvent debt caps and requirements for referenda.

They may also help them provide services now for which the bills come due later.

While hospitals and other private profit-making or nonprofit organizations receive the proceeds from bond offerings, they do not issue or sell the bonds. The bonds are issued on their behalf by a financing agency and sold to (or by) an underwriter (i.e., an investment banker) who in turn resells them. Proceeds from the bond sale are then transferred to the beneficiary, on whose behalf the bonds were issued, to meet the purpose of the bond offering.

On a state or local basis there may be more than one financing agency from which the beneficiary is permitted to choose. Presently, in the health care capital finance industry, there are twelve states with hospital finance authorities that have monopolies for issuing tax-exempt bonds. There are nineteen states where hospitals can select from state-level authorities or an alternative, local issuer. The remaining states have only non-state-level issuers.¹ We hypothesize that that these different regimes differ in the extent to which competition exists among issuers, and in the next section we test if this affects the cost of capital.

The financing agencies are responsible for matching hospitals with underwriters. Although it is the hospital that ultimately agrees to an underwriter, the financing agency usually chooses the pool of underwriters from which the hospital must select. So, the hospital chooses the financing agency (which as noted is a virtual statewide monopoly in twelve states), and then the hospital chooses an underwriter based on those acceptable to the financing authority.² Also, the financing agency can influence and may even decide whether the bond deal will proceed as a competitive issue (based on sealed bids by acceptable underwriters), a negotiated issue (where the hospital chooses a particular underwriter from a pool of acceptable ones), or a private placement (where the underwriter is bypassed altogether).

The other competition, thus, is among investment bankers for deals. Previous analyses provide some evidence that competition among bankers (competitive bidding for underwriting opportunities as opposed to negotiated deals) lowers the costs of capital in the hospital bond market.³ But competition among underwriters is not entirely absent in a negotiated deal because the lead underwriter is selected from a potential pool. It has become evident to us from our work and discussions with those involved in bond issues that the financing authority is often the locus of this competition. Indeed, as mentioned above, some authorities dictate the selection of a lead underwriter while others severely limit the number of potential lead underwriters among which the hospital must choose. It is plausible that the ability of an authority to limit the pool of underwriters is inversely related to the amount of competition that it faces.

The negotiated method is employed in approximately 94 percent of all issues of tax-exempt hospital bonds.⁴ Typically, interest rates on competitive issues are lower than on negotiated issues. Possibly this occurs because negotiated underwriters offer more services to the issuer (Sorensen, 1979). Negotiated hospital bond financings and private placements may also be riskier and may require more inputs from underwriters than similar corporate bond financings. But part of these differentials can also be due to the absence of competitive market forces in negotiated deals and private placements (Kessel, 1971). The plausibility of this argument is underscored by several scandals involving the issuance of negotiated municipal bonds, for instance in New Jersey in 1993. These scandals led then Governor Jim Florio to issue an executive order requiring that underwriters on future state bond deals be chosen by competitive bidding unless a strong justification could be made for another method of selection (Spiro, Light, Hawkins, and Smith 1993). Of course, there are myriad examples that have raised similar concerns, such as the yield burning accusations of the early 1990s. Finally, as Roden and Bland

(1986) and Bland (1985) explain, inexperienced and unsophisticated issuers may negotiate poorly. Again, in the next section we test if the choice of competitive or negotiated bidding processes affects the cost of capital.

Findings: Competition Matters

INSERT TABLE 1 ABOUT HERE

INSERT BOX: **Data and Methodology** ABOUT HERE

Table 1 presents the OLS regression results of our model of the determinants of hospital bond cost of capital. The true interest cost, or tic, is the dependent variable, and the independent variables include Issue and Issuer Characteristics (including a dummy if the sale was negotiated, the issuer's level of experience, and all standard characteristics of bond issues); National Characteristics; State Characteristics (including two measures of market concentration); County Characteristics; and Hospital Characteristics (including experience in the bond market). We present here two regressions using the same regressors except for the measure of market concentration. Regression (1) uses the concentration ratio while (2) uses the Herfindahl Index. The box on "Data and Methodology" provides more detail on and justification for this model, as well as variable definitions and other details on the database used. The box also explains the concentration ratio and the Herfindahl index. Concisely, both are higher the more concentrated, or centralized, the market to issue bonds in a state.

The coefficients for both negotiated sales and private placements are positive, significant, and relatively large in magnitude, indicating that these methods raise the cost of capital for hospital bonds in comparison to competitive sales. In fact, we estimate that the tic would decline by 58 basis points if the percentage of competitive issues rose from its current value of about 6

percent to 100 percent.⁵ The reduction in the tic that would accompany a much smaller increase in the percentage of competitive issues obviously would be much more modest. Our results suggest that cost savings would be realized by hospitals and third-party payors, including the Federal government, if underwriters were selected by competitive bidding more often. Indeed, the financial stakes are quite high. We compute that a reduction of only 10 basis points for all 1,152 hospital bonds in 1993 would have yielded \$200 million in savings.

The coefficients on the measures of market concentration are positive and statistically significant in each of the regressions. These results imply that reductions in concentration lower the cost of capital; thus, decentralized states are better off.⁶ Moreover, we calculate that a one standard deviation increase in issuers or reduction in concentration reduces the tic by approximately 12 basis points. While this may appear small at first, the effect is larger than that associated with a one standard deviation increase in the hospital's overall operating margin or its potential profitability under Medicare's prospective payment system. It is approximately equal to the premium associated with the inclusion of a call provision. Moreover, the cost of a bond's aggregate debt service during its life of twenty to thirty years to maturity is several times its par value. As noted above, a reduction in the interest rate of only a few basis points could yield substantial savings over time.

To further gauge the magnitude of the concentration effects, we consider how much the tic inclusive of fee would fall if each issuer had approximately the same share in real par value. The concentration ratio and the Herfindahl index have means of 0.83 and 0.45, respectively. These are the means of the actual variables rather than the antilogarithms of the means of their logarithms, presented in Table B1. Based on the number of different issuers in the issue year, there were 13 different issuers per state who issued bonds in a typical year in the period from

1980 through 1993. If each issuer had the same share in real par value, the Herfindahl index would equal 0.08, and the concentration ratio would equal 0.31. A two standard deviation reduction in the natural logarithm of the Herfindahl index would produce an actual index of 0.08, and a three standard deviation reduction in the natural logarithm of the concentration ratio would produce an actual ratio of 0.35. Therefore, we use a two standard deviation reduction in the case of the Herfindahl index and a three standard deviation reduction in the case of the concentration ratio. For the Herfindahl index, the average two standard deviation effect amounts to 14 basis points for the tic inclusive of fee. For the concentration ratio, the average three standard deviation effect amounts to 34 basis points for the tic inclusive of fee. We view an average of the two figures for each tic as the best estimate of the impact of inequality in market shares. Thus, departures from equality in market shares raise the tic inclusive of fee by 24 basis points.

In sum, both kinds of competition explored in this study appear to affect the cost of capital, and the current system of hospital bond finance could realize significant cost savings through encouraging and promoting competition. In addition, the two kinds of competition (among underwriters and among issuers) are in fact interrelated. Table 2 contains selected issue characteristics by type of issuer.

INSERT TABLE 2 ABOUT HERE

These characteristics have proven to be important determinants of bond yields in previous research. Above we found that negotiated issues and private placements carried much higher interest rates than competitive issues. Thus, it is notable that state and local authority bonds are much less likely to be issued on a competitive basis than those of other issuers. Government and district bonds are more likely to be of the general obligation variety. That is, they are more

likely to be backed by tax revenue as opposed to hospital revenue. General obligation bonds typically carry lower interest rates than revenue bonds. The table highlights a positive correlation between the probability that a bond is issued on a competitive basis and the probability that it is a general obligation issue. But this cannot account for our finding that competitive issues carry lower yields because we include a dichotomous variable that identifies general obligation bonds in our regressions.

Discussion and the Previous Defense of Negotiated Bidding

We do find that both issuer (e.g., authority) and beneficiary (e.g., hospital) experience lower the cost of capital, which implies that larger, more experienced issuers (which promote market concentration) have some advantages. This fact has also been used to defend negotiated bidding based on the concept that controlling for issuer experience and sophistication mitigates the costly impact of negotiated sales. The signs of the coefficients on both Issuer's history of real par value and Hospital's history of real par values are both negative and statistically significant.

We calculate that one standard deviation increase in issuer experience leads to approximately a 6 basis point reduction in the tic. While this effect may seem modest, it is consistent with some of the work of Robert Bland, who also has shown that the relationship between issuer experience and interest rates is far from clear cut. Bland (1985, 234) reports that experience lowers interest rates and argues that "Not only are experienced issuers better informed, but they will also be better negotiators," and our findings are consistent; however, we still find that negotiation raises the interest rate, even controlling for both issuer and beneficiary experience. This finding conflicts somewhat with Simonsen and Robbins (1996, 62) who find that issuer experience is not significantly associated with interest rates although they do, as mentioned, find that negotiation is more costly than competitive sales. Roden and Bland (1986)

also report that issuer sophistication reduces interest costs. On the other hand, Bland (1984, 53) suggests that the “greater the supply of bonds bearing the issuer’s name, the greater amount of search by underwriters for the most willing investors and, thus, the higher the interest rate.” This is particularly relevant given our measure of issuer’s experience. However, we do not find that issuer experience as measured by the par value of previous issues raises the cost of capital. We find that it lowers it. Clearly this is an area for additional research.

In addition, most of the more recent studies rely on relatively small data sets covering one or a few years. Simonsen and Robbins (1996) have 210 observations for the state of Oregon for 1992-93. Bland (1985) has 330 observations for the state of Pennsylvania with additional information from New Jersey and Ohio for 1976-78. Roden and Bland (1986) have 121 observations for Pennsylvania for 1978-80. Bland (1984) has 874 observations for ten Northeastern states for 1976-78. Kidwell and Rogowski (1983) have 615 observations for New England states for 1970-76. Kessel’s (1971) seminal study had 8,614 observations for all 50 states for 1959-1967. Our analysis is based on 4,576 observations for hospital bonds in all 50 states and the District of Columbia for 1980-93. Thus, our results are generalizable within the hospital bond sector and perhaps to other sectors that rely heavily on revenue bonds sold primarily through negotiation.

Conclusions, Policy Recommendations, and Directions for Future Research

These results have several implications for public policy at the Federal, state, and local levels. State and local governments should consider means to encourage the sale of revenue bonds through competitive rather than negotiated sales. Simonsen and Robbins (1996) and Bland (1984; 1986) summarize nicely the caveats to this assertion; nevertheless, it appears that more stands to be gained from encouraging competition among underwriters than in dwelling on the

exceptions. Requirements like those implemented by Governor Florio in New Jersey appear to have potential for significant cost savings. In particular, with the rising use of quasi-public special finance authorities, which are sanctioned by state governments, states have an interest in ensuring that these loosely-regulated entities follow the least costly practices available.

Regarding these quasi-public authorities, states should ensure that there is competition to issue hospital bonds, and perhaps other revenue bonds, among authorities and other issuers. At least states should not create and protect monopolies in the market to issue these bonds. They should allow more than one state-level authority to issue hospital bonds and/or allow local authorities to do so. Our results indicate that deconcentration of the hospital bond industry would decrease borrowing costs. While it is true that experience on the part of the finance agencies and the beneficiaries may lower the cost of capital (a fact that presumably favors larger and more concentrated issuers), it appears to be more important to promote competition among issuers and allow market forces to determine how many issuers enter the market, and how they achieve their market share.

The Federal Government has several reasons to pay attention to this industry. First, given the tax-deductibility of interest earned on municipal bonds, the Federal Government has an interest in ensuring that interest rates are as low as possible to minimize Federal tax expenditures. In addition, the cost of capital in the health care industry affects the cost of providing health care, which is certainly an issue of great salience currently at the Federal level. Therefore, the Federal Government should consider regulations that would promote competition, both among issuers and among underwriters, in order to realize cost savings in the cost of providing health care and state and local infrastructure.

Clearly there is a need for far more research in determining the impacts of competition on the cost and interest rates of bonds. More studies using national databases and additional service sectors are needed. We also need to better understand the nature of competition between issuers. Are local authorities sometimes the equivalent of local monopolies? What is the nature of competition between state and local level authorities in those states in which both are operating, and do beneficiaries perceive a choice between local and state level authorities? Nevertheless, it appears wise to continue the calls to promote and foster competition in the municipal bond market, both through competitive rather than negotiated sales and through deconcentrating the state finance agency regimes.

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BOX: Data and Methodology

The data used in this paper are derived from a data base we have constructed of all new issues of municipal securities from 1980-1993. The data were purchased from Securities Data Company (SDC) and each bond issue is an observation. The empirical analysis in this project is based on approximately 6,000 new hospital bond financings and refinancings. Data on issue characteristics are merged with hospital, national, state, and local market area characteristics from a variety of sources. The true interest cost (tic), or yield to maturity or internal rate of return, is the most widely used summary measure of the interest rate on a municipal bond issue from the borrower's point of view. This rate equates the proceeds received by the beneficiary to the present value of interest payments and principal repayments. For a more detailed description of the data base, with a full definition of and computation method for the tic, an appendix is available from the authors.

In order to compute most accurately the tic, we needed to know the fees that were charged by the finance authorities. This information was not available, so we devised and implemented a national survey of all health care finance authorities to determine the level of fees charged. To obtain information on fees charged by issuers and changes in fees over time, we conducted a survey of all issuers classified as state authorities, local authorities, and districts. The survey universe consisted of 999 issuers. Those receiving questionnaires issued 4,824 bonds

with a total real par value of \$130 billion in 1982-84 dollars during the period 1980 through 1993. Of the 999 issuers in the survey, 359 returned the questionnaire. Thus, the response rate of 36 percent in terms of issuers was relatively modest. The respondents, however, accounted for 65 percent of all issues done by the survey universe and for 71 percent of their real par value. These response rates are much more impressive. They indicate that our survey includes most of the large issuers both in terms of the number of bond deals and their total par value.

Regressions were estimated with a sample drawn from the 5,799 issues where fees exclusive of fees can be computed. 1,213 issues were done by state and local authorities who received the survey and did not respond and 10 were done by issuers who responded but did not report information on fees. Thus, the sample ($n = 4,576$) excludes these issues. Measures of the number of issuers and the concentration of par value among issuers are based on all 6,701 hospital issues in the full data base. The mean and standard deviation of the dependent variable, the true interest cost inclusive of fee in the sample, are 8.223 and 2.340, respectively. Table B1 presents the definitions, means, and standard deviations of the independent variables. Table 1 presents the standard OLS regression results.

Independent variables include Issue and Issuer Characteristics (including a dummy if the sale was negotiated or a private placement, the issuer's level of experience, and all standard characteristics of bond issues); National Characteristics (including the rate and variability of treasury bonds); State Characteristics (including the two measures of market concentration, and state tax rates); County Characteristics (including unemployment and urbanization data); and Hospital Characteristics (including Medicare and Medicaid shares and profitability margins).

There are, however, a few variable definitions and omissions that may need additional discussion. First, while the database includes refinancings, a dummy for a refinancing was not

significant and is therefore excluded from these results. Second, we do not know the number of bids for competitive bids and therefore include only a dummy for negotiated. While most studies include the number of bids, they are also generally limited to much smaller numbers of observations than we have. Third, we do not include bond ratings because given our detailed specification we consider them to be endogenous. Regressions with the ratings included were not substantively different, however. Finally, we have not included a variable for issue size because we consider it to be an endogenous variable and we are presenting a reduced form equation.

We have used two widely-used measures of concentration: the four firm concentration ratio and the Herfindahl index. For example, see Tirole (1988) or Scherer and Ross (1990). The former is defined as the fraction of industry output accounted for by the four largest producers. The latter is defined as the sum of the squared share of each producer in total output. The Herfindahl index ranges from 1 in the case of pure monopoly to $1/n_j$ in the case of n_j firms, each of whom produces the same output. The fewer are the number of firms and the more concentrated output is among them, the larger is the value of the index. For both measures real par value is used as output in this context.

The issuer's history of real par values (total real par value of all previous issues) measures its experience. One hypothesis is that more experienced agencies have more knowledge concerning the tax-exempt bond market, which may result in lower tics on their bonds exclusive of fees. Another hypothesis is that fees and tics inclusive of fees fall with experience if the costs of more experienced agencies are lower than those with less experience. These two hypotheses suggest it may be important to control for experience in estimating the effects of concentration or the number of issuers on tics exclusive of fees. This is because the more concentrated is the market the more likely it is that the total real par values of previous

issues is greater. But the experience effects described do not operate through concentration. Put differently, issuers in more concentrated markets have lower costs of production than those in less concentrated markets.

Another hypothesis is that experienced agencies have fewer incentives to invest resources that lower the tic because they have a well-established clientele. Moreover, fees may rise if more experienced issuers have more monopoly power (have lower price elasticities of demand). In these cases there is less reason to control for experience in estimating the effect of concentration because experience and concentration are proxies for the same causal mechanism. The experience measure is specific to each issuer and is exclusive of the most recent financing (which serves as the observation in the regression analysis). It can be characterized as a lagged variable and was obtained from a backward search of the SDC data base. Nursing home and life care issues are included because these reflect experience in issuing tax-exempt bonds.

The hospital's history of real par values (total real par value of all previous issues) measures its experience in using the tax-exempt bond market to finance capital investment. As in the case of issuer experience, the effects of this variable on the tic or the fee are ambiguous on a priori grounds. Reductions in these variables due to the increased knowledge possessed by hospitals who have made more use of the bond market in the past may be offset by several factors. Less experienced hospitals may have more incentives to search for an issuer that will help secure a lower tic exclusive of fee or charge a lower fee. Moreover, these hospitals may be more sensitive to fees (may have demand functions with larger price elasticities of demand). If issuers can engage in price discrimination, the fee charged to a less experienced hospital may be lower. The experience measure is exclusive of the most recent financing and was obtained from a backward search of the SDC database.

Table 1: Determinants of Hospital Bond Cost of Capital: OLS Regression Coefficients (Dependent Variable = true interest cost (tic) including fees charged) (t-statistic in parentheses, intercepts not shown, n=4,576)

Independent Variables	Tic Inclusive of Fee Regressions	
	(1)	(2)
<i>A. Issue and Issuer Characteristics</i>		
Negotiated	0.607 (6.87)	0.597 (6.74)
Private placement	0.816 (5.78)	0.804 (5.68)
Call	0.081 (1.36)	0.084 (1.41)
Put	-1.173 (-7.01)	-1.180 (-7.04)
Fixed	1.612 (10.05)	1.612 (10.03)
Length	0.022 (8.79)	0.022 (8.59)
Multi	-0.086 (-1.77)	-0.079 (-1.62)
Teach	-0.280 (-4.69)	-0.283 (-4.74)
Pool	-0.050 (-0.52)	-0.050 (-0.52)
Rank	0.008 (4.86)	0.008 (4.90)
No rank	0.424 (7.55)	0.424 (7.54)
General	-0.616 (-7.35)	-0.611 (-7.29)
Issuer's history of real par values	-0.00004 (-2.93)	-0.00004 (-2.86)
<i>B. National Characteristics</i>		
T bond rate	0.820 (63.97)	0.822 (64.16)
Variability	1.684 (8.41)	1.699 (8.47)
<i>C. State Characteristics</i>		
State income tax	-2.980 (-5.28)	-2.831 (-5.02)
Mandatory rate setting	-0.020 (-0.28)	-0.013 (-0.18)
Concentration ratio	0.367 (4.84)	
Herfindahl index		0.087 (3.34)
<i>D. County Characteristics</i>		
Unemployment	0.017 (2.15)	0.016 (2.02)
Rural	0.084 (1.33)	0.102 (1.63)
<i>E. Hospital Characteristics</i>		

Medicare share	0.009 (0.05)	-0.001 (-0.01)
Medicaid share	1.068 (2.48)	1.128 (2.62)
Asset ratio	-0.027 (-2.13)	-0.026 (-2.03)
Medicare share*PPS	-0.903 (-3.64)	-0.872 (-3.51)
Medicaid share*DRG	-1.452 (-2.79)	-1.538 (-2.95)
Medicaid share*other	-1.207 (-2.62)	-1.286 (-2.79)
Operating margin	-1.274 (-3.08)	-1.258 (-3.04)
Hospital's history of real par values	-0.0004 (-3.24)	-0.0004 (-3.25)
<i>F. Unknowns</i>		
Hospital history of real par value unknown	-0.165 (-2.17)	-0.164 (-2.16)
Asset ratio unknown	-0.203 (-1.05)	-0.194 (-1.00)
PPS margin unknown	0.041 (0.58)	0.046 (0.66)
Operating margin unknown	0.292 (3.67)	0.296 (3.72)
Other variable unknown	0.118 (0.52)	0.097 (0.43)
R-square	0.717	0.716
F-statistic	348.31	347.01

Table 1 Continued

Table 2: Selected Issue Characteristics, by Type of Issuer 1980-1993 (figures given are %)

Type of Issuer	General Obligation	Negotiated	Private Placement	Competitive	Credit Enhancements ^a	S&P AAA
State Government	20.83	54.17	12.50	33.33	25.00	25.00
County Government	19.93	78.90	5.28	15.83	34.58	27.43
City, Town, or Village Government	8.11	88.63	4.73	6.64	31.76	26.35
Hospital District	40.89	78.00	4.67	17.33	33.56	30.67
State Authority	0.33	93.10	5.42	1.48	45.81	36.13
Health Care	0.22	93.30	5.48	1.22	45.93	36.47
Equipment	5.26	100.00	0.00	0.00	68.42	36.84
Mental Health/Long-Term Care	0.00	75.00	16.67	8.33	41.67	41.67
Industrial Development	0.38	92.72	5.36	1.92	42.53	34.10
Education/Housing	1.67	90.00	3.33	6.67	50.00	33.33
Local or County Authority	2.62	91.92	5.24	2.84	42.35	33.68
Health Care	2.92	92.30	4.84	2.86	44.20	35.20
Mental Health/Long-Term Care	5.26	97.37	2.63	0.00	44.74	44.74
Industrial Development	1.66	90.61	6.63	2.76	36.46	28.36
Education/Housing	0.00	86.96	4.35	8.70	47.83	34.78
Other	5.68	69.32	15.91	14.77	28.41	12.50
All Issuers	7.55	88.70	5.39	5.91	40.17	32.16

^aCredit enhancements include bond insurance, letter of credit, and mortgage related insurance.

Table B1: Definitions, Means, and Standard Deviations of Independent Variables

(Entire sample of 5,799 issues. First figure is mean; second is standard deviation)

A. Issue and Issuer Characteristics	
Negotiated (0.910, 0.286) Private placement (0.029, 0.167)	Dichotomous variables that identify negotiated issues and private placements, respectively; omitted category pertains to competitive issues
Call (0.856, 0.351)	Dichotomous variable that identifies callable issues
Put (0.106, 0.308)	Dichotomous variable that identifies putable issues
Fixed (0.883, 0.321)	Dichotomous variable that identifies issues with fixed coupon rates
Length (24.594, 8.882)	Length in years between the date of final maturity and the date of issue
Multi (0.233, 0.423)	Dichotomous variable that identifies issues for multihospital systems
Teach (0.126, 0.332)	Dichotomous variable that identifies issues for hospitals that have teaching status
Pool (0.058, 0.233)	Dichotomous variable that identifies pooled financings
Rank (10.366, 13.034)	Rank of primary underwriter in terms of total par value of issues underwritten; ranges from 1 (highest par value) to 50 (lowest par value)
No rank (0.264, 0.441)	Dichotomous variable that identifies issues in which primary underwriter is not one of the 50 leading underwriters
General (0.074, 0.262)	Dichotomous variable that identifies general obligation bonds
Issuer's history of real par values (707.021, 1486.450)	Total real par value of all previous issues in millions of 1982-84 dollars; includes nursing home and life care issues
B. National Characteristics	
T bond rate (9.032, 1.979)	Yield on 30-year U.S. Treasury bond on week of issue as a percentage
Variability (0.170, 0.114)	Standard deviation of previous variable based on an eight-week period ending with the week of issue
C. State Characteristics	
Concentration ratio (-0.248, 0.280)	Natural logarithm of four largest issuer concentration ratio based on real par value in issue year; logarithm of fraction of real par value accounted for by four largest issuers
Herfindahl index (-1.202, 0.820)	Natural logarithm of Herfindahl index based on real par value; logarithm of sum of squared share of each issuer in total real par value
State income tax (0.052, 0.035)	State income tax rate in highest tax bracket as a fraction
Mandatory rate setting (0.102, 0.301)	Dichotomous variable that identifies issues in states with mandatory rate-setting programs
D. County Characteristics	
Unemployment ^a (7.274, 3.013)	Unemployment rate of persons aged 16 and over as a percentage

Rural ^a (0.192, 0.384)	Dichotomous variable that identifies rural counties
E. Hospital Characteristics	
Medicare share ^a (0.448, 0.135)	Fraction of inpatient days accounted for by Medicare inpatient days
Medicaid share ^a (0.097, 0.092)	Fraction of inpatient days accounted for by Medicaid inpatient days
Medicaid share*DRG ^a (0.033, 0.064) Medicaid share*other ^a (0.047, 0.082)	Fraction of inpatient days accounted for by Medicaid inpatient days multiplied by a dichotomous variable that identifies issues in states using a DRG reimbursement methodology under Medicaid (Medicaid Share*DRG) and fraction of inpatient days accounted for by Medicaid inpatient days multiplied by a dichotomous variable that identifies issues in states using a Medicaid reimbursement system with prospective rate of increase controls or with negotiation and fixed contracting (Medicaid Share*Other); omitted category pertains to issues in states using retrospective cost-based reimbursement under Medicaid
Asset ratio ^a (2.177, 1.862)	Ratio of total assets to total liabilities
Medicare share*PPS ^a (0.041, 0.101)	Fraction of inpatient days accounted for by Medicare inpatient days multiplied by PPS profitability margin (PPS); interacted with a dichotomous variable that equals 1 for the years 1984 through 1988 since PPS began in October 1983
Operating margin ^a (0.009, 0.058)	Net patient revenue minus operating expenses divided by net patient revenue
Hospital's history of real par values ^a (63.019, 160.129)	Total real par value of all previous issues in millions of 1982-84 dollars
F. Unknowns	
Hospital history of real par value unknown (0.141, 0.348)	Hospital name unknown; this variable and the next four are dichotomous indicators
Asset ratio unknown (0.290, 0.454)	Value of the asset ratio is unknown
PPS margin unknown (0.397,0.489)	Includes cases where PPS margin is known but Medicare share is unknown
Operating margin unknown (0.347, 0.476)	Value of the operating margin is unknown
Other variable unknown (0.279, 0.449)	Identifies issues in which the unemployment rate, the rural indicator, the fraction of Medicare patients days, and the fraction of Medicaid patient days are unknown; if one variable is unknown, all are unknown

^a Mean and standard deviation pertain to issues for which variable is known.

Table B1 Continued

Notes

1. The twelve Monopoly states are CO, CT, ID, MA, MD, MT, NH, RI, SD, VT, and WA. The nineteen states with state-level and local authorities are AZ, CA, DE, GA, IL, IN, KY, LA, MI, MO, MS, NC, NE, NJ, NY, OK, TX, WI, and WV. The District of Columbia is counted as a state regime in this study. Of the 80 per cent of par value of hospital bonds issued through special authorities, 46 per cent was issued by local (sub-state level) authorities, while 54 percent was issued by state-level authorities. Of the 20 per cent issued directly by governments, 93.5 percent was issued locally. And, there is great variation between states in these figures. All bonds in Texas in 1993 were issued by quasi-government authorities, and 90 per cent through local authorities. In California 70 per cent were issued by quasi-government authorities, but only 31 per cent through local authorities. In Rhode Island, all hospital bonds were issued by a single, state-level authority.

2. It is common in the literature to discuss the “search” processes involved in bond issues (e.g., Bland, 1985). Most of these discussions detail the importance of issuer search for underwriters (for negotiated sales) and underwriter search for investors. It is important to note that this search process is really more complex for hospital bonds. The underwriters search for investors much as described in Bland (1985). Beneficiaries search for a finance authority. They also search for an underwriter, but the finance authority may help or even dominate this search. In our discussion, we refer to finance authorities as issuers and hospitals as beneficiaries. When governments issue bonds directly--that is not through a special authority--they are generally both the beneficiary and the issuer. This is not the case for most hospital bond issues, or for most bond issues that use a special authority. Thus, our study lends insight into deals done through special authorities in which the search incentives may be skewed by the fact that the beneficiary and the issuer are not

the same entity.

3. See for instance Grossman, Goldman, Nesbitt, and Mobilia (1993). For additional studies on the determinants of the cost of capital in the health care sector, see Austen, Corman, and LiCalzi (1986); Carpenter (1991); and Cleverley and Rosegay (1982).

4. The sum of the underwriter's costs and profit is termed the gross spread. In a competitive deal the underwriter covers costs and makes a profit by purchasing the bonds from the issuer at approximately par value and re-offering them above par. In a negotiated deal the underwriter does not directly purchase the bonds. Instead, it finds customers who purchase the bonds from the issuer at par. The underwriter then subtracts its costs and profit from the proceeds received by the issuer. In either case the beneficiary of the bond issue borrows at a higher interest rate than the rate received by the ultimate purchasers of the bonds. A negotiated deal may involve an original issue discount which further reduces the proceeds received by the issuer. This occurs when some bonds in the issue (usually the term bonds and the serials with relatively long maturities) are offered to the public at less than par value.

5. In contrast, Sorensen (1979) reports that a negotiated deal adds 12 basis points to the interest rate in the case of new financings of corporate bonds. Simonsen and Robbins (1996) report that negotiated deals add about 29 basis points for general obligation bonds in Oregon.

6. Technically, we should probably use the term “deconcentrated” rather than “decentralized,” since it is entirely possible for a state to have many state-level issuers, which would thus be picked up by the measures of concentration. However, in practice, deconcentrated states are also decentralized because they have local issuers. Therefore, the term “decentralization” is also appropriate.