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HOSPITAL MARKET STRUCTURE AND THE BEHAVIOR OF NOT-FOR-PROFIT HOSPITALS: EVIDENCE FROM RESPONSES TO CALIFORNIA'S DISPROPORTIONATE SHARE PROGRAM

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Hospital Market Structure and the Behavior of Not-For-Profit Hospitals:
Evidence from Responses to California's Disproportionate Share Program
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ABSTRACT

I exploit a plausibly exogenous change in hospital financial incentives to examine whether the behavior of private not-for-profit hospitals varies with the share of nearby hospitals organized as for-profit firms. My results show that not-for-profit hospitals in for-profit intensive areas are significantly more responsive to an increased incentive to treat low-income patients insured by the Medicaid program than are other not-for-profit providers. The heterogeneity in behavior is not due to differences in financial constraints but is instead likely driven by different degrees of market competitiveness in areas with one or more for-profit hospitals. The observed variation in the governing boards of not-for-profit hospitals across market areas supports the hypothesis that increased for-profit penetration makes these facilities more profit-oriented.

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I. Introduction

Hospitals are the largest segment of the not-for-profit sector, accounting for nearly 40% of not-for-profit revenues in 1995 (Independent Sector, 1996). Unlike not-for-profit universities and religious organizations, many not-for-profit hospitals actively compete with profit-maximizing firms. Recent research suggests that the presence of one or more for-profit hospitals in a market may have a substantial effect on the behavior of private not-for-profit providers (Cutler-Horwitz, 1999). If this is the case, then the fraction of hospitals organized as profit-maximizing firms may understate the true impact that for-profit hospitals have on the markets in which they operate.

Because each hospital's type of ownership is endogenous, determining whether it is the presence of for-profit hospitals or some other factor that drives any observable differences in not-for-profit behavior or market outcomes presents a difficult identification problem.[1] The very factors that cause for-profit firms to enter particular markets may simultaneously lead other hospitals to behave differently from hospitals of the same ownership type in markets with correspondingly few profit-maximizers.

In this paper, I attempt to deal with this identification problem by exploiting a significant and plausibly exogenous change in hospital financial incentives.[2] Specifically, I use the change in financial incentives created by California's Disproportionate Share program (DSH) in 1990 to examine whether institutional level responses and market outcomes vary systematically with the

[1]This point is stressed by Norton and Staiger (1994), who demonstrate that for-profit hospitals locate in systematically different areas than do not-for-profit facilities.

[2]An alternative approach, employed by Cutler and Horwitz (1999), is to examine the effect of hospital conversions to for-profit status. While informative, one must of course worry whether any observed differences are driven by the increase in for-profit penetration or by those factors that led to the conversion.

share of hospitals that are for-profit. DSH increased hospitals' financial incentives to treat individuals insured by the federal-state Medicaid program, leading both private for-profit and private not-for-profit hospitals to "cream-skim" the most profitable indigent patients from government-owned providers (Duggan, 2000).

The results presented in the first empirical section demonstrate that the share of Medicaid-insured patients within a county reallocated from public to private hospitals is significantly related to the fraction of hospitals there organized as profit-maximizing firms. Public hospitals located in counties with relatively many for-profit hospitals experienced much greater reductions in their numbers of Medicaid-insured patients than did other government-owned facilities. For example, providers owned by the county of Los Angeles, a market in which half of the hospitals are for-profit, saw their share of Medicaid-insured newborn deliveries fall from 45% to 12% from 1990 to 1996. The patient mix at San Francisco's county hospital was much less affected - their share of Medicaid deliveries fell from 42% to 38% after DSH was introduced. All of the private hospitals in San Francisco are not-for-profit.

Of course, this observed difference in the extent of reallocation across market areas may not actually be caused by the presence of for-profit firms. The very factors that led for-profit firms to enter certain markets may also affect the responsiveness of both types of private hospitals to financial incentives. For example, if the quality of the government-owned hospital in an area is significantly related to the share of hospitals organized as for-profit firms, then the observed variation may be driven by differences in public hospital quality, and thus in the costs associated with skimming public hospital patients, rather than by the presence of for-profit firms. I therefore test whether controlling for this and several other potentially confounding factors eliminates the significant relationship described above. It does not.

In the next empirical section I take the hospital as the unit of observation, and test whether part of the difference across market areas reflects not-for-profit behavior that is significantly related to the ownership type of nearby hospitals. Consistent with the hypothesis outlined above, I find that not-for-profit hospitals in markets with relatively many for-profit hospitals respond more aggressively to a change in the financial incentive to treat low-income Medicaid patients than do other not-for-profit providers. I find no corresponding relationship for profit-maximizing hospitals.[3] This heterogeneity in not-for-profit responsiveness is partially responsible for the variation in market-level outcomes described above.

One potential explanation for the heterogeneity in responsiveness is that not-for-profit hospitals in for-profit intensive areas have systematically different financial constraints. For example, if for-profit providers compete more aggressively than do other facilities (e.g. by offering lower prices), then their not-for-profit competitors may be significantly more financially constrained than are other not-for-profit hospitals. Alternatively, if for-profit hospitals locate only in the most lucrative markets, then not-for-profits there may actually have a more expansive budget set than their counterparts in markets with no for-profit competitors. Because the plausibly exogenous change in hospital financing affected the slope and introduced kinks in each institution's budget set, any difference in financial constraints across market areas could lead to corresponding differences in the optimal response by not-for-profit facilities. This would be true even if all not-for-profit hospitals had identical objective functions.

[3] This supports the findings of Silverman and Skinner (2000), who show that not-for-profit hospitals in markets with one or more for-profit hospitals are significantly more aggressive about Medicare upcoding for pneumonia.

My results indicate that neither the net income nor the net worth of not-for-profit hospitals is significantly related to the fraction of nearby hospitals organized as for-profit firms. Additionally, it does not appear that hospitals in areas with relatively many for-profit providers were experiencing different degrees of fiscal stress prior to the change in hospital financing, as pre-DSH changes in hospital net worth are not systematically different in for-profit intensive areas.

One difference that does stand out, however, concerns the contestability of markets served by not-for-profit hospitals in places also served by profit-maximizing facilities. Specifically, not-for-profit facilities in areas with relatively many for-profit hospitals treat patients from more competitive areas, as measured by weighted herfindahls of hospital patient shares in each organization's immediate geographic area. Thus the presence of for-profit hospitals could plausibly lead to greater competition in an area, but this apparently does not show up in lower profitability for these facilities. Perhaps by behaving more like profit-maximizers, as the findings described above suggest that they do, not-for-profit hospitals in for-profit intensive areas are able to offset the effects of the greater competition.

My final set of results explores whether the objective functions of not-for-profit hospitals appear to be significantly related to the share of nearby hospitals organized as profit-maximizing entities. To do this, I examine the occupations of individuals who serve on the board of each organization. This is no doubt an imperfect measure of any organization's true objective function, as a person's occupation is not a perfect description of his or her preferences. Furthermore, how these individual preferences are aggregated into an organizational objective function is far from clear. Finally, the influence that any particular hospital board has over an organization's behavior will vary in unobservable ways across firms.

Despite these qualifications, an analysis of this data suggests that the composition of not-for-profit hospital boards is systematically related to the share of its nearby competitors organized as for-profit providers. While there is a striking difference between private for-profit and private not-for-profit firms with respect to what share of board members are physicians, this difference is significantly smaller in places with relatively many for-profit providers. Perhaps surprisingly, the share of for-profit board members who are physicians (49%) is more than twice as large as the corresponding share on the boards of not-for-profit hospitals (24%), who have relatively more retirees and individuals from the community on their boards. Because physicians are the most numerous group on most hospital boards, increases in their share may increase the ease with which organizations can respond to a change in their market environment[4] while also reducing the number of factors that enter the organization's objective function. This may partially explain why many profit-maximizing firms are governed by a board with a majority of physicians, while virtually none of the not-for-profit hospitals are.

The findings presented in this paper provide some insight into how not-for-profit hospitals are affected by the presence of one or more for-profit competitors. Not-for-profit hospitals in for-profit intensive areas are significantly more responsive to changes in financial incentives than are other not-for-profit hospitals. This heterogeneity is driven not by differences in financial constraints across market areas but is likely due to the greater competitiveness found in for-profit intensive market areas. Any hospital that is slow to respond to a change in its market environment will face a competitive threat for its own patients, and this threat appears to be especially great in areas with one or more for-profit hospitals. The fact that the composition of the governing board of not-for-

[4]The costs of collective decision-making are stressed by Hansmann (1996).

profit hospitals is significantly related to the share of nearby hospitals that are for-profit reveals one channel through which not-for-profits have become more profit-oriented.

II. Data and Background

A. The California Hospital Market

California's hospital market is served by private for-profit, private not-for-profit, and government-owned hospitals. Virtually all of the state's large urban areas are served by a publicly-owned safety net provider. The patients treated at these facilities are disproportionately poor.[5] For example, more than 90% of the patients treated at the four county-owned hospitals in Los Angeles are Medicaid-insured or uninsured, while only 2% of their patients are privately insured. The mix of patients at private for-profit and private not-for-profit hospitals is quite similar, as is shown in Table 2. Not-for-profit hospitals actually treat fewer indigent patients than their for-profit counterparts.

One factor that partially explains the substantial difference between public and private hospitals is location - hospitals owned by the government are located in relatively poorer areas. However, the results presented in Table 3 suggest that this is not the only important factor. In the first specification, I regress the fraction of a hospital's patients that are Medicaid-insured on dummy variables for its type of ownership. The coefficient estimates in the first column reveal that the share of public hospital patients insured by the federal-state Medicaid program is substantially greater than the corresponding share at either type of private hospital. The second specification introduces the variable MC-ZIP-PREDICT, which equals the share of hospital patients living within five miles of

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[5]Low-income individuals are more likely to be without health insurance or covered by the federal-state Medicaid program (Epstein and Weissman, 1994), as is shown in Table 1.

the hospital who are covered by the Medicaid program. The coefficient estimate on MC-ZIP-PREDICT is statistically significant but the inclusion of this variable does not affect the observed difference between public and private hospitals, while the difference between not-for-profit and for-profit facilities remains insignificant.

An alternative explanation for the difference between public and private hospitals is that facilities owned by the government provide different services from private ones.[6] The third specification introduces a variable MC-DIAG-PREDICT, which simply equals the fraction of each hospital's patients that would be Medicaid-insured if it served a representative group of patients within each diagnosis.[7] Despite its statistical significance, this variable does not reduce the significant difference between public and private hospitals, while the corresponding difference between the two types of private hospitals remains insignificant. Specifications four through six perform a similar exercise for uninsured patients and also show a substantial difference between public and private hospitals with no corresponding one between the two types of private providers.

B. Changes in Hospital Financial Incentives Caused by DSH

Previous work has exploited the change in incentives caused by the introduction of California's Disproportionate Share (DSH) program in late 1990 (Duggan, 2000). This program substantially increased hospitals' financial incentives to treat Medicaid patients but left the incentive to treat individuals without health insurance essentially unchanged. The non-linear incentives that

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[6]For example, individuals with a bullet wound are K times more likely than any randomly selected hospital patient to be treated at government-owned facilities.

[7]I use 26 major diagnostic categories when calculating MC-DIAG-PREDICT. Suppose that a hospital has 300 heart attack patients and 100 asthma patients. If 10% of heart attack patients and 30% of asthma patients statewide are Medicaid-insured, then MC-DIAG-PREDICT would equal 15% ((.75 * .10) + (.25 * .3)) for this facility.

were created by this program are shown in Figure 1, which plots a hospital's Medicaid DSH per-diem as a function of that facility's low-income number.[8] Hospitals that served relatively many low-income patients when this program was first introduced had a significant incentive to treat more Medicaid patients. So too did facilities close to but below the 25% notch.

Duggan (2000) shows that both types of private hospitals were similarly aggressive in responding to these incentives, leading to a substantial reallocation of the most profitable Medicaid patients from publicly-owned hospitals to private ones. This reallocation was especially pronounced for pregnant women, as Table 4 demonstrates. Furthermore, both types of private hospitals reduced their share of care to the uninsured. In the empirical sections that follow I focus primarily on low-income pregnant women, the group for whom competition intensified the most[9] after the new financial incentives were introduced.

III. The Relationship Between For-Profit Hospital Penetration and Market-Level Changes

The results shown in Table 4 suggest that a hospital's type of ownership is an important predictor of its response to a change in financial incentives. In this section, I investigate whether the ownership types of a hospital's nearby competitors also affect institutional behavior. Specifically, I test whether organizational responses to the plausibly exogenous change in financing described

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[8]The low-income number essentially measures the share of a hospital's costs that are attributable to Medicaid and uninsured patients.

[9]For a number of reasons, pregnant women were the most sought after of all Medicaid patients after DSH was introduced. First, because they are the most common type of Medicaid hospital patient, a private facility could substantially increase its low-income number simply by marketing to only one type of Medicaid patient. Second, a very small share of all low-income pregnant women are uninsured. Thus a private facility would be less likely to admit many additional uninsured patients if it did open its doors to low-income pregnant women. Costs per day are also significantly smaller for Medicaid deliveries, and the hospitals receive the DSH per-diem for both the mother and the newborn.

above are significantly related to the share of nearby facilities organized as profit-maximizing entities. This share varies substantially across market areas in California. Extreme examples include Los Angeles and San Francisco, where for-profit facilities account for 50% and 0%, respectively, of all general acute care hospitals.

A comparison of these two large urban areas suggests that the presence of for-profit hospitals may affect the behavior of other providers in the same market. Table 5 reveals that, while the share of Medicaid births delivered at public hospitals in Los Angeles dropped precipitously from 1990 to 1996, the corresponding decline in San Francisco was much less marked. Although for-profit hospitals accounted for some of the reallocation within Los Angeles, not-for-profit hospitals there enjoyed much larger increases than their counterparts in San Francisco. Specifically, the share of Medicaid births delivered at not-for-profit hospitals in Los Angeles rose from 37% to 61%, a much larger increase than the four percentage point rise at San Francisco's not-for-profit providers.

The results summarized in Table 6 suggest that the percentage of a county's hospitals organized as for-profit firms, FOR-FRAC_{90}, is significantly related to the decline in the share of Medicaid births being delivered at public hospitals, $\Delta\%\text{MC-BIRTH-PUBLIC}_{90\text{-}96}$, in the years after the DSH program was first introduced. A ten percentage point increase in the share of hospitals that are for-profit is associated with a 4.7 percent increase in the share of Medicaid-insured pregnant women switching from public to private facilities. This regression result is broadly consistent with the San Francisco - Los Angeles comparison described above, and is robust to the exclusion of these two counties.[10] The next specification includes only those counties that have at least one public

[10]The estimate does fall, however, to -.247, with a standard error of .066. Given that more than half of California's for-profit hospitals are located in Los Angeles, eliminating this observation from the sample substantially reduces the amount of variation in FOR-FRAC_{90}.

hospital and at least one private facility, reducing the number of counties in the sample to 29.[11] The coefficient estimate on the FOR-FRAC$_{90}$ variable remains statistically significant, declining slightly to -0.427.

In the next several specifications I explore whether these results are robust to the inclusion of other county-level control variables. If the share of hospitals organized as for-profit firms is simply correlated with some other factor that is actually driving the reallocation of Medicaid-insured pregnant women from public to private hospitals, then the preceding results will be misleading. I therefore test whether controlling for several potentially confounding factors eliminates the significant coefficient estimate on FOR-FRAC$_{90}$.

One important factor to consider is the change in the characteristics of Medicaid-insured pregnant women that was occurring during the first half of the 1990s. Specifically, Medicaid expansions led to an increase in the share of newborn deliveries that were Medicaid-insured, from 39% in 1990 to more than 47% by 1996.[12] If these expansions are occurring at different rates across counties, and if those made eligible were more likely to attend one type of hospital, then differences in the dependent variable could result without any reallocation of patients.[13] I therefore introduce

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[11]This excludes primarily rural counties. Of the 20 most populous California counties, only Solano (ranked number 20) is not included in this sample of 29 counties. The share of hospitals that are effectively excluded is less than 25%.

[12]Cutler and Gruber (1996) show that these expansions substantially crowded out private insurance coverage, implying that the sample of Medicaid beneficiaries changed substantially during the time period of interest.

[13]Currie and Gruber (1996) point out that the Medicaid expansions occurring in the late 1980s expanded eligibility to lower income individuals than did those during the 1990s. Because higher-income individuals were more likely to attend private facilities in 1990, one might expect a reduction in the share of Medicaid deliveries occurring at government-owned facilities during the time period of interest even with no reallocation.

a variable $\Delta\%MCAL_{90\text{-}96}$, to control for changes in the share of pregnant women in each county with Medicaid coverage. The coefficient estimate on this variable is significantly positive, suggesting that the marginal Medicaid-eligible is more likely to attend a private hospital than is the average one.[14] While controlling for the growth in Medicaid eligibility does reduce the coefficient estimate on FOR-$FRAC_{90}$, it remains statistically significant at -0.308.

The second factor that I consider is the quality of the public hospital(s) in a county. All else equal, as the quality of the government-owned facility declines, the ease with which both private for-profit and private not-for-profit can skim indigent patients will increase. If for-profit hospitals tend to be located in counties with lower-quality public hospitals, then the significant estimate described above may be due to this lower cost of responding to the DSH incentives and not to the presence of the profit-maximizing facilities. As the quality of a public hospital increases, the share of its patients with private insurance, who presumably have more choices than do Medicaid-insured or uninsured patients, should also increase. Because pregnant women and newborn children are the focus of this analysis, I use the fraction of public hospital deliveries that are privately insured as my proxy for public hospital quality.[15] This measure is no doubt imperfect, but should to some extent capture variation in the quality of public hospitals across counties. Inclusion of the variable PUB-PRIV-$FRAC_{90}$ does have the expected sign - higher quality public hospitals experience smaller reductions

[14]Additionally, as Medicaid becomes a larger share of the market, private hospitals will have an increased financial incentive to admit more of them.

[15]McClellan and Staiger (1999) use outcomes-based measures of quality when comparing private for-profit and private not-for-profit facilities. Given that my data does not contain as much information about the patients as does their data and because hospital-level measures of infant mortality will be even noisier than heart attack mortality rates (less than 0.7% of infants born in California in 1990 die within one year), the extra complication does not seem warranted.

in their number of Medicaid newborns - but this does not substantially affect the estimate on the $FOR\text{-}FRAC_{90}$ variable, which remains significantly negative.

Because of the non-linear nature of the incentives that were introduced by the DSH program, certain hospitals had a particularly strong incentive to admit more Medicaid patients. Those hospitals with low-income numbers above 25% enjoyed an immediate increase in their marginal revenue for Medicaid patients. If for-profit hospitals were located disproportionately in areas with relatively many private hospitals located above or slightly below this threshold when DSH was first introduced, then the coefficient estimate for $FOR\text{-}FRAC_{90}$ may actually be capturing this notch effect rather than a for-profit effect. To control for this potentially confounding factor, I introduce a variable $NOTCH\text{-}FRAC_{90}$, which equals the fraction of private hospitals within each county with low-income numbers of 15% or more when DSH was first introduced. The coefficient estimate has the expected sign but is insignificant - public hospitals located in counties with more notch hospitals do appear to have lost a larger share of their Medicaid-insured pregnant women. As was true in the previous two cases, the introduction of this variable does not significantly alter the coefficient estimate for the $FOR\text{-}FRAC_{90}$ variable.

Another important factor concerns the nature of the private insurance market within each county. Specifically, if managed care was more or less prevalent in counties with relatively many for-profit providers when DSH was first introduced, then private hospitals may have been actively seeking out new sources of revenue in response to reduced inpatient demand. Controlling for the share of hospital patients that were insured by managed care in 1990 does not, however, affect the coefficient estimate of interest, and the estimate for the $MANCARE_{90}$ variable is insignificant.

One final factor that could play an important role in a private hospital's decision to admit more indigent patients concerns the demographics of the Medicaid-insured pregnant women. Pregnant women on Medicaid are more than twice as likely as privately-insured pregnant women to be black or of Hispanic origin. If hospitals are more inclined to admit low-income individuals from certain demographic groups than from others, and if for-profit hospitals are located in geographic areas in which the demographics of the indigent are systematically different from other areas, then the estimate on the FOR-FRAC$_{90}$ coefficient may be capturing a discrimination effect.

I therefore control for the share of Medicaid-insured pregnant women within each county that are black or of Hispanic origin in the seventh specification. Interestingly, the estimates for both variables are significantly negative[16], suggesting that more reallocation of Medicaid-insured patients occurred in counties with relatively more minorities. This may suggest that, prior to DSH, private hospitals were less inclined to admit black or Hispanic Medicaid patients, but that the stronger financial incentives introduced by DSH led them to open their doors to these disadvantaged groups. As was true in all of the previous cases, the coefficient estimate on the FOR-FRAC$_{90}$ variable remains significant.

In the final specification, I include all of the control variables in one regression. Because there are only 29 observations and 7 explanatory variables, it is not surprising that every standard error increases substantially. The only variable to remain significant, though, is the share of hospitals in the county organized as for-profit firms, FOR-FRAC$_{90}$. In the next section I take the hospital as the unit of observation and examine whether the results presented here are partially due to differences in the behavior of private not-for-profit firms across different market environments.

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[16]These estimates are similar if I instead define the MC-BLACK and MC-HISPANIC variables to be the difference in the share of Medicaid and privately insured patients in each demographic group.

IV. The Relationship Between For-Profit Penetration and Not-for-Profit Behavior

In this section I explore whether the behavior of individual hospitals is influenced by the ownership type of nearby providers. Specifically, I test whether the share of hospitals organized as for-profit firms within ten miles of each facility has a significant relationship with each organization's response to the DSH financial incentives.[17] For each hospital, I define ΔMC-BIRTH$_{90-96}$ to be the change in the number of Medicaid births delivered at that facility from 1990 to 1996, and test whether the observed change is significantly related to the share of nearby hospitals organized as for-profit firms.[18]

For each hospital I define the variable FOR-FRAC$_{90}$, which equals the share of hospitals located within ten miles of the facility that are organized as private for-profit firms.[19] I then interact this variable with three separate ownership dummies - NOT-FOR-PROFIT, FOR-PROFIT, and PUBLIC - to investigate whether the share of hospitals that are for-profit is significantly related to changes in the patient mix at each of the three types of facilities by running specifications of the following type:

$$\Delta\, MC-BIRTH_{jt} = \alpha + \beta\; OWNER_j + \lambda\; OWNER_j * FOR-FRAC_j + \varepsilon_{jt}$$

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[17]The results presented below are robust to alternative market definitions, including the share within five miles of the hospital or the share within each hospitals' county.

[18]One potential problem with this approach is that the change in the number of Medicaid patients at any particular hospital is an outcome variable, which only partially reflects the organization's response. Hospital personnel may exert considerable effort in responding to the change in incentives, but enjoy no increase in the number of Medicaid patients because of competition from nearby facilities.

[19]I include the hospital in the market definition - thus the minimum number of hospitals in the relevant market will be one.

Summary statistics for each of these variables are displayed in Table 7.

The significantly positive estimate on the NFP * FOR-FRAC_{90} variable in the first specification suggests that not-for-profit hospitals with for-profit competitors enjoyed much greater increases in their Medicaid caseloads than did other not-for-profit providers. No corresponding relationship is found for private for-profit facilities, suggesting that their response to this change in financing was not systematically related to the ownership types of their nearby competitors. This is consistent with the hypothesis that the objective function of private for-profit hospitals is similar across market areas, and that income effects are likely to matter less for a pure profit-maximizer than for a not-for-profit facility.[20] Public hospitals located close to relatively many for-profit hospitals experienced significantly larger losses in their number of Medicaid patients, as the negative estimate on the PUBLIC * FOR-FRAC_{90} coefficient shows.

One problem with comparing the change in the number of Medicaid patients from 1990 to 1996 is that the sample of pregnant women who are Medicaid-eligible is changing substantially during this time period. In the second specification, I include a variable $\text{MC-BIRTH-PRED}_{90\text{-}96}$, which controls for the predicted effect of the eligibility expansions on the number of Medicaid-insured pregnant women attending each facility. For each hospital, I calculate the number of Medicaid newborns that the facility would have delivered, assuming that its share of Medicaid deliveries within each zipcode remained constant from 1990 through 1996.[21] Thus hospitals that

[20]If providers in for-profit intensive areas are, on average, more or less profitable than are other hospitals, then the optimal response of a for-profit hospital to a particular change in financial incentives should not be affected by this.

[21]This assumes that, within each zipcode, the Medicaid expansions will have the greatest impact on hospitals that are already serving relatively many Medicaid patients in that geographic area. This assumption will not always be met. For example, a public hospital may serve the

serve patients from zipcodes in which eligibility is expanding rapidly will have relatively large values for MC-BIRTH-PRED$_{90\text{-}96}$.[22] The coefficient estimate on this variable is significantly positive, as one would expect, but it does not affect the estimates on the three FOR-FRAC$_{90}$ variables of interest.

In the next specification, I control for the number of beds at each hospital. The significantly negative estimate for BEDS$_{90}$ suggests that larger hospitals experienced greater reductions in their number of Medicaid deliveries. Given that public hospitals in urban areas are, on average, substantially larger than either type of private hospital, this negative relationship is not surprising. Including this variable in the regression substantially increases the estimate for NFP * FOR-FRAC$_{90}$, while reducing the magnitude of the PUBLIC * FOR-FRAC90 coefficient. The FP * FOR-FRAC$_{90}$ coefficient remains statistically insignificant.

Because private for-profit hospitals are disproportionately located in urban areas, one potential concern with these estimates is that not-for-profit hospitals in urban areas are experiencing greater increases in their numbers of Medicaid patients than are not-for-profits in other areas for

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poorest half of individuals within a particular zipcode in 1990, while the private hospitals serves the other half. If only the former group is Medicaid eligible in 1990, while eligibility is extended to members of the latter group in the subsequent years, then the measure described above will predict a large increase in the number of Medicaid newborns for the public hospital, but no corresponding increase for the private one. Lacking more detailed information (e.g. income of the patient), it would be difficult to control for differences between the average and marginal Medicaid recipient within each zipcode.

[22]Zipcodes are, to some extent, changing over this time period. For example, some zipcodes that exist in 1996 did not in 1990, implying that the boundaries of zipcodes existing in 1990 are also changing. I neglect new zipcodes, which account for less than 6% of Medicaid births in 1996, in calculating MC-BIRTH-PRED$_{90\text{-}96}$. This may be an important consideration, however, for studies that make substantial use of *changes* in zipcode-level patient shares over long time periods. These changes may be driven more by changes in zipcode boundaries - especially in areas with high rates of population growth - than by reallocations of patients.

reasons that are unrelated to the presence of for-profit hospitals. To control for this potentially confounding factor, I introduce the variable NUM-HOSPITALS-CLOSE, which simply equals the number of hospitals within ten miles of each facility. The estimates for both NFP * FOR-FRAC_{90} and PUBLIC * FOR-FRAC_{90} remain statistically significant, while the estimate for NUM-HOSPITALS-CLOSE is insignificantly negative.[23]

The regression results in this section support the anecdotal evidence presented for Los Angeles and San Francisco above. Not-for-profit hospitals in places with for-profit competitors responded significantly more aggressively to an exogenous change in their financial incentives than did other not-for-profit facilities. The next section explores whether differences in the financial constraints of not-for-profit hospitals across market areas can partially explain this finding.

V. Why Are Not-for-Profit Hospitals in For-Profit Intensive Areas Different?

A. The Profitability and Net Worth of Not-For-Profit Hospitals

The Disproportionate Share Program substantially changed hospitals' financial incentives to treat individuals with Medicaid coverage. For hospitals that initially qualified, the marginal revenue associated with each additional Medicaid patient immediately increased. For those hospitals below the 25% qualifying threshold, the possibility of eventually qualifying for DSH introduced a kink in each organization's budget set. If two for-profit hospitals were similar in all respects save their net income, their optimal response to this exogenous change would be identical, because there

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[23]It is worth noting that, if NUM-HOSPITALS-CLOSE is interacted with three separate dummy variables, the estimate for both types of private hospitals are insignificantly positive, while the estimate for PUBLIC * NUM-HOSPITALS-CLOSE is significantly negative. This reflects the fact that public hospitals in urban areas experienced significantly larger reductions in their Medicaid caseloads than did their counterparts in less densely populated rural areas. The estimates for the three FOR-FRAC_{90} variables remain virtually unchanged if these three interactions are included.

are no income effects for profit-maximizing firms. However, if not-for-profit hospitals do have a more complex objective function than for-profit facilities, differences in financial constraints could lead to differences in the optimal response to this change in incentives.

Given that the profitability of not-for-profit hospitals could affect their optimal response, I therefore investigate whether facilities in areas with relatively more for-profit hospitals are less (or more) profitable than their counterparts in other places.[24] To do this, I examine whether hospital net income, net worth, and changes in net worth are significantly related to the share of nearby hospitals organized as profit maximizing firms. If there is a significant relationship, then part of the observed difference in the response of not-for-profit hospitals to the change in financial incentives could be the result of differences in income across facilities.

The results presented in Table 9, however, suggest that the share of neighboring hospitals that are profit-maximizers is not significantly related to the financial health of private not-for-profit providers. In the first column, I summarize a regression of each hospital's net income on the three FOR-FRAC_{90} variables defined above, dummy variables for each hospital's type of ownership, and the variable BEDS_{90} to control for the number of available beds at each facility. The results in this first specification show that, while government-owned facilities that are close to for-profit facilities are significantly less profitable than are other public hospitals, the same is not true for private not-for-profit hospitals.

The second specification controls for the number of hospitals that are within ten miles of each facility and for the log of the average income of individuals living within five miles of the hospital

[24]If for-profit hospitals price more aggressively than not-for-profit hospitals, and if there are regulatory or other barriers to entry in certain areas (e.g. San Francisco) but not in others (Los Angeles), then there could be persistent differences in profitability across market areas.

($LOG\text{-}PER\text{-}CAP_{90}$). Facilities located in relatively wealthier areas are significantly more profitable than are other hospitals, while those with many nearby competitors appear to be less profitable than are providers in less densely-populated areas. This latter result is consistent with the view that hospitals having few nearby competitors will have relatively more market power than other facilities. While the coefficient estimate of NFP * $FOR\text{-}FRAC_{90}$ increases substantially, it remains statistically insignificant.

The results from two analagous specifications that explain each hospital's net worth, TOTAL $EQUITY_{90}$, are summarized in columns three and four. The share of nearby hospitals that are for-profit is not significantly related to the net worth of any of the three types of facilities. The number of nearby competitors remains significantly negatively related to this measure of financial health, while hospitals in relatively wealthier areas do have higher net worth. The results summarized in the final two columns examine whether the net worth of hospitals located in for-profit intensive areas was changing differentially in the years before DSH was introduced. The coefficient estimates for the three $FOR\text{-}FRAC_{90}$ variables of interest show that this was not the case.[25]

The results presented in Table 9 suggest that not-for-profit facilities with for-profit competitors are no more or less financially constrained than are other not-for-profit hospitals. The next set of results examines whether the markets served by these same facilities are relatively more contested. If not-for-profits in for-profit intensive areas treat patients from more contested market areas, then they may respond relatively aggressively to a changes in their market environment because of the threat of potential competition for their own patients. In the example outlined above,

[25]Separate regressions that are not displayed here show that the rate at which hospitals were closing prior to DSH is also not significantly related to the share of hospitals that are private for-profit.

a not-for-profit hospital that did not respond to the DSH financial incentives might lose many of its own patients absent a response.

To calculate the competitiveness of each hospital's market area, I first calculate herfindahl indices for each zipcode by simply summing the square of each hospital's share of births within that zipcode. For each hospital I then calculate the weighted average of the herfindahl indices of zipcodes within five miles of the facility. Hospitals with relatively low values for HOSP-HERF$_{90}$ will presumably face greater competitive threats than will other providers for their patients.[26] This is likely to be a better measure of the extent of competition faced by a hospital than simply the number of nearby hospitals, as a low value for HOSP-HERF$_{90}$ indicates that many nearby facilities are already attracting many of the patients from a facility's immediate geographic area.

The first column of results in Table 10 demonstrates that not-for-profit and government-owned hospitals were located in significantly less competitive market areas than were their for-profit competitors in 1990. This difference disappears, however, once I control for the number of nearby facilities, as is shown in the second specification, suggesting that most of the observed difference is driven by the fact that for-profit hospitals are more likely to be located in densely populated urban areas.

The results presented in the third column, however, reveal that not-for-profit hospitals located in areas with relatively many for-profit competitors also face a greater competitive threat than do other not-for-profit providers. The significantly negative coefficient estimate on the NFP * FOR-FRAC$_{90}$ coefficient reveals that not-for-profit hospitals in counties like Los Angeles may behave

[26]Variation in the area and population of zipcodes implies that two hospitals serving an identical set of patients can have different values for this measure. On average, however, these herfindahl indices should capture differences in the contestability of market areas.

more like profit-maximizers because their market areas are more contested. However, introducing the variable HOSP-HERF$_{90}$ into the specifications summarized in Table 8 does not eliminate the significantly positive estimate on NFP * FOR-FRAC$_{90}$ there.

This raises an identification problem similar to the one posed above - namely, whether the presence of for-profit hospitals leads the market areas to be more contested or whether there is some other factor leading both to more competitive markets and above average for-profit hospital penetration. It seems clear, however, that part of the difference between not-for-profit hospitals in for-profit intensive areas and other not-for-profit providers stems from the greater competitive threats faced by these facilities rather than differences in financial constraints. This is one plausible mechanism through which the behavior of not-for-profit hospitals could systematically vary with the presence of competing for-profit facilities.

B. The Governing Boards of Not-For-Profit Hospitals

The results presented in the previous section investigated whether differences in constraints are the likely cause of the observed variation in not-for-profit behavior across market areas. In this section, I examine whether one observable measure of the not-for-profit objective function does vary systematically with the share of nearby hospitals organized as profit-maximizers. To do this, I exploit a data set that provides the profession of each individual serving on hospital governing boards. Occupations of board members are no doubt an imperfect measure of the not-for-profit objective function, as an individual's profession is not a perfect description of his or her preferences. Furthermore, how these individual preferences are aggregated into an organizational objective function is far from clear. Finally, the influence that any particular hospital board has over an organization's behavior will vary in unobservable ways across firms.

Nevertheless, an analysis of the data is instructive. The most common occupation among hospital board members is physician, with approximately three out of every ten board members listing this as their profession. This share varies substantially across hospital ownership types. Perhaps surprisingly, board members in for-profit hospitals are much more likely (49%) than either not-for-profit (24%) or public hospital (12%) board members to be a physician.[27] Individuals on the board of not-for-profit and government-owned facilities are much more likely to be retired or from the nearby community.[28]

One of the reasons that for-profit hospitals may choose to have relatively many physicians on their boards is that increasing the share of individuals with similar preferences may increase the ease with which the organization can make decisions and respond to changes in the market environment. Hansmann (1980) stresses that the costs of collective decision making increase as the diversity of opinions in any governing board rises. An organization may choose to have a more diverse group of individuals on its governing board if its objective function is more complex than simple profit maximization.

The results presented in Table 11B reveal that the share of not-for-profit hospital board members that are physicians is an increasing function of the share of nearby facilities organized as profit-maximizers. Similarly, the share that report being retired or from the community falls with the for-profit presence - though this latter result is statistically insignificant. This finding suggests

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[27]One might not have expected for-profit hospitals to have more physician board members given the vocal opposition of the AMA to the for-profit hospital industry.

[28]This latter group includes non-business people who are, based on their stated occupation, not employees of the hospital. The most common occupations listed for this group are community member, consumer, housewife, and homemaker.

that the boards of not-for-profit hospitals, and thus potentially their objective functions, look more similar to for-profit hospital boards as the for-profit presence increases. Thus the preferences of not-for-profit hospitals in for-profit intensive areas may look more like pure profit maximization than do the preferences of their not-for-profit counterparts in other areas.

VI. Conclusion

Taken together, the results presented in this paper suggest that the behavior of not-for-profit hospitals does vary systematically with the share of competing hospitals that are profit-maximizers. Not-for-profits in for-profit intensive areas are much more responsive to financial incentives than are other not-for-profit hospitals. In the case of California's DSH program, this greater responsiveness partially explains the substantial variation across market areas in the impact of a significant change in hospital financing that was intended to improve medical care for the poor.

While not necessarily driven by financial constraints, it appears that part of this greater responsiveness is due to the above-average competitiveness in market areas served by for-profit hospitals. To survive in these contested market environments, private not-for-profit hospitals may need to behave much like profit maximizers. The fact that not-for-profit governing boards in for-profit intensive areas look similar to the boards found in profit-maximizing hospitals supports this finding.

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Figure I

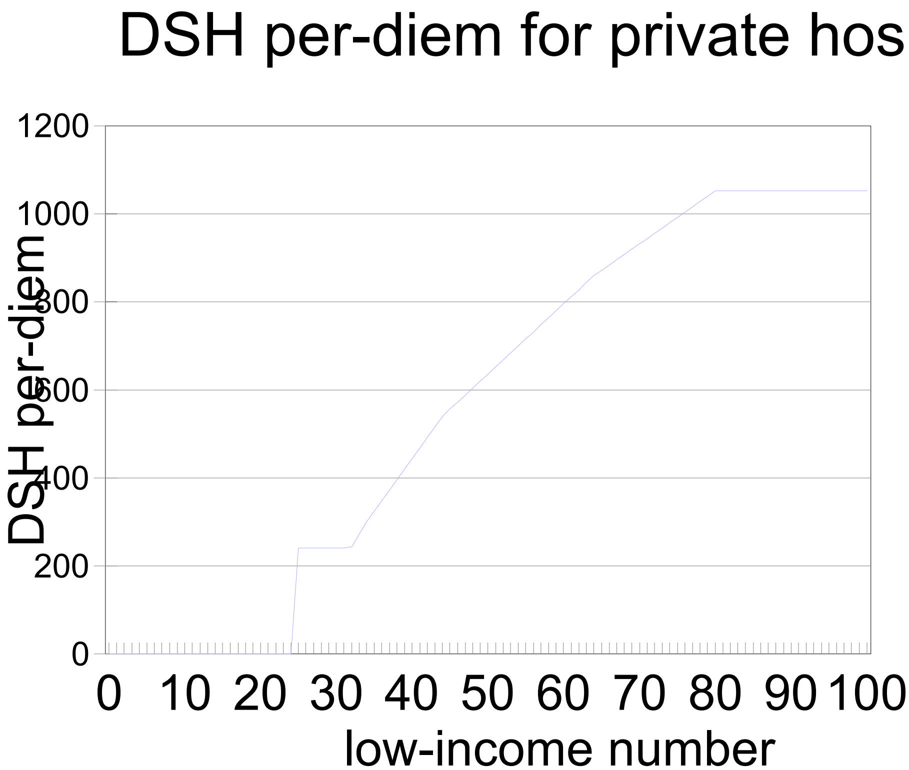
DSH per-diem for private hosp
1200
1000
800
600
400
200
0
DSH per-diem
0 10 20 30 40 50 60 70 80 90 100
low-income number

Table 1: % Medicaid and Uninsured by % Poor Quintiles

Quintile	% Poor	% Medicaid	% Uninsured
1	3.8%	6.6%	6.4%
2	6.6%	11.6%	7.2%
3	10.2%	18.1%	7.7%
4	15.3%	26.6%	8.2%
5	27.2%	40.5%	9.4%
Total	12.6%	22.3%	7.9%

Each quintile contains approximately 300 California zipcodes. The first quintile contains the 300 zipcodes with the smallest fraction of individuals in poverty in 1989, while the final quintile contains those with the largest share of residents living in poverty. The data on insurance status is obtained from hospital discharge data and is therefore cannot be considered an accurate estimate of the true share of the population in each group. Uninsured consists of both self-pay and those covered by California's Medically Indigent Services Program.

Table 2: Patient Mix at California Hospitals, 1990

	% Medicaid	% Uninsured	# Hospitals	# Discharges
Private NFP	15.5%	6.1%	223	2244K
Private FP	17.7%	7.7%	120	541K
Public	43.9%	14.5%	91	746K
Total	21.8%	8.1%	434	3531K

Includes all general acute care hospitals in operation in 1990. Discharge data is obtained from California's Office of Statewide Health Planning and Development.

Table 3: The Relationship Between Hospital Ownership and Care to the Poor in 1990

	% Medicaid			% Uninsured		
	(1)	(2)	(3)	(4)	(5)	(6)
MC-zip-predict		.631***	.539***			
		(.070)	(.059)			
UN-zip-predict					.995***	.964***
					(.096)	(.095)
MC-diag-predict			1.570***			
			(.116)			
UN-diag-predict						1.258***
						(.347)
Public	.146***	.131***	.130***	.055***	.060***	.057***
	(.021)	(.019)	(.016)	(.007)	(.007)	(.007)
Private For-Profit	-.014	-.012	.008	.009	.003	.004
	(.019)	(.017)	(.015)	(.007)	(.006)	(.006)
# Observations	434	434	434	434	434	434
R^2	.120	.262	.487	.103	.285	.307

Includes all general acute care hospitals that were operating in California in 1990. The dependent variables are the fractions of each hospital's patients that are Medicaid-insured and uninsured, respectively. MC-zip-predict and UN-zip-predict are the fractions of hospital patients within five miles of each hospital that are Medicaid-insured and uninsured, respectively. These distances are estimated using the latitudinal and longitudinal position of each zipcode. MC-diag-predict and UN-diag-predict are the share of each hospital's patients that would be Medicaid insured and uninsured, respectively, if the hospital picked a representative sample of patients within each diagnosis. Standard errors are included in parentheses.

Table 4: Share of Indigent Patients Admitted to Each Type of Hospital

	Medicaid Births		Other Medicaid		Uninsured	
	1990	1996	1990	1996	1990	1996
Private Not-for-Profit	44%	59%	47%	51%	48%	39%
Private For-Profit	11%	17%	11%	14%	14%	10%
Government	45%	24%	42%	35%	38%	51%

Percentages refer to the share of each type of patient treated at one of the three types of facilities. Columns may not add to 100% due to rounding. The sample of hospitals includes all California general acute care hospitals operating in both 1990 and 1995.

Table 5: Reallocation from Los Angeles and San Francisco Safety Net Facilities

	LAC Public Hospitals		SF General Hospital	
Category of Patient	1990	1996	1990	1996
% Medicaid	44%	20%	38%	37%
% Medicaid Births	45%	12%	42%	38%
% Births	21%	7%	14%	13%

Percentages equal the share of patients delivered at hospitals owned by Los Angeles County or San Francisco County in 1990 and 1996.

Table 6: For-Profit Hospital Penetration and the Reallocation of Medicaid Patients from Public to Private Providers

	Δ %MC-BIRTH-PUBLIC$_{90\text{-}96}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
%FOR-PROFIT$_{90}$	-.468*** (.074)	-.427*** (.106)	-.308*** (.108)	-.322*** (.126)	-.411*** (.107)	-.318*** (.116)	-.423*** (.108)	-.249* (.139)
Δ %MCAL$_{90\text{-}96}$			-2.36** (0.96)					-1.89 (1.31)
PUB-PRIV-FRAC$_{90}$				.202 (.129)				.061 (.144)
%MAN-CARE$_{90}$					-.237 (.255)			.005 (.294)
%MC-HISPANIC$_{90}$						-.296*** (.095)		-.178 (.147)
%MC-BLACK$_{90}$						-.643*** (.276)		-.543 (.354)
NOTCH-FRAC$_{90}$							-.112 (.312)	.063 (.317)
CONSTANT	-.045* (.025)	-.064 (.037)	-.009 (.041)	-.136 (.058)	-.020 (.061)	.139 (.069)	-.058 (.041)	.089 (.104)
# OBSERVATIONS	50	29	29	29	29	29	29	29
R-SQUARED	.456	.377	.494	.418	.397	.584	.380	.630

Dependent variable is the change in the share of Medicaid-insured newborns delivered at public hospitals within each county. % FOR-PROFIT equals the share of general acute care hospitals organized as for-profit firms. The rest of the variables are defined in the text. First column includes all counties with at least one facility that Medicaid-insured newborns, while specifications two through eight include only those counties with at least one public and at least one private facility. Regressions are weighted by the number of general acute care hospitals in the county. Standard errors are included in parentheses.

Table 7: Summary Statistics

VARIABLE NAME	N	Mean	Std. Dev
Δ $MC\text{-}BIRTH_{90\text{-}96}$	401	43	968
NOT-FOR-PROFIT	401	.53	.50
PUBLIC	401	.21	.40
FOR-PROFIT	401	.26	.44
NFP * $FOR\text{-}FRAC_{90}$	401	.10	.19
FP * $FOR\text{-}FRAC_{90}$	401	.14	.26
PUBLIC * $FOR\text{-}FRAC_{90}$	401	.02	.08
$MC\text{-}BIRTH\text{-}PRED_{90\text{-}96}$	401	27	234
$BEDS_{90}$	401	190	152
NUM-HOSPITALS-CLOSE	401	10.6	11.0
NET $INCOME_{90}$	376	1794	5613
TOTAL $EQUITY_{90}$	376	25157	38231
Δ $EQUITY_{88\text{-}90}$	368	3586	10995

Table 8: Changes in Medicaid Births and the Share of Nearby Hospitals that are For-Profit

	Δ MC-BIRTH$_{90\text{-}96}$			
	(1)	(2)	(3)	(4)
NFP * FOR-FRAC$_{90}$	646**	618**	1042***	1212***
	(259)	(257)	(256)	(289)
FP * FOR-FRAC$_{90}$	-295	-319	-419	-487
	(406)	(403)	(386)	(389)
PUBLIC * FOR-FRAC$_{90}$	-4773***	-4938***	-4211***	-4134***
	(552)	(551)	(541)	(544)
NOT-FOR-PROFIT	-210	-212	-184	-302
	(248)	(246)	(236)	(253)
PUBLIC	-413	-417	-471*	-595**
	(257)	(255)	(244)	(263)
MC-BIRTH-PRED$_{90\text{-}96}$		.50***	.38**	.36**
		(.18)	(.17)	(.17)
BEDS$_{90}$			-1.79***	-1.68***
			(.29)	(.31)
NUM-HOSPITALS-CLOSE				-6.26
				(4.94)
CONSTANT	297	294	594	719
	(236)	(234)	(230)	(250)
# OBSERVATIONS	401	401	401	401
R-SQUARED	.239	.254	.318	.321

Sample includes all general acute care hospitals in operation in California in 1990 and 1995 that have financial information. Dependent variable is the change in the number of Medicaid-insured newborns delivered at each hospital. The variable FOR-FRAC$_{90}$ equals the share of hospitals within ten miles of each facility that are for-profit. Standard errors are included in parentheses.

Table 9: Fiscal Stress and the Share of Nearby Hospitals that are For-Profit

	NET INCOME$_{90}$		TOTAL EQUITY$_{90}$		Δ EQUITY$_{88\text{-}90}$	
	(1)	(2)	(3)	(4)	(5)	(6)
NFP * FOR-FRAC$_{90}$	-412	2865	5426	13933	1352	1986
	(1714)	(1904)	(9301)	(10375)	(3393)	(3819)
FP * FOR-FRAC$_{90}$	-2323	-3494	4009	2080	3426	3459
	(2476)	(2457)	(13434)	(13385)	(4905)	(4927)
PUBLIC * FOR-FRAC$_{90}$	-6631*	-5074	-11749	-5979	-5512	-4292
	(3444)	(3404)	(18692)	(18542)	(7114)	(7118)
NOT-FOR-PROFIT	-263	-2312	14164*	10330	5634	5756
	(1521)	(1625)	(8255)	(8852)	(3026)	(3272)
PUBLIC	358	-1604	10981	8797	6510	7309
	(1568)	(1700)	(8510)	(9261)	(3120)	(3424)
BEDS$_{90}$	14.11***	15.46***	157***	155***	22.76***	20.51***
	(1.91)	(2.02)	(10.4)	(11.0)	(3.81)	(4.08)
LOG-PER-CAP$_{90}$		1559*		16502***		5910***
		(912)		(4971)		(1840)
NUM-HOSPS-CLOSE		-118***		-300*		-21.35
		(33)		(177)		(64.79)
CONSTANT	-295	-12987	-14712	-168187	-5544	-62052
	(1474)	(9103)	(8000)	(49591)	(2931)	(18305)
# OBSERVATIONS	376	376	376	376	376	376
R-SQUARED	.163	.206	.469	.491	.153	.179

Sample includes all general acute care hospitals in operation in California in 1990 and 1995 that have financial information (this excludes those owned by the Kaiser Corporation, all of which are exempt from reporting their financial information). Dependent variables are hospital net income in 1990 (1 and 2), hospital net worth in 1990 (3 and 4), and changes in hospital net worth from 1988 to 1990 (5 and 6). All values are expressed in thousands of dollars. Standard errors are included in parentheses.

Table 10: Contestability of Market Areas and the Presence of For-Profit Hospitals

	HOSP-HERF$_{90}$		
	(1)	(2)	(3)
NOT-FOR-PROFIT	.164***	-.001	.121**
	(.029)	(.020)	(.050)
PUBLIC	.063**	.029	.141***
	(.024)	(.026)	(.053)
NUM-HOSPITALS-CLOSE		-.0110***	-.0097***
		(.0008)	(.0010)
NFP * FOR-FRAC$_{90}$			-.124**
			(.058)
FP * FOR-FRAC$_{90}$			.167**
			(.078)
PUBLIC * FOR-FRAC$_{90}$			-.070
			(.111)
CONSTANT	.236	.417	.305
	(.019)	(.021)	(.050)
# OBSERVATIONS	401	401	401
R-SQUARED	.074	.376	.389

Sample includes all general acute care hospitals in operation in California in 1990 and 1995. Dependent variable is a weighted average of the zipcode-level herfindahl indices for each zipcode within five miles of the hospital. Standard errors are included in parentheses.

Table 11A: The Occupations of Hospital Governing Board Members

BOARD MEMBER OCCUPATION	FOR-PROFIT	NOT-FOR-PROFIT	PUBLIC
% PHYSICIAN	49.0%	23.7%	12.7%
% RETIRED / COMMUNITY	6.6%	13.7%	23.2%
% PROFESSIONAL	11.1%	19.1%	20.6%

Data are taken from page 3.3 of California's 1990 OSHPD hospital financial reports. Professional category includes accountants, lawyers, consultants, and other outside executives.

Table 11B: The Composition of Not-for-Profit Hospital Boards

	% PHYSICIANS	% RET / COMM	% PROFESSIONAL
NFP * FOR-FRAC$_{90}$	.083**	-.061	-.028
	(.042)	(.044)	(.052)
CONSTANT	.212	.154	.198
	(.012)	(.013)	(.015)
# OBSERVATIONS	199	199	199
R-SQUARED	.019	.010	.002

Sample includes all not-for-profit hospitals operating in 1990 that had occupation information for their board members. Dependent variables are simply the share of the governing board of each of the non-exhaustive categories. Standard errors are included in parentheses.