Hospital Market Structure and the Behavior of Not-For-Profit Hospitals

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Abstract

I exploit a change in hospital financial incentives to examine whether the behavior of private not-for-profit hospitals is systematically related to the share of nearby hospitals organized as for-profit firms. My findings demonstrate that not-for-profit hospitals in for-profit intensive areas are significantly more responsive to the change than their counterparts in areas served by few for-profit providers. Differences in financial constraints and other observable factors correlated with for-profit hospital penetration do not explain the heterogeneous response. The findings suggest that not-for-profit hospitals mimic the behavior of private for-profit providers when they actively compete with them.

I. Introduction

Hospitals are the largest segment of the not-for-profit sector, accounting for nearly 40% of all not-for-profit revenues in 1995. Unlike not-for-profit educational institutions 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 affect the behavior of private not-for-profit providers (Cutler-Horwitz, 1999; Silverman-Skinner, 2001). 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 difference 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 for-profit hospitals.

In this paper, I deal with this identification problem by exploiting a significant and plausibly exogenous change in hospital financial incentives.[2] Specifically, I use the change in incentives created by California's Disproportionate Share program (DSH) to examine whether institutional responses and market outcomes vary systematically with the share of hospitals that are for-profit. DSH increased the reimbursement rate for patients 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, 2000a).

The results presented in the first empirical section demonstrate that the share of Medicaid-insured

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[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.

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 served by relatively many for-profit hospitals experienced much greater reductions in their numbers of Medicaid-insured patients than did other government-owned facilities. For example, the general acute care hospitals 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 county-owned hospital in San Francisco, a county with no for-profit hospitals, was much less affected. Its share of county Medicaid deliveries fell by only 4% during the same time period.

To test whether the observed difference across market areas is caused by the presence of for-profit firms or some other factor that is correlated with for-profit hospital penetration, I next control for other potentially important market characteristics. If, for example, the quality of the government-owned hospital in a county is significantly related to the share of hospitals there organized as for-profit firms, then the difference described above may actually be driven by the lower costs associated with skimming public hospital patients rather than by the presence of for-profit firms. Controlling for this and several other potentially confounding factors does not change the robust relationship between for-profit hospital penetration and the reallocation of Medicaid patients.

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 Medicaid patients than do other not-for-profit providers.[3] There is no corresponding relationship between the ownership type of competing hospitals and the behavior of profit-maximizing

[3]This is consistent with 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.

hospitals. Public hospitals located in for-profit intensive areas lose a substantial share of their newly profitable patients both because of the response of for-profit hospitals to the change in incentives and because of the more aggressive response by private not-for-profit hospitals in these markets.

In the final empirical section I explore whether the heterogeneity in not-for-profit hospital behavior can be explained by differences in their financial constraints. If for-profit providers compete more aggressively on price than do other hospitals, then their not-for-profit competitors may be more financially constrained than the average not-for-profit. Even if the objective function of not-for-profit hospitals does not vary across market areas, this difference in the hospital budget constraint could lead to variation in the optimal response to a change in the market environment. My empirical evidence indicates that not-for-profit hospitals in for-profit intensive areas are not more financially constrained than are other not-for-profit facilities, suggesting that the presence of one or more for-profit hospitals in a market changes the objective function of not-for-profit providers and leads them to behave more like profit maximizing firms.

The outline of the paper is as follows. Section two provides background on the California hospital market and the Disproportionate Share program , and describes the reallocation of patients that resulted from the change in hospital financial incentives. The empirical results presented in section three demonstrate that the market-level effect of the change in financial incentives varied systematically with the share of hospitals organized as private for-profit firms. Section four investigates whether heterogeneous responses by not-for-profit hospitals partially explain the variation in market-level outcomes and then examines whether differences in financial constraints can account for the relationship between for-profit hospital penetration and not-for-profit behavior. Section five concludes.

II. Data and Background

California's hospital market is served by private for-profit, private not-for-profit, and government-

owned hospitals.[4] Virtually all of the state's large urban areas have at least one publicly-owned safety net provider. The patients treated at these facilities are disproportionately poor and tend to be without health insurance or insured by the Medicaid program (Epstein and Weissman, 1994). For example, more than 90% of the patients treated at the four county-owned general acute care 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 similar, with not-for-profits actually treating fewer indigent patients, as a share of their total patient mix, than their for-profit counterparts (16% and 18%, respectively, in 1990).

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. Additionally, these facilities tend to offer services that are used differentially by the poor. But even after controlling for these differences, public hospitals in California treat significantly more low-income patients than do private hospitals. Cross-sectional estimates of the corresponding difference between the two types of private hospitals suggest that private not-for-profit facilities do not provide more medical care to the poor than for-profit hospitals do (Duggan, 2000b).

Recent work has exploited the change in incentives caused by the introduction of California's Disproportionate Share (DSH) program to explore whether a hospital's type of ownership affects its response to a change in the incentive to treat low-income patients (Duggan, 2000a). The DSH 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 resulted are shown in Figure

[4]The data used in this study are obtained from two sources, both of which are compiled by the California Office of Statewide Health Planning and Development (OSHPD). The hospital-level data set is obtained from OSHPD's Hospital Disclosure reports, while the source of patient level data is the OSHPD Patient Discharge Data set. These data are described extensively in Duggan (2000a).

1, which plots a hospital's Medicaid DSH per-diem as a function of that facility's low-income number.[5] 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% threshold.

Duggan (2000a) 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. From 1990 to 1996, the share of Medicaid-insured newborns delivered at hospitals owned by the government fell from 43% to 23%, after remaining roughly constant prior to 1990. In the empirical sections that follow I focus primarily on low-income pregnant women, the group for whom competition intensified the most after the new financial incentives were introduced.[6]

III. The Effect of For-Profit Hospital Penetration on Market-Level Changes

In this section, I use county-level data to investigate whether the fraction of Medicaid patients reallocated from public to private hospitals after the change in financial incentives is systematically related to the share of hospitals in a market that are private for-profit. This would be the case if profit-maximizing hospitals did, on average, respond more aggressively than private not-for-profit facilities to the change in incentives or if private not-for-profit hospitals behaved more like for-profit hospitals when actively competing with them. Recent work has provided empirical evidence consistent with this latter hypothesis, suggesting that for-profit hospitals exert a peer effect on their not-for-profit competitors (Cutler and Horwitz, 1999; Silverman and Skinner, 2001).

For-profit hospital penetration varies substantially across market areas in California. Extreme

[5]The low-income number measures the share of a hospital's costs that are attributable to Medicaid and uninsured patients (Duggan, 2000a).

[6]See Duggan (2000) for an explanation of why pregnant women were the most profitable of all Medicaid patients following the change in financial incentives.

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 1 reveals that, while the share of Medicaid births delivered at public hospitals in Los Angeles fell substantially 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 county-level regressions summarized in Table 2 investigate whether this pattern holds for the typical county in California. Summary statistics for the explanatory variables are included in the first column. The dependent variable in this set of regressions is equal to the change from 1990 to 1996 in the share of Medicaid-insured births that are delivered at public hospitals. The explanatory variable of interest, $\%FOR\text{-}PROFIT_{90}$, represents the fraction of general acute care hospitals in the county that are private for-profit firms.

The coefficient estimate for $\%FOR\text{-}PROFIT_{90}$ in the first specification demonstrates that the share of Medicaid births delivered at public hospitals fell by significantly more in counties with substantial for-profit hospital penetration. A ten percentage point increase in the share of hospitals that are for-profit is associated with a 4.7 percentage point increase in the share of Medicaid-insured pregnant women switching from public to private facilities. This regression result is consistent with the San Francisco - Los Angeles comparison described above, and is robust to the exclusion of these two counties.[7] The next specification includes only those counties that have at least one public hospital and at least one private provider, reducing

[7]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 $\%FOR\text{-}PROFIT_{90}$.

the number of counties in the sample to 29.[8] The coefficient estimate for $\%FOR\text{-}PROFIT_{90}$ falls slightly but remains statistically significant at -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 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. 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.[9] If these expansions occurred 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.[10] I therefore introduce the variable $\Delta\%MEDICAID_{90\text{-}96}$ to control for changes in the share of pregnant women in each county with Medicaid coverage. The coefficient estimate on this variable is significantly negative, suggesting that the marginal Medicaid-eligible is more likely to attend a private hospital than is the average one.[11] While controlling for the growth in Medicaid eligibility does reduce the magnitude of the coefficient estimate on $\%FOR\text{-}PROFIT_{90}$, 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,

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[8]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 located in the excluded counties is less than 25%.

[9]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.

[10]Individuals made eligible for Medicaid in the early 1990s had higher incomes than the average recipient (Currie and Gruber, 1996). Thus one would potentially observe a decline in the share of Medicaid deliveries occurring at public hospitals even with no reallocation.

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

as the quality of the government-owned facility declines, the ease with which both private for-profit and private not-for-profit hospitals can skim newly profitable 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.[12] This measure is no doubt imperfect, but should to some extent capture variation in the quality of public hospitals across counties. The coefficient estimate for the $PRIV\text{-}AT\text{-}PUBLIC_{90}$ variable has the expected sign - higher quality public hospitals experience smaller reductions in their number of Medicaid newborns - but this does not substantially affect the estimate on the $\%FOR\text{-}PROFIT_{90}$ 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 this threshold when DSH was first introduced, then the coefficient estimate for $\%FOR\text{-}PROFIT_{90}$ may actually be capturing this average incentive effect rather than a for-profit effect. To control for this potentially confounding factor, I introduce a variable $\%\ NOTCH_{90}$, which equals the fraction of private hospitals within each county with low-income numbers of 25% or more when DSH was first introduced. The coefficient estimate has the expected sign - public hospitals located in counties with more notch hospitals do appear to have lost a larger share of their Medicaid-insured pregnant women - but is statistically

[12]McClellan and Staiger (1999) use measures of quality based on health outcomes. Because I do not have detailed clinical information about individual patients, it is not possible in this case to reliably separate quality differences from the effect of differences across facilities in average patient health. I therefore use this alternative measure.

insignificant. As was true in the previous two cases, the introduction of this variable does not significantly alter the coefficient estimate for the $\%FOR\text{-}PROFIT_{90}$ 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 newborn deliveries that were insured by managed care in 1990 does not, however, affect the coefficient estimate of interest, and the estimate for this $\%\ MANAGED\ CARE_{90}$ variable is not statistically significant.[13]

The characteristics of Medicaid-insured pregnant women may also affect a private hospital's decision to respond to the change in financial incentives. 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 $\%\ FOR\text{-}PROFIT_{90}$ coefficient may be capturing this other 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[14], 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 minority groups. As was true in all of the previous cases, the coefficient

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[13]Controlling for the change in the share of births insured by managed care has a similarly small effect on the coefficient estimate for $\%FOR\text{-}PROFIT_{90}$.

[14]These estimates are similar if I instead define the $\%\ BLACK_{90}$ and $\%\ HISPANIC_{90}$ variables to be the difference in the share of Medicaid and privately insured patients in each demographic group. Additionally, controlling for the change in the share of Medicaid-insured newborns who are black or of Hispanic origin does not affect the $\%FOR\text{-}PROFIT_{90}$ coefficient estimate.

estimate on the *%FOR-PROFIT*$_{90}$ 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-PROFIT*$_{90}$. The next section investigates whether the variation in market-level outcomes shown here is to some extent driven by differences in the behavior of private not-for-profit firms across different market environments.

IV. The Effect of For-Profit Hospital Penetration on Responses to a Change in Incentives

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 is significantly related to the average response by each type of hospital to the DSH financial incentives.[15] For each hospital, I define the variable *ΔMC-BIRTH*$_{90\text{-}96}$ to be the change in the number of Medicaid births delivered at the 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, *FOR-FRAC*$_{90}$.[16] I interact this variable with three separate ownership dummies - *NOT-FOR-PROFIT*, *FOR-PROFIT*, and *PUBLIC* - to separately identify the effect of for-profit hospital penetration by ownership type. The basic estimating equation is:

$$\Delta\text{MC-BIRTH}_{jt} = \alpha + \beta * \text{OWN}_{jt} + \lambda * (\text{OWN}_{jt} * \text{FOR-FRAC}_{jt}) + \mu * \Delta\text{MC-BIRTH}_{j,t-1} + \gamma X_{jt} + \varepsilon_{jt}$$

with *OWN*$_{jt}$ representing the three dummy variables for the hospital's type of ownership. The specifications

[15]I exclude own hospital in the market definition and define all hospitals within ten miles in the market area. The main 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.

[16]The dependent variable is defined in levels rather than logs because nearly 30% of the hospitals did not deliver any Medicaid-insured newborns in either 1990 or 1996 and because one-third of these 117 facilities had a non-zero amount in one of the two years.

also include a control for the pre-existing trend in hospital-specific admission rates for Medicaid-insured newborn deliveries $\Delta MC\text{-}BIRTH_{88\text{-}90}$ and for the number of beds available at each facility in 1990. Summary statistics for these variables and for each of the additional explanatory variables defined below are provided in Table 3.

The first set of regression results are summarized in Table 4. The significantly positive estimate of 672 on the $NFP * FOR\text{-}FRAC_{90}$ variable in the first specification reveals that not-for-profit hospitals with relatively many for-profit competitors enjoyed substantially greater increases in their Medicaid caseloads from 1990 to 1996 than did other not-for-profit providers.[17] This estimate implies that a one standard deviation increase in the share of hospitals that are organized as for-profit hospitals is associated with a 0.33 standard deviation increase in the change in Medicaid deliveries from 1990 to 1996 at private not-for-profit hospitals.[18]

Inferring a causal effect of for-profit hospitals on the behavior of not-for-profit hospitals from this coefficient estimate would be problematic if the extent of for-profit hospital penetration were systematically correlated with some other factor that affected the incentive to admit more Medicaid patients. One way to test for the importance of such an omitted variable is to investigate whether the behavior of for-profit hospitals also varies systematically with the $FOR\text{-}FRAC_{90}$ measure. If it did, then one might reasonably conclude that for-profit hospital penetration is proxying for some other factor that affects the incentive of both types of private hospitals to admit more indigent patients following the introduction of DSH.[19] The small

[17]Standard errors in Table 8 are corrected to account for the fact that the $FOR\text{-}FRAC_{90}$ variable varies at the zipcode level and thus the residual in the estimating equation is not independent across hospitals within a zipcode cell. See Moulton (1990) for a discussion of this correction.

[18]Among not-for-profit hospitals, the average increase in Medicaid deliveries from 1990 to 1996 was 210 with a standard deviation of 555. The corresponding mean and standard deviation for the $FOR\text{-}FRAC_{90}$ measure are 0.222 and 0.270. The summary statistics in Table 7 provide means and standard deviation for the full sample and do not break out these values by type of ownership.

[19]Even if the financial constraints of private for-profit hospitals do vary with their competitors' ownership types, theory predicts that such "income effects" do not influence the profit-maximizing response to a change in incentives. But this type of variation could influence the optimal response of a

and statistically insignificant estimate on the $FP * FOR\text{-}FRAC_{90}$ coefficient suggests that omitted variables are not driving the observed heterogeneity in the responsiveness of not-for-profit hospitals to the change in incentives, as profit-maximizing firms are not affected by the ownership type of their competitors.

The coefficient estimate of -498 on the *PUBLIC* variable shows that, consistent with Table 2, the average public hospital experienced a substantial reduction in the number of Medicaid-insured newborns delivered at its facility from 1990 to 1996. Additionally, the significant coefficient estimate for the $PUBLIC * FOR\text{-}FRAC_{90}$ variable implies that this loss was much greater in markets served by relatively many for-profit providers. A one standard deviation increase in the fraction of nearby hospitals that are for-profit is associated with a 0.21 standard deviation decrease in $\Delta MC\text{-}BIRTH_{90\text{-}96}$ for public hospitals.[20]

The significantly negative estimate for the $\Delta MC\text{-}BIRTH_{88990}$ implies that there was a substantial break in trend in hospital-specific Medicaid admissions in 1990, the year that the DSH program was introduced. Those hospitals with the largest increases in Medicaid deliveries from 1988 to 1990 experienced the smallest increases (or largest decreases) during the next six years. The coefficient estimate for the number of hospital beds is statistically insignificant.

In this first specification I exclude those facilities that have zero competitors within ten miles. In the next one, I include these 87 facilities and set $FOR\text{-}FRAC_{90}$ equal to zero for them. The coefficient estimates are largely unaffected by this adjustment, or by the inclusion of a dummy variable $ONLYHOSP_{90}$ in the third specification that is equal to one if a facility has no competitors within ten miles and zero otherwise. In the fourth specification I define $FOR\text{-}FRAC_{90}$ to equal the share of available hospital beds within ten miles that are located in for-profit facilities, thus giving greater weight to larger competitors. This adjustment does not

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not-for-profit firm.

[20]Given that there are twice as many not-for-profit hospitals as public ones, it is not surprising that the magnitude of the $NFP * FOR\text{-}FRAC_{90}$ estimate is only half as large as the corresponding one for $PUBLIC * FOR\text{-}FRAC_{90}$. A public hospital could, for example, lose 1400 Medicaid deliveries because two private facilities skim 700 more Medicaid patients each.

affect the *NFP * FOR-FRAC*$_{90}$ estimate appreciably, though it does reduce the estimate for *PUBLIC * FOR-FRAC*$_{90}$. This estimate is still statistically significant at the ten percent level, while the estimate for *FP * FOR-FRAC*$_{90}$ remains close to zero.

One possible explanation for this set of findings is that the estimates on the *FOR-FRAC*$_{90}$ interactions are picking up an effect of private hospitals rather than an effect of private for-profit hospitals specifically. To investigate this possibility, in the fifth specification I introduce controls for the share of competing hospitals that are private not-for-profits, and interact this with the ownership dummies. The estimates on both the *NFP * NFP-FRAC*$_{90}$ and the *FP * NFP-FRAC*$_{90}$ coefficients are small and statistically insignificant, providing further evidence that the significant estimate on the *NFP * FOR-FRAC*$_{90}$ coefficient is capturing a causal effect of private for-profit hospitals on the behavior of not-for-profit hospitals.

It is interesting to compare the effect of private for-profit and private not-for-profit hospital penetration on the loss of Medicaid patients at public hospitals. The significant estimate of -670 on the *PUBLIC * NFP-FRAC*$_{90}$ coefficient suggests that public hospitals in not-for-profit intensive areas did lose a significant number of their Medicaid patients. But this estimate is less than half as large as the corresponding one for for-profit hospital penetration, implying that public hospitals in markets with relatively many for-profit hospitals were the ones most affected by the change in financial incentives and the resulting reallocation of patients. Including both of these interactions causes the estimate on the *PUBLIC* dummy variable to become small and insignificant. Thus public hospitals that competed only with other government owned facilities or that had no competitors within ten miles did not experience large declines in their numbers of Medicaid deliveries.

Columns six and seven summarize the results for specifications analogous to those in columns three and five, with the dependent variable now set equal to total Medicaid admissions (not newborns only). Consistent with the above results, the coefficient estimates demonstrate that for-profit hospital penetration has a significant effect on the behavior of not-for-profit hospitals but no corresponding effect on the behavior

of profit-maximizing facilities. Moreover, after controlling for for-profit penetration, the share of hospitals that are private not-for-profit does not exert any additional effect on either type of private hospital. Public hospitals in markets served primarily by private not-for-profit hospitals are much less affected than those located in areas with a large fraction of for-profit providers. Public hospitals that do not face competition from the private sector are unaffected by the change in hospital financial incentives caused by the DSH program.

The results presented in this section strongly suggest that the behavior of private not-for-profit hospitals is affected by the presence of for-profit competitors, and that this largely explains the observed variation across market areas in the effect of the Disproportionate Share program. The next section explores whether this variation is driven by an impact of for-profit hospitals on the financial condition of private not-for-profit providers.

V. Do Differences in Financial Constraints Explain the Heterogeneous Response?

Because a not-for-profit hospital may have an objective function that positively values factors other than profits, its optimal response to a change in financial incentives could plausibly vary with its financial constraints.[21] A cash-strapped facility that is struggling to break even may respond much more aggressively to a profitable opportunity than one with an identical objective function that is in good financial shape. If this is the case, then the results presented above may be driven by the effect of for-profit hospitals on the financial condition of not-for-profit providers. Theoretically, one would not expect financial constraints to have any effect on the behavior of for-profit hospitals, as these facilities would respond to the change in incentives if it was profitable to do so.

The first specification summarized in Table 5 explores whether hospitals in for-profit intensive areas

[21]A substantial body of previous work has considered the interaction of preferences and constraints when modeling the behavior of private not-for-profit firms. See for example Newhouse (1970), Feldstein (1971), Weisbrod (1988), Frank and Salkever (1991), Glaeser and Shleifer (2001), Eggleston, Miller, and Zeckhauser (2001).

are more financially constrained than other providers. The estimating equation is similar to the one presented above, and the dependent variable ($DEBT_{90} / ASSET_{90}$) is equal to hospital debt as a fraction of total assets in 1990. The insignificant estimate on the *NFP* * $FOR\text{-}FRAC_{90}$ coefficient suggests no systematic relationship, though the positive sign is consistent with a modest effect of for-profit hospitals on the financial stress of not-for-profit facilities. The estimates for *FP* * $FOR\text{-}FRAC_{90}$ and *PUBLIC* * $FOR\text{-}FRAC_{90}$ are also positive but neither is statistically significant.[22] The next specification tests whether this debt-to-asset ratio had been increasing differentially in for-profit intensive areas prior to the introduction of DSH. The insignificant estimates for all three of the $FOR\text{-}FRAC_{90}$ coefficients suggest that this was not the case. Alternative definitions of hospital financial conditions yield a similar result.

The third specification examines whether the areas served by for-profit hospitals are more contested. If this is the case, then not-for-profit hospitals in these areas may respond more aggressively to a change in financial incentives because of the threat of potential competition for their own patients and because there are more potential patients to admit. To test this, I use the number of hospitals within ten miles of each facility $NUM\text{-}HOSPS\text{-}CLOSE_{90}$ as the dependent variable and find that for-profit hospital penetration is strongly related to the number of hospitals in an area. While the typical not-for-profit hospital has only 9.4 hospitals within ten miles, a one standard deviation increase in the fraction of hospitals that are for-profit is associated with an increase of 5.5 in the number of nearby competitors.

In Table 6, I focus exclusively on not-for-profit hospitals and examine whether differences in financial constraints, market competitiveness, or other factors eliminate the estimated effect of for-profit competitors on not-for-profit hospitals. The first specification summarized in Table 6 explains the change in Medicaid births as a function of the share of competing hospitals that are for-profit, $FOR\text{-}FRAC_{90}$.[23] As

[22]The results are qualitatively similar if I utilize alternative measures of hospital financial conditions, including net income or total equity per available hospital bed.

[23]There is no interaction in this case because I include only not-for-profit hospitals in the Table 6 regressions.

in Table 4, the coefficient estimate is significantly positive, albeit smaller in magnitude. A one standard deviation increase in $FOR\text{-}FRAC_{90}$ is associated with a 0.2 standard deviation change in $\Delta MC\text{-}BIRTH_{90\text{-}96}$.

To test whether financially constrained not-for-profit hospitals respond more aggressively to the change in incentives caused by the DSH program, I include the variable $DEBT_{90} / ASSET_{90}$ in specification two. This coefficient estimate has the expected sign - more debt leads to a larger increase in Medicaid deliveries - but the effect is statistically insignificant. Including this variable in the regression has virtually no impact on the $FOR\text{-}FRAC_{90}$ coefficient, suggesting that the effect of for-profit hospitals is not operating through an effect on not-for-profit balance sheets.

The next specification controls for the number of competing hospitals within ten miles of the not-for-profit hospital. As was shown in the previous section, for-profit hospitals tend to be located in densely populated areas with relatively many hospitals in a given geographic area. While the inclusion of this variable reduces the $FOR\text{-}FRAC_{90}$ estimate by approximately one-third, it remains significantly related with the change in Medicaid deliveries from 1990 to 1996.

In specifications four and five I control for two additional factors that may affect the responsiveness of private not-for-profit hospitals to the DSH financial incentives. The first variable, $NOTCH\text{-}HOSPITAL_{90}$, is set equal to one if the private hospital had a low-income number of 15% or more when DSH was first introduced, and thus a large incentive to respond to the new incentives, and zero otherwise. The statistically significant estimate for this coefficient has the predicted sign - private not-for-profit hospitals close to or above the DSH qualifying threshold do respond more aggressively to the change in financial incentives. But the inclusion of this variable does not reduce the $FOR\text{-}FRAC_{90}$ coefficient estimate.

I then investigate whether being close to a public hospital is significantly related to the response of private not-for-profit hospitals to the DSH financial incentives. The variable $PUBCLOSE_{90}$ takes on a value of one if the not-for-profit is within ten miles of a government-owned hospital, and zero otherwise. The estimate has the predicted sign but is statistically insignificant and does not affect the coefficient estimate on

the $FOR\text{-}FRAC_{90}$ variable.

In the final specification I control for all of these factors simultaneously. The robust relationship between for-profit hospital penetration and the response of not-for-profit hospitals to the DSH financial incentives remains. The results presented in this section and in the previous ones suggest that for-profit hospitals exert a "peer effect" on their not-for-profit counterparts, as these facilities mimic the behavior of profit-maximizing firms when they actively compete with them.[24]

VI. Conclusion

The findings presented in this paper indicate that the behavior of not-for-profit hospitals does vary systematically with the share of competing hospitals that are organized as profit-maximizing firms. 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-for-profit hospitals in Los Angeles and similarly for-profit intensive areas responded aggressively to the DSH incentives, their counterparts in San Francisco and other areas with relatively few for-profit providers did not.

Markets served by relatively many for-profit hospitals are different from the average hospital market in California. But controlling for these other factors does not eliminate the for-profit effect described above. While the evidence suggests that for-profit hospitals have a modest effect on the financial constraints of not-for-profit hospitals, the likely explanation for the heterogeneity in not-for-profit behavior is a peer effect. Not-for-profit hospitals mimic the behavior of profit maximizers when actively competing with them, suggesting that the share of hospitals that are private for-profit in an area will understate the extent to which providers in a market are profit-oriented. Whether private for-profit firms have a similar impact on the

[24]See Arnould, Bertrand, and Hallock (2002) for evidence suggesting that HMOs affect the objective function of not-for-profit hospitals.

objective function of their not-for-profit competitors in other sectors is an important topic for future research.

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Table 1: 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 2: For-Profit Hospital Penetration and the Reallocation of Medicaid Patients from Public to Private Providers

		Δ%MC-BIRTH-PUBLIC$_{90\text{-}96}$							
	μ , σ	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
% FOR-PROFIT$_{90}$	.291	-.468***	-.427***	-.308***	-.322***	-.411***	-.318***	-.423***	-.249*
	(.198)	(.074)	(.106)	(.108)	(.126)	(.107)	(.116)	(.108)	(.139)
Δ % MEDICAID$_{90\text{-}96}$	.038			-2.36**					-1.89
	(.022)			(0.96)					(1.31)
% PRIV-AT-PUBLIC$_{90}$	.195				.202				.061
	(.191)				(.129)				(.144)
% MANAGED CARE$_{90}$	.207					-.237			.005
	(.083)					(.255)			(.294)
% HISPANIC$_{90}$	.639						-.296***		-.178
	(.245)						(.095)		(.147)
% BLACK$_{90}$	.073						-.643***		-.543
	(.077)						(.276)		(.354)
% NOTCH$_{90}$	.065							-.112	.063
	(.069)							(.312)	(.317)
CONSTANT	-	-.045*	-.064	-.009	-.136	-.020	.139	-.058	.089
		(.025)	(.037)	(.041)	(.058)	(.061)	(.069)	(.041)	(.104)
# OBSERVATIONS	29	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. The first column includes summary statistics for the explanatory variables. The mean and standard deviation of the dependent variable are -.188 and .138, respectively. First column includes all counties with at least one facility that delivered one or more 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 3: Summary Statistics for Sample Hospitals

VARIABLE NAME	N	Mean	Std. Dev
Δ MC-BIRTH$_{90\text{-}96}$	401	43	968
Δ MC-BIRTH$_{88\text{-}90}$	401	179	439
Δ MC-DISCH$_{90\text{-}96}$	401	266	2248
Δ MC-DISCH$_{88\text{-}90}$	401	477	1164
NOT-FOR-PROFIT	401	.529	.500
PUBLIC	401	.212	.409
FOR-PROFIT	401	.259	.439
FOR-FRAC$_{90}$	401	.233	.275
NFP * FOR-FRAC$_{90}$	401	.117	.225
FP * FOR-FRAC$_{90}$	401	.092	.202
PUBLIC * FOR-FRAC$_{90}$	401	.023	.126
NFP-FRAC$_{90}$	401	.437	.343
NFP * NFP-FRAC$_{90}$	401	.261	.346
FP * NFP-FRAC$_{90}$	401	.118	.242
PUBLIC * NFP-FRAC$_{90}$	401	.058	.212
BEDS$_{90}$	401	190	152
ONLY-HOSP$_{90}$	401	.217	.413
DEBT/ASSET RATIO$_{90}$	376	.377	.305
Δ DEBT/ASSET RATIO$_{90}$	367	.012	.212
NUM-HOSPITALS-CLOSE	401	9.63	10.98
PUBLIC-HOSP-CLOSE$_{90}$	401	.494	.501
NOTCH-HOSPITAL$_{90}$	401	.232	.423

Table 4: The Effect of For-Profit Penetration on Hospital Responses to Financial Incentives

	Δ MC-BIRTH$_{90\text{-}96}$					Δ MC-DISCH$_{90\text{-}96}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NFP * FOR-FRAC$_{90}$	672***	827***	756***	633**	693**	1768***	1780**
	(244)	(298)	(253)	(259)	(295)	(644)	(735)
FP * FOR-FRAC$_{90}$	46	134	38	-68	-35	235	182
	(260)	(213)	(217)	(243)	(235)	(487)	(519)
PUBLIC * FOR-FRAC$_{90}$	-1421*	-1493**	-1610**	-934*	-1758**	-3296**	-3488**
	(759)	(721)	(769)	(584)	(744)	(1650)	(1593)
FOR-PROFIT$_{90}$	-196	-121	-133	-174	-68	-280	-97
	(205)	(135)	(143)	(161)	(104)	(323)	(230)
PUBLIC$_{90}$	-498***	-352**	-308***	-465***	-64	-601***	-102
	(175)	(139)	(109)	(158)	(73)	(241)	(159)
Δ MC-BIRTH$_{88\text{-}90}$	-.583***	-.594***	-.600***	-.632***	-.558***		
	(.192)	(.186)	(.188)	(.206)	(.185)		
Δ MC-DISCH$_{88\text{-}90}$						-.540**	-.502**
						(.230)	(.230)
BEDS$_{90}$	-1.76	-1.49	-1.65	-1.61	-1.55	-2.72	-2.60
	(1.58)	(1.40)	(1.53)	(1.58)	(1.54)	(3.49)	(3.52)
ONLY-HOSP$_{90}$			-186	-178	-291	-465	-547
			(180)	(181)	(176)	(439)	(399)
NFP * NFP-FRAC$_{90}$					58		307
					(161)		(358)
FP * NFP-FRAC$_{90}$					-44		10
					(149)		(344)
PUBLIC * NFP-FRAC$_{90}$					-670**		-1136**
					(249)		(584)
CONSTANT	623	463	550	617	523	1189	1352
	(369)	(268)	(344)	(373)	(307)	(809)	(872)
# OBSERVATIONS	314	401	401	401	401	401	401
R-SQUARED	.325	.309	.313	.275	.326	.272	.238

Sample includes all general acute care hospitals in operation in California in 1990 and 1996. The dependent variable in specifications one through five is the change in the number of Medicaid-insured newborns delivered at each hospital. In specifications six and seven, the dependent variable equals the change from 1990 to 1996 in the number of all Medicaid admissions. Standard errors are corrected for group effects and are included in parentheses.

Table 5: The Relationship Between For-Profit Penetration and Hospital Characteristics

	DEBT/ASSET RATIO$_{90}$	Δ DEBT/ASSET RATIO$_{88\text{-}90}$	NUM-HOSPS-CLOSE$_{90}$
NFP * FOR-FRAC$_{90}$	.040	.019	20.5***
	(.068)	(.036)	(3.7)
FP * FOR-FRAC$_{90}$	.135	-.086	31.0***
	(.153)	(.092)	(4.4)
PUBLIC * FOR-FRAC$_{90}$	.030	.074	7.5*
	(.137)	(.074)	(4.1)
FOR-PROFIT	-.026	.088	-.55
	(.062)	(.041)	(1.43)
PUBLIC	-.119***	-.014	-2.68***
	(.037)	(.036)	(.70)
CONSTANT	.392	-.004	4.90
	(.026)	(.016)	(.059)
# OBSERVATIONS	376	367	401
R-SQUARED	.036	.020	.418

Sample includes all general acute care hospitals in operation in California in 1990 and 1996. Dependent variables are the ratio of hospital debt to total hospital assets, the change in the ratio of hospital debt to total hospital assets, and the number of hospitals within ten miles of the hospital,. Standard errors are corrected for group effects and are included in parentheses.

Table 6: For-Profit Hospital Penetration and the Behavior of Not-for-Profit Hospitals

	Δ MC-BIRTH$_{90\text{-}96}$					
	(1)	(2)	(3)	(4)	(5)	(6)
FOR-FRAC$_{90}$	404***	431***	269*	443***	413***	326*
	(148)	(159)	(154)	(148)	(148)	(180)
Δ MC-BIRTH$_{88\text{-}90}$	-.253	-.285	-.287	-.321*	-.255	-.368*
	(.191)	(.188)	(.192)	(.190)	(.191)	(.188)
BEDS$_{90}$	.689***	.793***	.533**	.770***	.639**	.686**
	(.231)	(.241)	(.238)	(.234)	(.267)	(.290)
DEBT/ASSET RATIO$_{90}$		166				121
		(124)				(125)
NUM-HOSPITALS-CLOSE$_{90}$			8.21			8.29
			(5.61)			(7.00)
NOTCH-HOSPITAL$_{90}$				234**		171*
				(97)		(96)
PUBLIC-HOSPITAL-CLOSE$_{90}$					42	5
					(81)	(115)
CONSTANT	7	-50	0	-43	-7	-79
	(43)	(74)	(44)	(48)	(43)	(70)
# OBSERVATIONS	212	187	212	212	212	187
R-SQUARED	.106	.129	.120	.126	.107	.156

Sample includes all private not-for-profit general acute care hospitals in operation in California in 1990 and 1996. Dependent variable is the change in the number of Medicaid-insured births at each hospital, and each explanatory variable is defined in the text. Standard errors are corrected for group effects and are included in parentheses.