Antitrust Treatment of Nonprofits: Should Hospitals Receive Special Care?

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ABSTRACT

Nonprofit institutions are required to provide socially beneficial activities in exchange for an exemption from taxation. When nonprofits rely heavily on revenue as opposed to donations, the interaction between competition and the ability to finance such socially beneficial activities may be important and hence create a tension between the favored treatment of nonprofits under the tax code and their treatment under the antitrust laws. In essence, the antitrust laws, which are designed to promote competition, may undercut the policy rationale for granting tax exemptions to nonprofits. Specifically, the inability to charge some consumers a high price may deprive a nonprofit altruist of the ability to subsidize the consumption of those who would otherwise have inefficiently low levels of care, such as the poor. For this reason, some have suggested that a different antitrust standard be used when evaluating the mergers of nonprofit hospitals than when evaluating mergers of for profit firms. We analyze a 2001-2007 panel of data on pricing, competition, and charity care provision by for-profit, nonprofit, and government hospitals in California to determine whether hospitals that face less competition provide more benefits to their communities. Our empirical results offer little support for the proposition that nonprofit hospitals with more market power use the resulting additional profits to cross-subsidize care for the uninsured. In the cases where a positive relationship between concentration and provision of charity care emerges, this relationship is not specific to nonprofit hospitals.

I. Introduction

The health care sector is characterized by extensive government regulation, prominence of insurance, product differentiation, information asymmetries, imperfect information, externalities, rapid technological change, dominance of nonprofit providers, and various moral issues. Although many of these characteristics are found in other areas of the economy, the fact that health care has all of them distinguishes it from other industries (Arrow, 1963). Antitrust law is based on the premise that competition maximizes consumers' welfare. However, considering the distinctiveness of the health care sector, it is not surprising that the application of antitrust doctrine to this industry has been debated. Although the debate continues as to whether or not competition in health care markets promotes welfare in the same way as it does in other markets, recent years have seen a shift away from regulatory policies and towards competition. Antitrust policy toward hospitals and other providers has become much more vigorous, especially in the last three decades (Gaynor and Vogt, 2000).

Nonprofit hospitals account for roughly 70% of all hospital beds in the U.S. A debate has arisen as to whether and how this characteristic should affect the application of antitrust to health care. Neither the Sherman Act nor the Clayton Act include statutory exemption for nonprofits and the Supreme Court has held that nonprofit organizations are not exempt from the antitrust laws.[1] There is also, however, case law that though the antitrust laws apply to nonprofits, they should be applied in a way that accounts for the social goals of the nonprofit firms.[2]

The same antitrust standards should be applied to nonprofits as to for-profit firms if competition among nonprofits maximizes welfare. However, it is not clear that this is so and therefore the appropriate antitrust standards for, say, hospital mergers are not clear. Some commentators deem that mergers involving nonprofits should be treated in the same way as all other mergers (e.g. Simpson and Shin, 1998; Philipson and Posner, 2009). Others argue

[1] See, for example, *NCAA v. Board of Regents*, 468 U.S. 85, 100 n. 22 (1984); *American Soc'y of Mechanical Eng'rs, Inc. v. Hydrolevel Corp.*, 456 U.S. 556, 576 (1982); *Goldfarb v. Virginia State Bar*, 421 U.S. 773, 786-87 (1975).

[2] See *United States v. Brown University, et al.*, 805 F.Supp. 288 (E.D.Pa.1992); *U.S. v. Brown University, et al.*, 5 F.3d 658 (3rd Cir. 1993).

that traditional antitrust rules should not apply to mergers involving nonprofit hospitals because these institutions are not disposed to exercise market power in the form of higher prices (e.g. Lynk, 1994).

For the most part, empirical work investigating the effect of hospital mergers on pricing finds that hospital mergers that create market power do lead to higher prices, and that this is true for both for-profit and nonprofit hospitals (Keeler, Melnick, and Zwanziger, 1999; Dranove and Ludwick, 1999; Krishnan and Krishnan, 2003; Vita and Sacher, 2003; Capps and Dranove, 2004; Dafny, 2009).[3] Empirical research on the cost effects of hospital mergers generally finds that most hospital mergers lead to either no cost savings or small cost savings.[4] Empirical research on the quality effects of hospital mergers is less well developed, but the handful of studies on this topic typically find either no effect on quality, mixed effects on quality, or small reductions in quality from hospital mergers.[5]

A key question relevant to assessing hospital mergers and market power that has received little formal study to date is whether nonprofit hospitals provide greater amounts of charity care when they earn higher profits?[6] (David and Helmchen, 2006). Generally, nonprofits may exercise market power in order to produce a socially desirable outcome, such as the redistribution of wealth among different segments of the population (Carlton et al., 1995). When this occurs, the relevant policy question emerges of whether collective action that achieves this result should be allowed or given consideration under the antitrust laws. Note that such an outcome would not occur if the firm were profit maximizing, so this question relates primarily to the antitrust treatment of nonprofit entities.

It is the outcome of a political bargaining game that leads to nonprofits being used to achieve social goals. For example, in health care, various political and economic factors

[3] Lynk (1995) finds that nonprofits do not exercise market power by charging higher prices.

[4] Connor, Feldman, and Dowd (1998), in a study based on 1986-1994 data, find the largest cost savings from hospital mergers, about 5%. Spang, Bazzoi, and Arnould (2001) extend the Connor et al. framework by comparing cost changes at merging hospitals to the changes at their nonmerging rivals and find modest cost savings. Dranove and Lindrooth (2003) find that only full hospital "mergers," in which hospitals combine licenses and merge operations, generate significant cost savings; such full mergers are a small minority of all hospital mergers and acquisitions.

[5] See Ho and Hamilton (2000); Kessler and McClellan (2000); Sari (2002); Gowrisankaran and Town (2003); Capps (2005); and Gaynor (2006).

[6] Garmon (2009) studies reported charity care and concentration in Florida and Texas using data from 1999-2002 and finds no evidence that increased competition leads to reductions in charity care.

combine to make it such that a significant portion of the population does not have health insurance. As a result, most hospitals provide uncompensated care to a nontrivial number of patients, for whom care is not affordable. In recognition of this provision of community benefits, nonprofit hospitals are granted an exemption from paying income and other taxes. Given this outcome, it would be inconsistent with public policy as reflected in the tax code to apply the antitrust law in a way that ignores the benefit of achieving social goals.

The key underpinning of the argument for favorable antitrust treatment of nonprofits is that when nonprofits have the power to elevate price to some consumers, the resulting profits are used to provide services to consumers who would otherwise have inefficiently low levels of care, such as the poor. Other possibilities, such as opportunistic behavior by nonprofit administrators, the dissipation of rents through non-price competition, and various forms of regulatory evasion, exist. If any of these factors dominate then granting favorable antitrust treatment to nonprofits may result in deadweight loss and lost tax revenue without creating the benefits that form the rationale for the nonprofit tax exemption.

In this paper, we develop a theoretical model that demonstrates that in contrast to competition among for profit firms competition among nonprofits can sometimes be undesirable, thereby justifying previous courts' findings that consideration of nonprofit status is appropriate in evaluating antitrust issues associated with nonprofits. This means that it is an empirical question whether a particular merger or action that increases market power is undesirable. We then analyze this empirical question for hospitals using seven years of data on competition and charity care provision by California hospitals. Should the empirical analysis verify the theoretical possibility that less competition leads to greater levels of charity care, there would be two direct antitrust implications. First, it would confirm the need to apply a rule of reason approach to analyzing coordination among independent nonprofit hospitals in cases that would otherwise be deemed *per se* Section 1 cartel cases (e.g., an agreement among for-profit hospitals as to which services each would offer). Second, it would justify the use of different standards for nonprofit merger cases. Specifically, even if nonprofit hospitals could gain market power by merging, a full antitrust analysis would need to consider the offsetting benefits of expanded charity care provision. Our empirical results, however, provide no support for special antitrust treatment of hospitals. Reliance on altruistic motives of hospitals as a method of providing healthcare is not a wise public policy.

Moreover, we point out that allowing nonprofits to use their market power to engage in social policy is a second best outcome compared to social policies that directly address the policy objective. In the context of nonprofit hospitals, it would be more efficient to directly subsidize indigent care but allow competition to flourish than to indirectly fund charity care by allowing nonprofits to exercise market power (even assuming that the funding would be so used). State managed Medicaid programs are an example of a directly subsidized health program for families with low incomes and resources. However, Medicaid as presently constituted does not solve the uninsured problem.[7] Additionally, Medicaid payments below patient care costs represent a major source of uncompensated care.[8]

The paper is organized as follows. In section II we discuss the application of antitrust to nonprofit firms and its reflection in the provision of community benefits through cross-subsidies in the hospital industry. In section III we develop a theoretical model of the effects of competition among nonprofit hospitals, charged with achieving social goals, on welfare. In section IV, we present an empirical analysis of the charity care provision by California hospitals from 2001 to 2007 that tests the hypotheses that nonprofit hospitals that face less competition provide higher levels of charity care. Section IV concludes the paper.

II. Background

Antitrust and tax treatment of nonprofits

In this section we first address the policy question of how antitrust policy is applied to the nonprofit sector, and then discuss health care specifically. The policy question is how should collective action among nonprofits be treated? A not-for-profit firm receives 501(c)(3) status when its purpose is to advance certain social goals, 501(c)(3) status provides certain tax advantages to the firm and allows it to raise funds through (tax deductible) donations. The fact that nonprofits are designed to achieve certain social goals requires that antitrust pay

[7] In addition Medicaid coverage is tied to children. Adults without children are not eligible for Medicaid (without a state waiver), regardless of their income-unless they are disabled or otherwise unable to work.

[8] Uncompensated care is an overall measure of hospital care provided for which no payment was received from the patient or insurer. It is the sum of a hospital's "bad debt" and the charity care it provides. However, hospitals vary significantly in how they measure and report bad debt and charity care (IRS 2009).

attention to those goals, and antitrust has done so. One of the leading cases regarding nonprofits, from the early 1990s, is the MIT case, in which the Antitrust Division sued MIT and the eight schools in the Ivy League under Section 1 of the Sherman Act for engaging in a conspiracy to fix the prices that students pay. The Antitrust Division claimed that the schools conspired on financial aid policies in an effort to reduce aid and raise their revenues. While the District Court's opinion found the schools guilty of a per se offense of price fixing, the Court of Appeals found it appropriate to consider nonprofit institutions' justifications for collective action, such as to enable the poor to attend school, under a Rule of Reason. The court thus accepted the schools' justification for their cooperative behavior: enabling them to concentrate aid on only those in need (Carlton et al., 1995), but did not give schools unlimited ability to raise tuition to subsidize poor students.

Another recent case regarding nonprofits involves teaching hospitals. Medical school graduates enrolled in residency programs brought a class action charging universities, medical schools, foundations and hospitals with violating Section 1 of the Sherman Act. Plaintiffs alleged that the defendants contracted, combined and conspired among themselves to limit competition in the market for resident services and to fix and stabilize residents' wages. In this case, courts were preempted from ruling by legislation. In April 2004, Congress passed a provision to the Pension Funding Equity Act of 2004 entitled "Confirmation of Antitrust Status of Graduate Medical Resident Matching Programs," creating a price-fixing exemption for a certain class of antitrust claims for graduate medical education residency matching programs.[9] This exemption highlights the relative weight placed on the efficiency of the matching process, in this case through the National Resident Matching Program, a nonprofit corporation, over anticompetitive effects of collusion. Congress intended to protect the Match Program and its participants from the cost of defending antitrust actions that challenge the Match Program, with the rationale that the primary mission of teaching hospitals was patient care, physician training and medical research as opposed to standard profit maximization objectives. Of course, a more cynical

[9] At its core, the provision provides that "[it] shall not be unlawful under the antitrust laws to sponsor, conduct, or participate in a graduate medical education residency matching program, or to agree to sponsor, conduct, or participate in such a program."

explanation is that the special interests of teaching hospitals have prevailed to allow them to exploit medical residents.

Under current regulation, private nonprofit hospitals are eligible for exemptions from property, sales, and income taxes, while for-profit hospitals are required to pay these taxes. Private nonprofit hospitals have access to capital financing through tax-exempt bonds, whereas this option is not available to for-profit hospitals. On the other hand, private nonprofit hospitals do not have access to equity financing. Tax exemptions for nonprofits are (or used to be) justified by a "bargain" that was "struck between the hospital and the community: a hospital would treat patients who were unable to pay, and the government would grant a tax exemption to the hospital" (Pellegrini, 1989). More broadly, private nonprofit hospitals are expected to provide "community benefits" in return for their 501(c)(3) tax-exempt status. To date, there is no convincing answer to the question of whether or not nonprofit hospitals are doing enough to justify their tax exempt status (David and Helmchen, 2006). Our theoretical analysis implies that competition may reduce "community benefits", and therefore raises the policy question of whether alternative programs (e.g., competition plus transfers) would be superior and, if so, why they are politically infeasible.

While there is evidence that nonprofit hospitals respond to competition in ways that benefit consumers and that such benefits will be lost if competition is eliminated, courts must anticipate the likely emergence of other benefits, such as community benefits. Price increases that occur in the wake of hospital mergers highlight the ability of hospitals to exercise market power; however, market power may very well be used to attain a socially desirable objective, such as promotion of health care to the poor. The special tax treatment for nonprofits indicates not only that society places a value on the promotion of such care but also that, rightly or wrongly, society views nonprofits as the superior mechanism for attaining that goal (David and Helmchen, 2006).

Evidence on community benefits provided by nonprofit hospitals

Uncompensated care is just one form of community benefits reported by hospitals. As reported in a recent study by the IRS (IRS, 2009), "average and median percentages of total revenues reported as spent on community benefit expenditures were 9% and 6%." As indicated by the divergence between the average and median, the distribution of community benefits is skewed, with a relatively small portion of hospitals studied providing high levels of community benefits. Uncompensated care is only one form of community benefit; other major categories of reported community benefits are medical education and training, research, and community programs.[10] Uncompensated care accounts for 56% of total community benefits reported by nonprofit hospitals, and the average and median percentages of revenue devoted to uncompensated care were 7% and 4%. These measures, however, are subject to manipulation.

The IRS study also finds a great deal of variation in how hospitals measure and report uncompensated care. For example, the study reports that roughly one-fifth of hospitals include as uncompensated care each of the following: "the difference between hospital charges and the amount private insurance paid or allowed for services (private insurance shortfalls); the difference between hospital charges and the amount Medicare paid or allowed for services (Medicare shortfalls); the difference between hospital charges and the amount Medicaid allowed for services (Medicaid shortfalls); and the difference between hospital charges and the amount other public insurance programs allowed for services (other public program shortfalls)."[11]

In our study, we focus only on the component of community benefits that accrues directly to the direct customers of hospitals; namely, uncompensated care. If some action (e.g., a merger or coordination with rivals) allows a nonprofit hospital to charge higher prices to the insured and also to provide more uncompensated care, then the overall effect of that action on the hospital's patients will be ambiguous. In contrast, if higher prices fund research and

[10] Education and training account for 23% of reported community benefits, medical research accounts for 15%, and community programs account for 6% (IRS, 2009).

[11] Some of these measures appear questionable. For example, including "private insurance shortfalls" in uncompensated care is subject to ready manipulation: a hospital could increase its list charges, offer managed care organizations correspondingly larger discounts, and thereby report higher levels of uncompensated care.

teaching, then those higher prices would make patients unambiguously worse off, at least in the short run. Thus, by focusing on uncompensated care, we are analyzing the overall effects on patients.[12]

We study a number of questions of interest: What explains the *level* of uncompensated care provided by hospitals? Is that affected by the ownership status (for profit/nonprofit)? Does the presence of market power increase (or decrease) the level of uncompensated care provided by hospitals? And, does the effect of market power on uncompensated care provision depend on whether the hospital is a nonprofit? How does the provision of uncompensated care by nonprofits compare to the costs of the tax exemption? Finally, do the available data indicate that nonprofits exaggerate the degree of uncompensated care they provide?

Antitrust enforcement in the hospital industry

Hospital acquisitions and mergers in 2004 involved 130 U.S. hospitals and were valued at $9.07 billion.[13] Since 1980, 37 antitrust cases were brought by the U.S. Department of Justice or the Federal Trade Commission against hospitals, 17 of which were against nonprofit hospitals (Philipson and Posner, 2009).[14] The Federal Trade Commission (FTC) and the Justice Department lost a combined seven consecutive cases challenging proposed mergers of hospitals in the 1990s. In some cases the courts have pointed to hospitals' nonprofit status as a reason to let mergers go through.[15] In 2005 the FTC prevailed in a trial seeking to

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[12] Our justification for excluding medical research and education is twofold. First, existing institutions, including universities, private corporations, and the National Institutes of Health, directly fund medical research and teaching. As a result, the policy rationale for funding research and teaching via permissive antitrust treatment of nonprofit hospitals is less compelling than the rationale for funding uncompensated care in that fashion. Second, it seems clear that, absent uncompensated care, a significant portion of the population would receive inefficiently low levels of hospital care. It is not clear that the same applies to medical research and teaching.

[13] Bernard Wysocki Jr. "FTC Targets Hospital Merger in Antitrust Case" *The Wall Street Journal*, January 17, 2005: uses data from Irving Levin Associates Inc., a publisher of heath-care data based in New Canaan, Connecticut. (http://www.karlloren.com/healthinsurance/p32.htm)

[14] This figure appeared in a working paper version of Philipson and Posner (2009) paper, but is not in the final, published version. In any case, the DOJ and FTC have brought many cases against hospitals, both for profit and nonprofit. See, for example, Capps et al. (2002).

[15] For example, in the mid-1990s, the FTC fought unsuccessfully to block a Grand Rapids, Mich., hospital merger. In that case, the judge placed great weight on the hospitals' nonprofit status.

undo the January 2000 takeover of Highland Park Hospital, in suburban Chicago, by Evanston Northwestern Healthcare Corp.[16] The FTC accused Evanston Northwestern, a nonprofit corporation, of antitrust violations, saying it used its post-merger market power to impose significant price increases on insurers and employers. Both the trial judge and, after a *de novo* review on appeal, the five commissioners of the FTC, concluded that the merger had created market power and that Evanston Northwestern had exercised that market power. The Commission, however, reversed the trial judge's order that Evanston Northwestern divest Highland Park Hospital. Instead, the Commissioners imposed a conduct remedy specifying that Evanston and Highland Park hospitals would have to negotiate separately with insurers; the Commissioners later added a provision allowing insurers to enter into binding arbitration in the event of an impasse in price negotiations.

Hospitals in merger cases often point to industry specific efficiencies from consolidated operations, patient management, elimination of duplication, and even slowing the pace of adopting expensive technology.[17] Such efficiency gains, if present, are not unique to nonprofit hospitals. Merger among nonprofits may produce additional gains. For example, Gaynor and Vogt (2000) argue that "Hospitals, particularly not-for-profit hospitals, provide a lot of charity care to indigent patients. To the extent that such care is financed out of profits, increased competition may reduce charity care" and that "charity care which is lost due to increased competition may not be replaced, due to the vagaries of politics."

A large part of the literature deals with the lack of incentives in nonprofits to exercise market power. Blackstone and Fuhr (1992) argue that incentives for profit maximization are inherently weaker for those who manage nonprofit organizations, as they don't stand to gain from price increases. Identifying nonprofits as apathetic to profits led researchers to focus on the relationship between pricing behavior of nonprofits and concentration. Lynk (1995) argues that nonprofit hospitals charge lower prices in more concentrated markets than in less concentrated markets, while for-profit hospitals charge higher prices in more concentrated markets. While his view supports differential antitrust treatment for nonprofits, a number of

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[16] *In the Matter of Evanston Northwestern Healthcare Corporation and ENH Medical Group, Inc.*, Docket No. 9315, File No. 011 0234, at http://www.ftc.gov/os/adjpro/d9315/index.htm (Accessed March 21, 2009).

[17] Hospital competition was deemed wasteful as it often led to "medical arms race", where hospitals made strategic investment in costly technologies in order to compete for patients.

subsequent studies challenged Lynk's methodology and found that nonprofits do charge higher prices in more concentrated markets (Simpson and Shin 1998; Dranove and Ludwick 1999; Keeler et al. 1999; Young et al. 2000).[18] We argue that while nonprofits may have markedly weaker incentives to maximize profits, the argument identifying the lack of profit motives with a departure from exercising market power is misleading. Objectives such as maximizing quality, providing charity care, and/or operating unprofitable services may all require the ability to exercise market power.

Courts, following the lead of economists, typically regard a reduction in competition as a result of a merger as undesirable. Yet, if competition may interfere with nonprofits' ability to engage in socially desirable activities, such a general premise would be erroneous. The tension between the favored treatment of nonprofits under the tax code (presumably to achieve social objectives) and their treatment under antitrust laws creates a conceptual dichotomy, which is important to mend, one way or another. If indeed society assigns a value to the achievement of certain goals through the nonprofit sector and this value exceeds the loss of revenue from tax exemptions, courts ultimately have to face the complex and difficult task of evaluating the positive achievement of certain social goals against negative competitive effects of mergers where nonprofits are involved.

III. Theory

A recent paper has advanced a theory in which altruistic nonprofit producers exhibit some degree of "output preferences," that is, they derive utility directly from output in addition to profits. The authors recognize the differences between the nonprofit organization's utility and the utility in the absence of altruism, but show that competition still maximizes society's surplus (Philipson and Posner, 2009). The authors recommend an antitrust doctrine that does not distinguish between the for-profit and the nonprofit sectors. However, we show

[18] Dranove and Ludwick (1999) point to methodological flaws in Lynk's work, mainly the endogeneity of market share and the need to control for quality and severity, which can explain both high prices and high concentration.

that their result vanishes once one allows nonprofits to have a slightly more general objective function than the one postulated in their paper.

The key insight that Philipson and Posner identify is that if an altruist has an output preference, then competition among altruists, just like competition among profit-maximizing firms, will generate the "correct" marginal pricing conditions—if we assume that the social welfare function values consumption in the same way as the altruist. For example, if α represents the additional value that the altruist attaches to everyone's health consumption, then $p = c + \alpha$ is the optimal pricing condition, where p is the price and c is marginal cost. But for this pricing condition to represent optimality, it must also be the case that such marginal pricing will lead to financial viability for the firm. However, even in the simplest constant returns to scale model, this cannot be true unless the altruist has a private source of wealth to subsidize the consumption of the poor, as Philipson and Posner assume. Conversely, if the sole source of funds must come from the revenue of the nonprofit firm rather than from the rich altruist, then it must be the case that the financing constraint will matter.[19] Therefore the ability to exercise market power is a critical ingredient needed to provide funds to pay for health care. In addition, the altruist in the Philipson and Posner model values the health care consumption of everyone at α. A slight modification is to allow the altruist to value the health care consumption of different individuals differently. For illustration, suppose that the altruist thinks that rich people can afford a minimal level of health care consumption, but poor people cannot. Hence, the altruist values health care consumption of rich people at zero and that of poor people at α.[20] These two changes to the Philipson and Posner model alter their conclusion. Our point is not that our assumptions are necessarily superior to theirs but rather that their strong conclusion does not survive even minor changes to their model's assumptions. Only an empirical analysis can resolve the issue of the proper role of antitrust in evaluating nonprofits.

Two implications follow from our modifications. First, if the financing constraint matters (as would be the case if the altruist is not the source of funds), then the creation of market power through merger may benefit society because the elimination of competition relaxes

[19] In essence, we are ruling out the ability of the altruist to levy lump sum taxation on the public.

[20] By and large, the need to access charity care is discrete (patients either have insurance or they don't)

the financing constraint. Second, in order for the market power to be exercised so as to generate funds to be used to subsidize the health care consumption of the poor, the firm must be able to charge differential prices to the rich and the poor.[21] Without this ability, the transfer from the rich to the poor could not occur. But competition makes such price discrimination difficult since with differential pricing, hospitals (even not-for-profits) will want to poach its rivals' profitable customers and this erodes the ability to exercise market power against profitable customers. Let us now turn to a model to illustrate these points.

Consider first the case of for-profit firms when there is no special value attached to the consumption of health care by the poor. Hence if α represents the additional value that society places on each unit of consumption by the poor, then $\alpha = 0$. In this case there is no reason to have not-for-profit firms and no reason to use 501(c)(3) status. Let $c(q_1, q_2)$ be the hospital's cost function for providing q_1 units to the rich and the q_2 units to the poor. Assume for simplicity that $c(q_1, q_2) = F + c \cdot (q_1 + q_2)$. Suppose $F = 0$; in this case competition among firms will maximize social welfare, as usual. For $F > 0$, if the firms play Bertrand, as Sutton has shown, there is no stable equilibrium if there is more than one hospital (Sutton, 1991). If instead competition is less intense than Bertrand (e.g. Cournot), there is a stable equilibrium with non-negative profits for a neighborhood of F around 0, for any number of rivals. For this case, a merger that reduces the number of competitors definitely harms consumers because prices rise to both groups with no offsetting benefits. It is precisely for this reason that antitrust forbids mergers that only reduce competition.

Consider now a not-for-profit hospital which receives 501(c)(3) status as a reflection of society's desire to increase health care among the poor (i.e., the involuntarily uninsured). Suppose that the social welfare function reflects that "society" values health care consumption by the poor above what the poor value it for themselves and the "altruist" hospital reflects the values of the social welfare function towards the poor. There is the entirely separate issue that the "altruist" may not faithfully represent society's values. An important distinction between our objective function and that used by Philipson and Posner is that our altruist cares about only consumption by the poor, not total consumption. This

[21] While many of the uninsured are not poor, for simplicity, we use the terms "rich" and "poor" to denote the patients that are paying above competitive rates and the patients who are benefitting from cross-subsidization.

seemingly minor change accounts for our different theoretical results. That social value is reflected by α, the additional value society places on consumption by the poor.[22]

Suppose that competition between rival hospitals is Bertrand, with competition of even two hospitals guaranteeing that price reflects marginal social cost. It immediately follows under Bertrand competition between two altruists that

$$P_1 = \frac{\partial c}{\partial q} = c \quad \text{and} \quad P_2 = \frac{\partial c}{\partial q} - \alpha = c - \alpha,$$

where α is the assumed altruist's (and society's) extra benefit when the poor receive health care, and P_1 and P_2 are prices to the rich and poor respectively.

Since $c(q) = F + c \cdot q$ and $F > 0$ there is a natural monopoly element to hospital care as marginal cost pricing will not cover cost.[23] Moreover, even if $F = 0$, the optimality conditions related to the altruistic parameter α guarantee that profits are negative at the socially optimal pricing, since the price to the poor is below c. The following proposition states this result formally.

Proposition 1. With Bertrand competition between rival hospitals, the equilibrium cannot produce the socially optimal outcomes in which each hospital remains financially viable for $c(q) = F + c \cdot q$ and $F > 0$.

If competition is not as strong as Bertrand (e.g. Cournot), there would then be a positive margin earned on the rich and this could provide a source of financing for the poor. But the point is that competition for the rich limits the ability to finance healthcare for the poor.

Now consider a merger to monopoly. The merger allows P_1 to be set above c, generating funds that can be used to subsidize the poor, subject to a zero-profit constraint. The nonprofit monopolist's altruist problem is

[22] If nonprofits have no desire to subsidize care for the poor, allowing them the ability to set prices above marginal cost will not aid in achieving this desired social goal.

[23] In addition, when $c(q)$ is not homogenous of degree 1 in q, marginal cost pricing may not cover cost.

$$\underset{P_1,P_2}{Max}\ \alpha\cdot\int_{P_2}^{\infty} q_2(x)\,dx$$

(1) $$s.t.\quad P_1q_1+P_2q_2-c\cdot(q_1+q_2)-F=0$$

$$P_1,P_2\geq 0$$

where α again reflects society's (and the altruist's) valuation of health consumption by the poor. The altruist channels producer surplus generated in the rich market to maximize consumer surplus for the poor.[24] The social planning problem is to maximize the social welfare function subject to zero-profits of the hospital and can be written as:

$$\underset{P_1,P_2}{Max}\ \int_0^{q_1(P_1)}\left[P_1(x)-c\right]dx+\int_0^{q_2(P_2)}\left[P_2(x)-c+\alpha\right]dx$$

(2) $$s.t.\quad P_1q_1+P_2q_2-c\cdot(q_1+q_2)-F=0$$

$$P_1,P_2\geq 0$$

The solution to the not-for-profit altruist's problem (1) is:

$$\left(\frac{P_1-c}{P_1}\right)=\frac{1}{\varepsilon_1}\ \text{ and }\ P_2=\arg\max\left\{c-\frac{(P_1-c)\cdot q_1-F}{q_2},0\right\}$$

This solution says that the altruist charges the monopoly price to the rich in order to maximize the funds (i.e. $(P_1-c)\cdot q_1-F$) that can subsidize the health consumption of the poor. Note that α does not enter the nonprofit monopolist's pricing rule. A unique price-quantity pair for the poor is determined solely by the funds generated in the rich consumers market.

The solution to the social planner's problem in (2) is a (modified) Ramsey pricing solution:

$$\left(\frac{P_1-c}{P_1}\right)=\frac{\mu}{\varepsilon_1}\ ,\ \left(\frac{P_2-(c-\alpha)}{P_2}\right)=\frac{\mu}{\varepsilon_2}-\frac{\mu\cdot\alpha}{P_2}\ ,$$

[24] The resulting choice of prices in (1) is identical for any function that is increasing in quantity for the uninsured (q_2). This is true for consumer surplus maximization, which is monotonically increasing in quantity. Notice that we are assuming that the altruist places additional value solely on the health consumption of the uninsured.

where $\mu = -\frac{\lambda}{1+\lambda}$ and λ is the Lagrange multiplier related to zero profits and ε_i is the elasticity of demand for group *i*. Notice how the social planner pays attention not only to the transfer to the poor (i.e. the amount by which P_2 exceeds $c-\alpha$), but also to the markup on rich individuals (i.e. the amount by which P_1 exceeds c).

Assume that the demand for health care by the poor is zero at a price of *c*. Comparing the nonprofit altruist monopoly problem to that of the social planner, it is clear that the (modified) Ramsey pricing solution to (2) will differ from (1). In (1), the monopolist pays no attention to the distorting effects of a high P_1 on the health consumption of the rich, and therefore will raise P_1 above the socially optimal level.[25] For (1), the optimal solution is to set P_1 at the monopoly price and use all the profits to cover *F* and the remainder to subsidize consumption of the poor. In contrast, the social planner will trade off the negative deadweight loss caused by monopoly pricing to the rich against the social external gain associated with each additional unit of consumption by the poor. In general, the "altruist" harms the rich more than is socially desirable in order to serve the poor. This leads directly to proposition 2.

Proposition 2. When $c(q) = F + cq$ and $F > 0$, the exercise of market power is necessary in order for the poor to consume health care. The rich subsidize the poor. The altruist, not-for-profit monopolist, however, charges the rich too much and underprices health care to the poor relative to the social optimum.

Figure 1 illustrates this idea. $P_1^D = P_2^D = c$ is the single Bertrand duopoly price, which leads to the exclusion of the poor from receiving services. P_1^M and P_2^M are the prices set for the rich and the poor under the altruist monopoly. Positive profit margins in Market 1 (i.e. $q_1^M \cdot (P_1^M - c)$) are necessary for cross-subsidization across groups. Independent of any

[25] Note that $\lambda > 0$ leads to $\mu < 1$, which in turn, means that the nonprofit altruist will charge the insured a price P_1 that exceeds the price set by the social planner.

social weights, the altruist behaves as a monopoly in Market 1 and will set P_2^M below c, which leads to the delivery of services to the poor where the private value of their consumption is below marginal cost (when $q > q^*$ in the right hand-side panel of Figure 1).

The disadvantage of treating nonprofits like for-profits under the antitrust laws is that the poor are underserved if mergers that create market power are not allowed because market power is needed to generate funds to cross-subsidize the poor. The disadvantage of giving nonprofits an exemption from antitrust is that the rich are overcharged even relative to the social optimum, which recognizes the external benefit of consumption by the poor. In the extreme case, merger to monopoly may lead to a decrease in welfare when the loss in consumer surplus resulting from the price increase in Market 1 (area L) coupled with the deadweight loss due to underpricing services for the poor (area D) is greater than the surplus generated for consumers in Market 2 (area G). Since the choice to serve the poor does not by itself constitute a net increase in welfare, in order to justify a merger that suppresses competition from a social stand point, we need (1) sufficiently high value placed by society on consumption by the poor and (2) sufficiently inelastic demand for healthcare services for the rich patients, which in turn, limits the distortion from cross subsidization.[26]

The simple theme of this theoretical section, then, is that competition does not produce the socially desirable outcome even when a not-for-profit altruist is ordered to follow a "social preferences" to favor the poor. The process of competition limits the ability to price discriminate and to cross-subsidize. Where cross-subsidization is necessary to achieve social optimality, as it typically is when one relies on 501(c)(3) organizations to achieve social goals, competition simply does not produce the socially correct outcome.

Indeed, the acquisition of market power is a necessary (but *not* sufficient) condition for cross-subsidization to fund care for the poor. Further establishing that market power is, if not fully a sufficient condition, at least generally associated with greater provision of care to the poor by nonprofit hospitals, would constitute a compelling argument in favor of special antitrust treatment of nonprofits. With respect to non-merger matters, a "special antitrust

[26] Note that moral hazard due to insurance coverage will contribute to lowering the demand elasticity for the rich patients.

treatment" would entail rule of reason analyses under which courts trade-off consumption by the rich and the poor (that is, conduct that would be condemned on a per se basis in the for-profit sector should be judged on a rule of reason basis in the nonprofit sector). With respect to mergers (which are never judged on a per se basis), a "special antitrust treatment" would, similarly, consider not just prices and surplus in the rich market but also trade-off consumption by the rich and the poor.

Appendix A provides a more detailed welfare analysis for the case of linear demand curves, illustrating how a merger of nonprofit hospitals can increase social welfare by suppressing competition.

IV. Empirical analysis of uncompensated care, nonprofit status, and market power

As noted above, market power is a necessary, but not sufficient, condition for the uninsured to receive care when nonprofit hospitals face a financing constraint. In general, the link between market power and uncompensated charity care will depend on the nonprofit hospital's objective function. While it is entirely possible that nonprofit hospitals will direct profits from insured patients towards care for the uninsured, other possibilities, such as opportunistic behavior by nonprofit administrators, the dissipation of rents through possibly inefficient non-price competition, and various forms of regulatory evasion, are also plausible.[27] Accordingly, whether and to what extent nonprofit hospitals with market power use profits from the insured to cross-subsidize care for the uninsured is an empirical question.[28] This section studies the interrelationship between changes in charity care provision, within hospitals, and variation in market concentration/competition.

[27] In 2008, the *Wall Street Journal* published two critical articles questioning whether nonprofit hospitals were providing sufficient levels of uncompensated care or whether they were satisfying their nondistribution constraints via high compensation and excess capital spending. See Carreyrou (2008) and Carreyrou and Martinez (2008).

[28] Note that the Philipson and Posner (2009) model unambiguously shows that increased nonprofit market power reduces welfare, whereas the model in this paper highlights the possibility that such market power is welfare-enhancing.

We use a 7-year panel of data on California hospitals from 2001 through 2007. The data set combines financial information, including revenue, profit, and two measures of uncompensated care provision, from the California Office of Statewide Health Planning and Development (OSHPD) Hospital Financial Disclosure Reports with concentration measures derived from the OSHPD Patient Discharge data bases. We also use the discharge data to construct an alternative measure of uncompensated care based on the volume of care provided to uninsured patients.

Measuring charity care

Both for profit and nonprofit hospitals provide substantial amounts of uncompensated care (CBO, 2006). When the hospital approves in advance free or discounted care, such care is considered charity care, and will likely appear in a hospital's financial data as a deduction from revenue under the category of "charity care." In many cases, a hospital may realize after the fact that the care it provided partially or entirely uncompensated care. Such care is also accounted for as a deduction from revenue (similar to the accounting treatment of contractual discounts), but is commonly allocated to "bad debt."[29] The majority of uncompensated care in California is actually accounted for as bad debt rather than charity care. More generally, hospitals and hospital systems vary in how they allocate uncompensated care into charity care and bad debt. As a result, the sum of charity care and bad debt is likely the more reliable dollar-denominated measure of uncompensated care (CBO, 2006; David and Helmchen, 2006). In the analysis below, we focus both on reported charity care and uncompensated care (charity care plus bad debt).

The value of uncompensated care reported in hospitals' financial statements may overstate the market value and the cost of uncompensated care. Charity care and bad debt are commonly computed using the list prices for services as reflected in each hospital's chargemaster. However, in practice, hospitals rarely if ever receive payment equal to their list charges. Private insurers commonly negotiate discounts under which actual payments may be 40-60% below list prices. Medicare payments are typically below private rates, and Medicaid

[29] See, for example, the discussion in Missouri Foundation for Health (2005).

rates are usually lower still. The uninsured are often billed full list charges, but they rarely actually pay those bills, which will be reflected in the high levels of bad debt.

This is likely to lead to biased estimates of charity care provision when inflation of and discounting from list charges are not constant across hospitals. As a result, hospitals that have higher list charges may appear to provide more uncompensated care than hospitals with lower list charges.[30] Cross-sectionally, the bias would be particularly severe if hospitals with more market power have a greater ability or propensity to inflate their list charges. Such tendencies, to the extent that they are time-invariant, are diminished by the inclusion of hospital fixed-effects in the econometric analysis. Nevertheless, there still remains the concern that the within-hospital co-movement of charity volume and price is responsive to the dynamics of competition. For example, hospitals in markets experiencing consolidation may use their market power to raise list prices without allocating more resources to enhancing the volume and type of uncompensated care provided.

To focus on the effect on charity volume, we construct a third measure of charity care provision that is based on the *volume* of inpatient service provided to uninsured patients. Each year, the Centers for Medicare and Medicaid Services (CMS) computes and publishes DRG "weights." From 2001 to 2007, the set of inpatient services hospitals offer were divided into roughly 550 Diagnosis Related Groups (DRGs). CMS determines weights for each DRG based upon regular surveys of hospitals for information on the cost of treating a typical patient in each DRG. The weights reflect the relative cost of treating patients in a particular DRG—for example, a patient in a DRG with a weight of 4 is four times as costly on average to treat as a patient in a DRG with a weight of 1. The volume based measure of care provided to various sets of patients that we analyzed below (e.g., Medicare, Medicaid, privately insured, uninsured. . .) is computed as the sum of the DRG weights for all patients in a given payer class. The three measures are defined in Table 1.

Figure 2 presents histograms describing the distributions of the three charity measures. Since larger hospitals are expected to provide higher nominal and physical rates of charity,

[30] See note 11, above.

measures of charity are divided by the number of staffed beds for each hospital. Charity measures, adjusted for size, appear to follow a log normal distribution.

Figure 3 presents statewide yearly trends in charity care, bad debt, and charity volume. Both charity care and uncompensated care (the sum of charity care and bad debt) doubled between 2001 and 2007. Charity volume, on the other hand, grew by just 25% over the same period.[31] This indicates that the growth in charity care and uncompensated care is driven by increases in both charges and patient volume, but more so the former.

Measuring competition

Computing traditional concentration measures such as the HHI or four-firm concentration ratio requires pre-specifying the geographic areas within which to compute market shares. Commonly used geographic units of analysis, such as counties or metropolitan statistical areas (MSAs), are, in the context of hospitals, not based on market demand conditions and do not take into account the set of available choices or the actual choices of patients. As a result, imposing such arbitrary market definitions may overstate or understate the true size of the market and generate spurious conclusions about the degree of competition faced by hospitals or produce a measure of concentration that has so much measurement error that it would be impossible to identify any relationship between concentration and charity care or market power.

To avoid this problem, we use an alternative measure of competition that does not require specifying any geographic market or market boundaries (this measure is similar to that used in Kessler and McClellan (2000)). Our competition measure is constructed as follows. In the first step, we calculate the standard HHI based on observed patient shares within each unique zip code and Major Diagnostic Category (MDC) combination (which we call a "micromarket") pair, taking joint ownership into account.[32] All hospitals that treat patients in

[31] Over this same period, the under-65 population of California grew by 3.4%, from 31.2 million to 32.3 million; the size of that group that is uninsured held steady at approximately 6.5 million (http://www.census.gov/hhes/www/hlthins/historic/hihistt6.xls). The increase in measured charity volume exceeds the growth in the uninsured population.

[32] Because we focus on acute care hospitals, for the purpose of measuring competition, we exclude MDCs 19 (psychiatric care) and 20 (alcohol and drug related admissions), which are also provided by standalone

a given MDC-zip code pair are part of this HHI calculation, so we do not impose any market boundaries (except insofar as we use data only from the state of California). In the second step, each hospital's HHI is computed as the weighted sum of micromarket HHIs, where the weight is the share of that hospital's patients that originate from each zip code-MDC combination.

In general, hospitals that draw patients from more concentrated zip codes and more concentrated service lines will have higher hospital-level HHIs. The higher a hospital's HHI, the weaker is the competitive pressure that it faces. Therefore, not surprisingly, a number of studies have demonstrated that this modified HHI is a good predictor of hospital prices, indicating that it is also a good measure of a hospital's or hospital system's market power (Gruber, 1994; Keeler, Melnick, and Zwanzinger, 1999; Dranove and Ludwick, 1999; Capps and Dranove 2004).[33]

Formally, the measure of the degree of competition faced by each hospital, *Hosp-HHI$_j$*, is defined as follows:

$$(3) \qquad \textit{Hosp-HHI}_j = \sum_{z=1}^{Z}\sum_{m=1}^{M}\left(\frac{\text{Hosp. j's patients from zip } z \text{ and MDC } m}{\text{Hosp. } j\text{'s total patients}}\right)\left(HHI_{z,m}\right)$$

$HHI_{z,m}$ is the typical HHI, computed as the sum of squared market shares among patients from zip code z with a diagnosis in MDC m. $HHI_{z,m}$ is calculated after combining the shares of hospitals that are jointly owned.

Using this measure of competition addresses the problems raised by pre-specifying a geographic market within which to measure competition. However, the *Hosp-HHI* is still theoretically subject to endogeneity (e.g., hospitals' prices determine their market share and

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psychiatric hospitals and addiction treatment centers, respectively. Additionally, these services are used disproportionately by the uninsured population and are considered unprofitable; therefore, they are not likely to contribute to or reflect the formation of market power. In order to avoid double-counting labor and delivery admissions, we also exclude DRG 391, the DRG for a normal newborn.

[33] Kessler and McClellan (2000) noted, correctly, that this competition measure is likely endogenous and proposed constructing the hospital-level HHIs using the predicted values from a discrete choice model that includes only exogenous right hand side variables (rather than observed market shares) to compute the HHI in each micromarket. In practice, estimating 7 years of logit models for the state of California is impractical and, as noted, the simpler measure based on observed micromarket shares is an effective predictor of hospital pricing.

thus the HHI, and prices may also affect the provision of charity care). Kessler and McClellan address this issue by substituted for the observed shares within each microsegment the predicted shares from a choice model that uses only exogenous factors (e.g., distance and age) as predictors. This approach is less practical in the current setting because, while Kessler and McClellan compute their concentration measures for heart attack admissions only, we study all acute care inpatient admissions.[34]

We view the concern as minimal. Primarily, this is because, due to the presence of insurance, the majority of the hospital population faces no variation or very modest variation in prices across in-network hospitals (the same is true of the uninsured, who typically do not pay their inpatient hospital bills). As a result, market shares and HHIs will only be affected by prices to the extent that determine whether hospitals are included in or excluded from insurers' networks.

This distinction was discussed in detail in Vistnes (2000), who described hospital competition as a "two stage" process. In the first stage, hospitals and insurers negotiate pricing and determine network structure. In the second stage, hospitals compete for patients primarily on the basis of non-price factors.[35] Additionally, Capps, Dranove, and Satterthwaite (2003) show that insurers have an incentive to assemble expansive hospitals networks. Conversely, most hospitals have at least some excess capacity and would find it profitable at the margin to enter agreements with as many insurers as possible. This explains why, in practice, most managed care networks include most hospitals.[36] Price, therefore, serves primarily to divide the gains from trade between hospitals and insurers (and the insurers' customers). The direct effect of price on patients' choices of hospitals is minimal, so we do not think endogeneity poses a problem in this context. We also explore a sensitivity analysis

[34] Compared to the data in Kessler and McClellan, our data encompass roughly 20 times as many patients per year and span seven years rather than four.

[35] The trial judge in the Evanston case described above adopted this model of competition in reaching his decision that Evanston Northwestern Healthcare's acquisition of Highland Park Hospital had resulted in anticompetitive price increases. "Initial Decision of Chief Administrative Law Judge Stephen J. McGuire," *In the Matter of Evanston Northwestern Healthcare Corporation and ENH Medical Group, Inc.,* No. 9315 (Federal Trade Commission October 21, 2005).

[36] This was less true in the 1990s, when HMOs were both more common than PPOs and tended to feature narrower networks. By the end of the 1990s, consumers had largely rejected narrow networks, and HMOs began offering broader networks (which PPOs had always offered). See Draper et al. (2002) and Ginsberg (2005).

that replaces the all-patient hospital-HHIs with the hospital-HHIs derived from just those patients in traditional Medicare. The hospitalization decisions of Medicare enrollees are unlikely to be affected by network restrictions (virtually all hospitals accept Medicare), pricing, or market power (Medicare prices are regulated).

Data overview

Table 2 presents summary statistics describing the time path of the number of hospitals, beds, utilization, financial information, and charity care provision from 2001-2007, separately for nonprofit, for-profit, and government hospitals. Over the sample period, the number of nonprofit hospitals declined by 10% and the number of for-profit hospitals declined by 24%. The bulk of this decline occurred after 2003 and was likely related to the requirement that hospitals complete seismic retrofitting by 2006 (i.e., some hospitals closed or converted to other uses rather than retrofit) (Chang and Jacobson, 2008). Average net income among for-profit hospitals also began a marked decline in 2004. Average net income among nonprofit hospitals, however, increased steadily over the sample period.

Average discharges at the surviving hospitals increased over time, consistent with the decline in the number of hospitals. The average number of beds increased only slightly over time, since exiting hospitals were smaller than average; therefore the growth in discharges per hospital was primarily the result of higher utilization of existing beds rather than the addition of new beds.[37]

The bottom three rows in each panel contain the annual averages of three measures of charity care. The first row contains reported charity care; the second contains uncompensated care; and the third contains the volume of service measure of charity care.[38] At nonprofit hospitals, all three measures grew rapidly over the sample period. Notably, as indicated in Figure 3, the volume-based measure of charity care grew at a much slower rate

[37] The average exiting hospital had 101.6 beds while the average staying hospital (i.e. a hospitals appearing every year in our sample) had 194.2 beds.

[38] The patient discharge data contain 10 different payer categories. This measured is constructed as the sum of DRG case weights provided to patients for whom the expected payer is either "County Indigent Programs," "Other Indigent", or "Self Pay."

than either of the two dollar-based measures of charity care. This suggests that some portion of the increase in measured charity care reflects factors other than increasing levels of uncompensated inpatient care. As discussed above, this could result from increases in list charges, decreases in reimbursement for some types of insured patients, or accounting practices that incorporate expenditures not directly related to patient care, such as medical research and teaching, into the reported charity care measures. Government hospitals reported growing levels of charity care and bad debt, but did not provide an increasing volume of inpatient care to the uninsured and indigent (as we show below, however, the *level* of inpatient care government hospitals provide to the uninsured, is high relative to their scale and revenue).

Figure 4 charts average hospital trends by ownership type for each of the three measures of charity provision. The left hand-side panel includes row means while the right hand-side panel tracks measures of intensity by dividing each charity measure by the number of staffed beds and averaging it across hospitals within ownership type. All charity measures for the average nonprofit hospital in our sample have risen over time (left hand-side panel). When adjusting for hospital size, the growth for nonprofit hospitals is more modest. For profit hospitals, due to their relatively smaller scale, have the highest rates of charity care per beds and uncompensated care per beds. Government hospitals provide a disproportionately high amount of charity volume, especially when accounting for their size. Nonprofit hospitals provided only slightly more charity volume compared to their for-profit counterparts.

Summary statistics for scale measures, concentration, and the three charity measures, are presented in Table 3. Three Hospital-HHI measures are also summarized: the first is derived from the full sample of patients, the second is based only on privately insured patients, and the third is calculated based only on Medicare patients. Our primary analysis relies on the first measure; results described in the sensitivity analysis below discuss reasons for considering these alternative measures and establish that our results are robust to alternative ways of computing our concentration measure.

The final column in Table 3 shows that over the full sample period, nonprofit hospitals actually account for a disproportionately *low* share of total charity care provision. Despite accounting for 70% of beds, discharges, and revenue, nonprofit hospitals account for only

63% of charity care and bad debt and only 54% of the total volume of inpatient service provided to the uninsured. Perhaps surprisingly, for-profit hospitals actually account for a disproportionately large amount of charity care measured in dollars, though the same is not true for the volume measure. Relative to their overall scale, government hospitals provide a particularly large volume of inpatient care to the uninsured—over one-third of the total volume of care provided to the uninsured is provided by government hospitals. This finding is consistent with a 2006 CBO report that reported that the average cost of uncompensated care as a share of hospitals' operating expenses is much higher at government hospitals (13.0 percent) than at either nonprofit hospitals (4.7 percent) or for-profit hospitals (4.2 percent).

As suggested by the theoretical section above, the disproportionately low level of charity care provided by nonprofit hospitals could be the result of competitive pressures that preclude charging prices to insured patients that are sufficiently high to facilitate cross-subsidizing uncompensated care. However, Table 3 also shows that nonprofit hospitals on average face less competition than for-profit hospitals. Moreover, while the degree of competition faced by for-profit hospitals has increased slightly over time (the average hospital-HHI for for-profits fell from 2,807 in 2001 to 2,647 in 2007), the degree of competition faced by nonprofit hospitals remained roughly unchanged over the sample period.

Results

The basic regression model posits that charity care measure m is a function of the degree of competition faced by a hospital and other potential control variables $W_{j,t}$ such as patient mix (e.g., uninsured patients living near a given hospital) or local demographics (e.g., income, urban/rural area):

$$Ln(Charity)_{j,t}^{(m)} = \alpha_0 + \alpha_j + \beta_j Hospital\_HHI_{j,t} + \gamma W_{j,t} + D_t + \varepsilon_{jt}.$$

The coefficient on the measure of market power, β_j, captures the extent to which hospitals with more market power provide more (or less) charity care. To identify potentially differing propensities to provide more charity care for a given level of market power, we allow the coefficient on the concentration measure to vary according to the ownership status of hospital j.

We explore two sets of models in the baseline analysis. The first is a set of cross-sectional and fixed effect models, presented in Table 4, which are robust to correlations between unobserved time-invariant hospital-specific factors and the error term. However, to the extent that the provision of charity care is related to time-invariant hospital characteristics (e.g., teaching status, ownership status, scale) or factors that are not available on an annual basis (e.g., income of the surrounding area), fixed effects regressions cannot identify potentially important determinants of the provision of charity care. Therefore, we also perform a set of cross-sectional regressions that include a wider set of hospital and area characteristics (presented in Table 5).

The hospital characteristics included in the full controls specifications include ownership type, teaching status, discharges, and an indicator for rural hospitals. Area characteristics are computed at the hospital service area (HSA) level and include the median income in each HSA, the 18-65 population, total population, the poverty rate, and the percentages of hospitalized residents that lack insurance and that have private insurance.[39] The variables describing the payer mix within each HSA are derived from the hospital discharge data and so vary over time; accordingly, these are included in both sets of models.

Our cross-sectional results are presented in the upper panel of Table 4. In the model without ownership interactions, the coefficient estimates on hospital-HHI are positive and statistically significant for all charity measures. Adding ownership interactions shows that there is no clear distinction between nonprofit and for profit hospitals in terms of the relationship between concentration and charity care, uncompensated care, and charity volume. If anything, for profit hospitals on average provide more charity care than nonprofit hospitals when they face less competition. Government hospitals provide less charity volume in more concentrated markets, but higher levels of charity and uncompensated are.

When hospital fixed-effects are included (lower panel of Table 4**)** the statistical significance disappears. Based on the point estimate, a 10% increase in Hosp-HHI is associated with

[39] HSAs are defined by the Dartmouth Atlas Project and are computed as collections of zip codes "whose residents receive most of their hospitalizations from the hospitals in that area." See http://www.dartmouthatlas.org/faq/data.shtm. For demographic data from the Census, HSA averages are calculated as population-weighted averages of the zip code level means. There are 215 HSAs in California that contain hospitals. See Figure 5.

about a 1.7% increase in the volume-measure of charity. So, based on the point estimate, a 4:3 merger (with equal shares pre- and post-merger, and with equal impact on all micro-segments) would increase the Hosp-HHI by about one-third and increase the volume of charity by about 5%. But there is no evidence that the effect is greater for for-profit hospitals than for nonprofit hospitals.

An intermediate case between the upper and lower panels of Table 4 is presented in Table 5, where instead of hospital fixed effects the regression is saturated with hospital-level and market-level characteristics.

As in the less saturated cross-sectional specifications, there is a significant relationship between concentration and the *charity volume*. But there is, again, no significant difference between for profit and nonprofit hospitals. Government hospitals' charity volume is either less sensitive to or negatively related to the degree of competition (i.e., government hospitals appear to provide less charity care in more concentrated markets).[40]

In terms of levels of charity volume, when compared to nonprofit hospitals and controlling for size, for-profit hospitals provide lower charity volume while government hospitals provide substantially higher charity volume. That is, holding factors other than the degree of competition constant, nonprofits do appear to provide somewhat more charity volume than for profits. But as concentration increases, the gap between for profits and nonprofits either stays the same or narrows. Moreover, controlling for scale, nonprofits provide substantially less charity volume than government hospitals.

Teaching hospitals may provide slightly more charity care under the first two dollar-denominated measures and they provide significantly more charity volume than nonteaching hospitals. Rural hospitals have higher levels of charity and uncompensated care (after controlling for size), but provide less charity volume.

[40] As a basic check of the reasonableness of the market power measure, we replace our dependent variable from Table 5 with price measures. We analyze two price measures: (1) a severity adjusted overall price and (2) a price index based on conditions (DRGs) treated at a broad set of hospitals. The results are presented in Table 6. We find that our concentration measure (Hosp-HHI) is an effective predictor of prices, though the relationship is not significant when hospital fixed effects are included.

The percentage of privately insured discharges in a hospital's HSA generally has a statistically significant and positive effect on all three measures, though the effect appears strongest in rural areas (the coefficient on the privately insured percentage is smaller and insignificant in the specifications that exclude rural hospitals). Under the cross-subsidization theory, hospitals use profits from privately insured patients to provide care to the uninsured, implying that hospitals in an area with a higher percentage of privately insured patients are more able to provide charity care. Alternatively, hospitals with higher uncompensated care burdens may be able to demand higher prices from insurers (e.g., by having a credible threat to exit the market). Additionally, the percentage of uninsured patients in a hospital's HSA has a positive and significant effect on *charity volume*. .

As expected, larger hospitals have higher levels of care and uncompensated care and charity volume but, as evidenced by the coefficient on the log of total discharges being close to 1, the effect is roughly proportional to scale. The coefficient on discharges is close to 1 based on the charity volume measure but is well above 1 for the other two measures. This likely reflects large hospitals having higher list charges.

Overall, the only measure that shows a consistent positive relationship between concentration and charity care provision by nonprofits is the volume-based measure. And, even for that measure, there is no significant difference between for profits and nonprofits.[41]

Sensitivity analyses

One potential concern is that the measure of competition, the Hosp-HHI, may be endogenous. Kessler and McClellan (2000) noted, correctly, that this competition measure is likely endogenous and proposed constructing the hospital-level HHIs using the predicted values from a discrete choice model that includes only exogenous right hand side variables (rather than observed market shares) to compute the HHI in each micromarket. As noted above, this is impractical in the current analysis. As an alternative approach, we construct a version of the Hosp-HHI that is based solely on patients covered by Traditional Medicare (i.e., Fee-for-service Medicare). Medicare patients have essentially unfettered choice of

[41] Note that the positive relationship between concentration and all measures of charity care provision vanishes under the fixed effects regressions (see Table 4). This casts some doubt on whether there is any causal relationship between concentration and charity care provision.

hospitals and, because Medicare pays rates that are set administratively, Medicare patients also face little if any price variation across hospitals. Therefore, hospitals' shares among Medicare patients are very unlikely to be affected by hospital market power or pricing.[42] As shown in Appendix A, the results under this alternative measure of concentration are very similar to those under the baseline concentration measure.

We also considered the possibility that some service lines may be intrinsically unprofitable and also highly concentrated, in which case the apparent "concentration" may in fact be the provision of a community benefit. As a first note, our analysis focuses on acute inpatient care and so our concentration measure excludes two services, psychiatric care and rehabilitation, often cited as unprofitable.[43] The acute care service lines most often cited as unprofitable include trauma care, burn care, the emergency department, neonatology, and, to a lesser extent, labor and delivery.[44] Even among these services, however, privately insured patients are likely to be profitable. To explore whether we may be conflating concentration in unprofitable service lines and patients, we also estimate versions of the same models using the Hosp-HHI as constructed only from privately insured patients. The results are very similar to those under the baseline concentration measure and the Medicare-derived measure.[45] (We revisit unprofitable services below.)

Finally, we also considered the possibility that the results were driven primarily by cross-sectional variation rather than within-hospital variation over time. To address this, we estimate the model using only hospitals that are in the bottom and top 25% of the distribution of changes in the Hosp-HHI from the beginning to the end of the sample.[46] As shown in Appendix D, the results under this restricted sample are also qualitatively similar. While more concentration is associated with more charity care provision, the effect of

[42] However, hospitals' shares of Medicare patents in various microsegments is an imperfect proxy for the preferences of privately insured patients.
[43] [CITE]
[44] [CITES] Note that visits to the emergency department (ED) are not recorded as inpatient care; only if an ED patient stays overnight, that patient would typically be admitted to the hospital and treated as an inpatient admission.
[45] These tables are omitted but are available upon request.
[46] 25% of hospitals had a decrease in the Hosp-HHI of 237 or more and 25% of hospitals had an increase in the HHI of more than 108. The former would correspond to a firm with a share of roughly 22% splitting into two firms; the latter would correspond to a merger of two firms with shares of roughly 7% each.

concentration on *charity volume* is not larger for nonprofit hospitals than for for-profit hospitals.

Unprofitable Services

It is possible that nonprofit hospitals use their profits to provide services that are unprofitable, even if they are not disproportionately provided to uninsured patients. As noted above, hospital services commonly cited as unprofitable include psychiatric care, rehabilitation, the emergency department, trauma services, burn care, neonatology, and labor and delivery. Offerings of these services by ownership type are presented in Table 7. It is clear from this table that nonprofit and government services are the most common providers of these services. However, as shown in the pattern of results relating concentration to the provision of these services (see Table 8), nonprofits are no more likely to offer these services as concentration falls than are for profit hospitals. Specifically, these services are generally more likely to be provided by hospitals in more concentrated markets. However, this effect is not confined to nonprofit hospitals and, for three services, the effect of concentration on the probability of providing these unprofitable or less profitable services appears stronger for for-profit hospitals.[47]

V. Conclusion

Our theoretical model suggests that welfare implications of the suppression of competition through mergers will depend on the social value placed on increasing consumption of favored groups, industry profitability, and the link between market concentration and charity care provision. However, our empirical results offer little support for the proposition that nonprofit hospitals with more market power will use the resulting profits to cross-subsidize care for the uninsured., and therefore our results provide no support for treating nonprofit hospitals differently than for profit hospitals under the antitrust laws.[48]

[47] These are ER, OB, and Neonatology.

[48] Garmon (2009) also reaches this conclusion.

There is an apparent conflict between the tax laws, which offer nonprofits favorable treatment in exchange for community benefits, and the antitrust laws, which do not similarly favor nonprofits. In light of our empirical results, modifying antitrust policy to remove this inconsistency risks creating deadweight loss in the commercially-insured market without the offsetting benefit of higher levels of care provided to the indigent and uninsured.

Political pressures are emerging that could ultimately force nonprofit hospitals to provide more uncompensated care in order to retain their nonprofit status.[49] Should such pressure prove effective, the potential benefit of higher pricing by nonprofit hospitals would need to be revisited. Even in that case, our view is that reliance on hospitals' local market power to achieve the desirable goal of serving the indigent and uninsured is inefficient and could be better achieved in other ways (e.g. universal heath care coverage). Funding indigent care via local market power is a second best solution, at best.

The concept of universal health care coverage rules out free care provision to uninsured individuals, as, by definition, insurance coverage would be universal. This raises the broader issue of the role of nonprofit hospitals in providing benefits to their communities under universal health care coverage, and in particular, the diminished need to use tax exemptions to facilitate the delivery of care to the poor. While shortfalls from public payers could necessitate the use of cross-subsidization, the rationale for granting tax exemptions to nonprofit hospitals may grow even weaker should insurance coverage expands.

[49] See, for example, "Grassley Targets Nonprofit Hospitals on Charity Care," *Wall Street Journal*, December 18, 2008

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VII. Appendix A: Welfare analysis for the case of linear demand curves

We now present an example to illustrate how a merger of nonprofit hospitals can increase social welfare by suppressing competition. Following our analysis above, suppose that a hospital monopolist produces a single service at a total cost of $c(q) = F + cq$, and that it is able to divide the aggregate demand into two groups: rich patients (Market 1) and poor patients (Market 2). These two groups have two distinct downward-sloping demand curves for hospital services, the demand curves are known to the monopolist, and there is no opportunity for arbitrage between groups, as medical care is "non-tradable" from the patient prospective. To illustrate our point simply, we assume that under uniform pricing Market 2 is not served profitably when price is set at marginal cost. This is important for our example because when demand curves are linear, price discrimination results in lower welfare and uniform price is favored (Schmalensee, 1981). In our model however, since the poor are excluded under a uniform price, the welfare implications of price discrimination are ambiguous.

The monopolist chooses a price for each group. Let $\{P_1, P_2\}$ denote the prices in Market 1 and Market 2 respectively. Assume that the demand curve in Market *i* is $q_i = a_i - b_i P_i$. Serving Market *i* is profitable if $P_i > c$, or $a_i > c \cdot b_i$ for $i = 1, 2$. If this condition is violated a for-profit monopoly will not engage in price discrimination. Instead, it will choose a uniform price (i.e. set price in both markets equal to the monopoly price for rich patients). Such pricing behavior excludes poor patients from receiving services. On the other hand, a nonprofit monopoly may serve markets in which this condition is violated. By relying on other segments of the population for whom they can price above cost (Market 1), the nonprofit firm will price below cost in Market 2 without violating its non-distribution constraint, which applies to the organization as a whole.

Under the assumption that $cb_2 - a_2 > 0$ a for-profit monopoly will always choose to exclude the poor ($q_2^F = 0$). On the other hand, a sufficient condition for a nonprofit monopoly to serve the poor is the ability to set P_1 above c. The monopoly will supply services to the

poor even in the extreme case, where the social value of serving the poor (for every level of quantity) is lower than the social cost. As previously discussed, under these conditions, poor patients are served only if the hospital is nonprofit. However, this does not imply that, for example, merger to monopoly will necessarily increase welfare. The change in welfare across groups is given by:

$$\Delta W = \left[\int_0^{q_2^M} [P_2(x) + \alpha - c]dx\right] - \left[\int_{P_1^D}^{P_1^M} q_1(x)dx\right]$$

The first term is the surplus generated in Market 2 as a result of such merger to monopoly and the second term is the loss of consumer surplus in Market 1. As expected the desirability of merger (i.e. suppression of competition) increases with α, the additional value that society places on each unit of the poor's consumption. While the nonprofit monopolist does not consider α when choosing the quantity of services to the poor, a greater α will increase the social benefits from eliminating competition. Subsequently this would raise the attractiveness of 501(c)(3) organizations as a vehicle for achieving social goals.

Following Proposition 2, the price for paying consumers chosen by the monopolist (problem (1)) is given by $P_1^M = \frac{a_1 + c \cdot b_1}{2 \cdot b_1}$, whereas, the price chosen by the social planner (problem (2)) is given by $P_1^* = \frac{\lambda \cdot a_1 + (1+\lambda) \cdot c \cdot b_1}{(1+2\lambda) \cdot b_1}$. The profit condition $a_1 > c \cdot b_1$ is necessary and sufficient for $P_1^M > P_1^*$.[50] Hence, as in the general case, the altruistic nonprofit monopolist overprices healthcare to the rich and over-provides services to the poor.

[50] Proof: $a_1 > c \cdot b_1$

$\Rightarrow a_1 \cdot b_1 > c \cdot b_1^2 \Rightarrow a_1 \cdot b_1 + c \cdot b_1^2 > 2 \cdot c \cdot b_1^2$

$\Rightarrow a_1 \cdot b_1 + c \cdot b_1^2 + 2 \cdot \lambda \cdot (a_1 \cdot b_1 + c \cdot b_1^2) > 2 \cdot c \cdot b_1^2 + 2 \cdot \lambda \cdot (a_1 \cdot b_1 + c \cdot b_1^2)$

$\Rightarrow (a_1 + c \cdot b_1) \cdot (1 + 2 \cdot \lambda) \cdot b_1 > 2 \cdot b_1 \cdot (\lambda \cdot a_1 + (1+\lambda) \cdot c \cdot b_1) \Rightarrow \frac{a_1 + c \cdot b_1}{2 \cdot b_1} > \frac{\lambda \cdot a_1 + (1+\lambda) \cdot c \cdot b_1}{(1+2 \cdot \lambda) \cdot b_1}$

$\Rightarrow P_1^M > P_1^*$

VIII. Figures and tables (body)

Figure 1. Graphical analysis of cross-subsidization

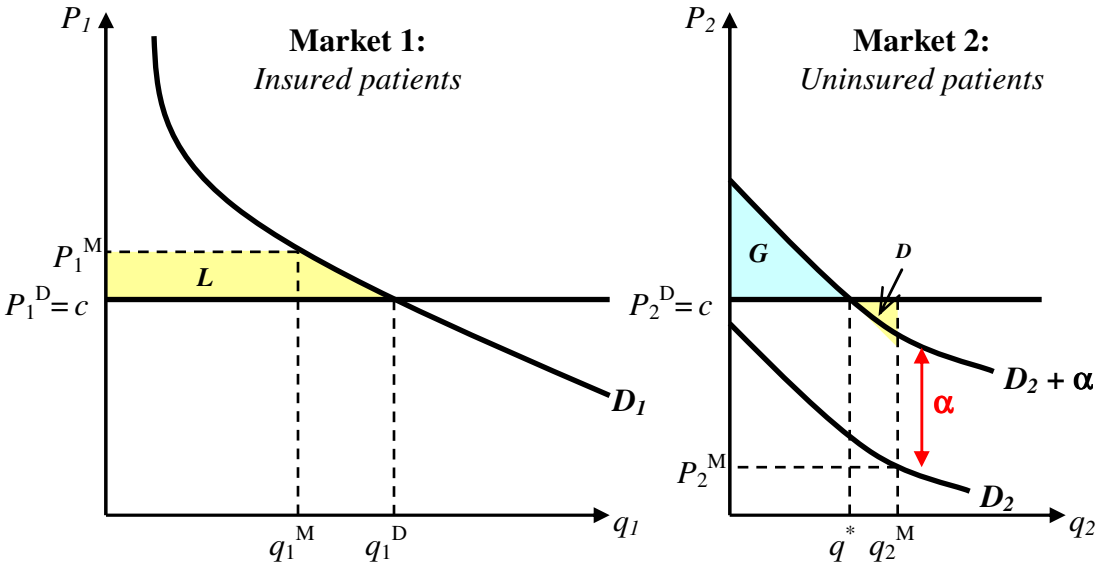
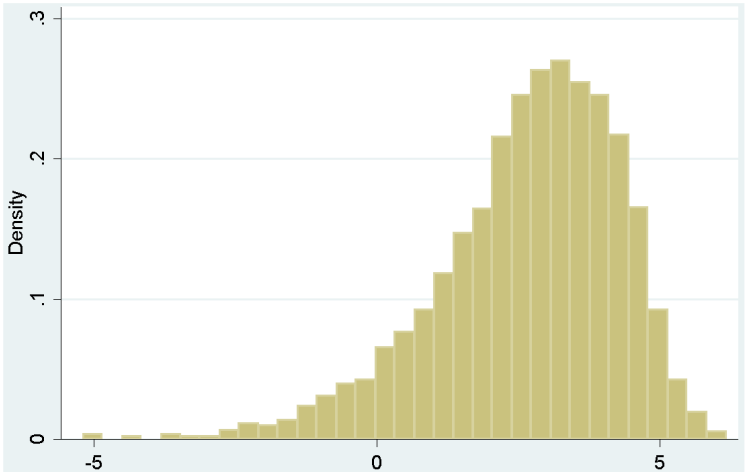
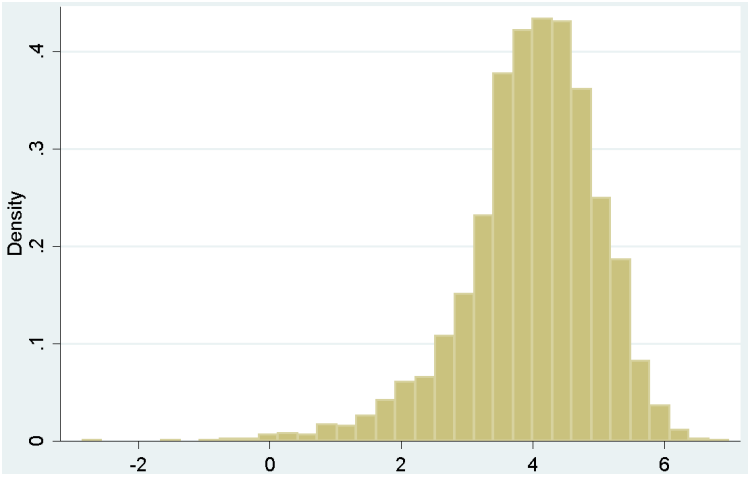


Figure 2. Histograms of Charity Measures (per number of staffed beds)

Ln(Dollars of Charity Care per staffed bed)



Ln(Dollars of Uncompensated Care per staffed bed)



Ln(Charity Volume per Staffed Bed)

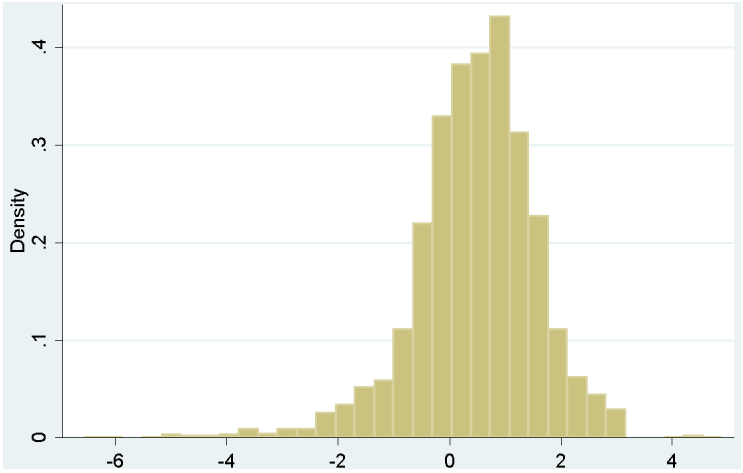


Figure 3. The Growth of Charity Care, Bad Debt, and Charity Volume, 2001 – 2007

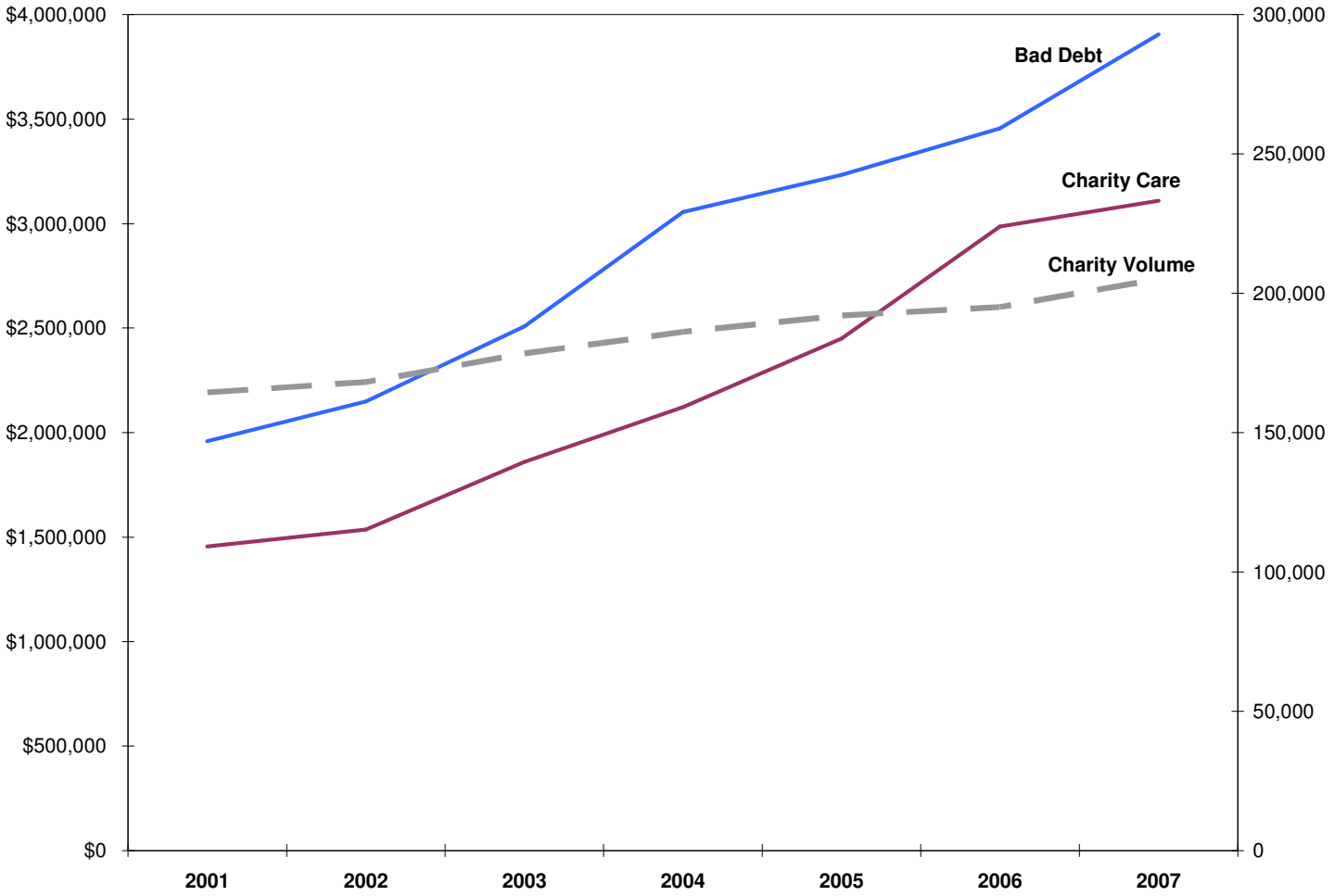


Figure 4. Average hospital trends for the three charity measures, 2001-2007

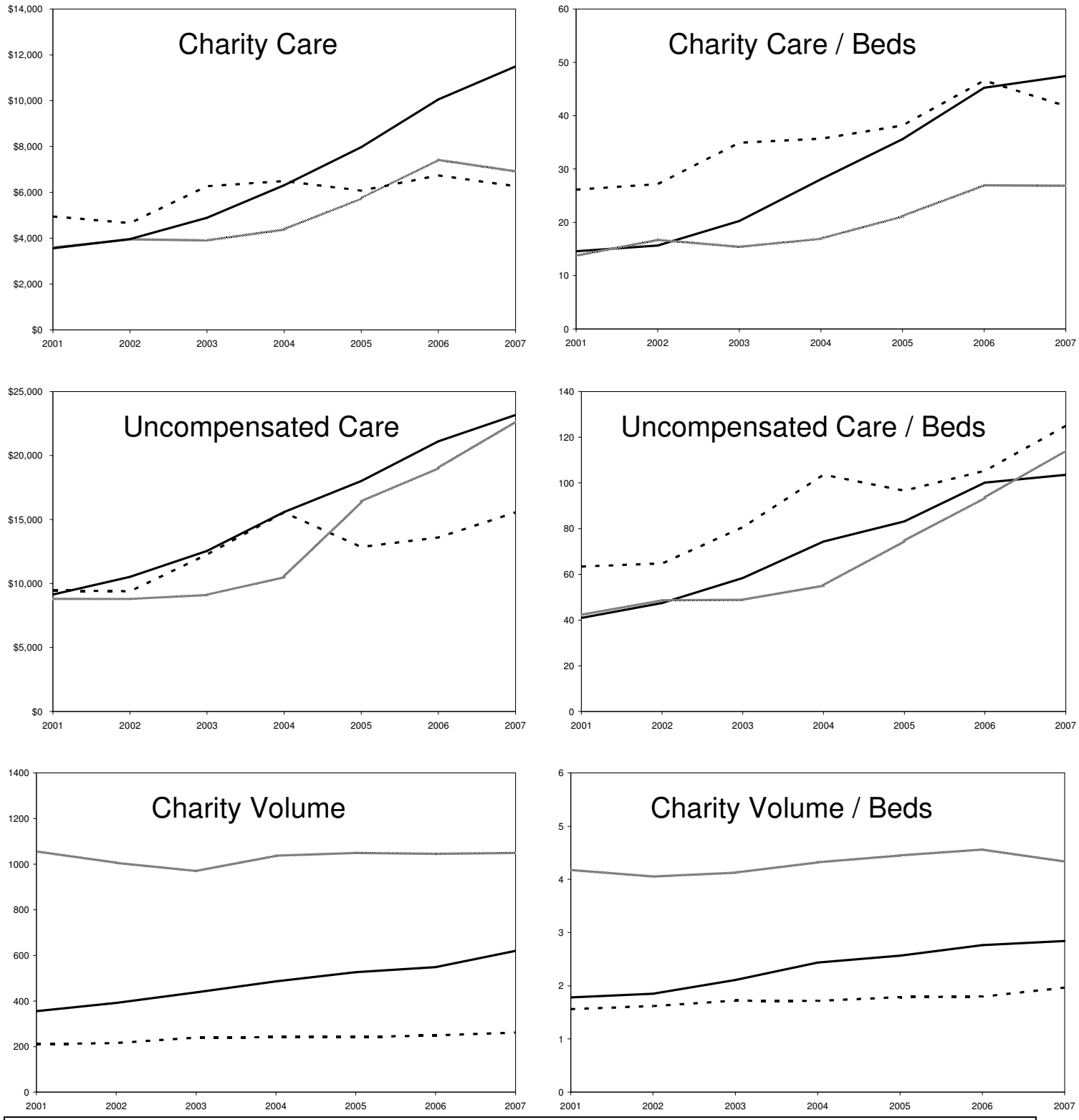


Figure 5. Hospital Service Areas (HSAs) in California

Table 1: Measures of Charity Care

Measure	Definition	Limitations
Charity Care	Reported Dollar amount for charity care	• Represents forgone charges, not incurred expenses or forgone revenue • Reporting variation across hospitals (some hospitals include only services for which the hospital does not expect to be compensated, while others include Medicare and Medicaid shortfalls, teaching and research, and even private payer shortfalls relative to list charges)
Uncompensated Care	Reported charity care + bad debt	• Represents forgone charges, not incurred expenses or forgone revenue • Reporting variation across hospitals • Bad debt may not indicate charitable intentions and could be a reflection of poor management practices • Bad debt may be generated from insured patients
Charity Volume	"DRG units" of care provided to uninsured/self-pay patients	• Does not reflect fixed investments in facilities • Based solely on inpatient data • Does not account for quality of care • Reflects cost of services, which is only a proxy for the quality of services

Table 2. Summary data for California hospitals, 2001-2007

Control	Variable	2001	2002	2003	2004	2005	2006	2007
Nonprofit	N	218	213	212	207	201	200	195
	Beds - staffed	212.84	221.73	221.49	214.27	217.94	217.58	222.28
	Discharges	10,286.91	10,364.35	10,934.70	11,281.37	11,656.43	11,868.80	12,156.62
	Gross IP Rev ($1000s)	$225,993	$263,653	$321,724	$372,828	$427,959	$471,437	$523,377
	Net income ($1000s)	$4,625	$6,086	$6,545	$7,336	$9,585	$13,778	$17,117
	Charity ($1000s)	$3,557	$3,964	$4,893	$6,314	$7,972	$10,059	$11,494
	Charity + Bad debt ($1000s)	$9,139	$10,512	$12,555	$15,586	$18,001	$21,099	$23,159
	Charity: DRG measure	356.20	391.88	437.55	486.38	526.05	548.53	620.20
For-profit	N	91	94	90	83	79	74	69
	Beds - staffed	134.99	133.20	139.17	140.83	135.27	138.69	133.14
	Discharges	6,041.21	6,096.65	6,472.96	6,433.84	6,629.18	7,159.58	6,952.48
	Gross IP Rev ($1000s)	$210,249	$253,422	$312,569	$318,183	$331,188	$363,077	$364,997
	Net income ($1000s)	$7,019	$7,739	$8,531	$(1,156)	$1,027	$863	$755
	Charity ($1000s)	$4,945	$4,662	$6,272	$6,497	$6,077	$6,740	$6,270
	Charity + Bad debt ($1000s)	$9,455	$9,395	$12,261	$15,553	$12,857	$13,591	$15,546
	Charity: DRG measure	210.81	215.85	239.57	241.71	241.95	249.15	261.80
Government	N	64	64	66	63	64	64	63
	Beds - staffed	147.66	146.19	146.94	155.21	155.92	152.25	154.10
	Discharges	6,725.70	6,625.08	6,677.74	7,042.48	7,160.25	7,255.53	7,301.54
	Gross IP Rev ($1000s)	$137,114	$156,172	$173,589	$197,188	$215,932	$232,279	$244,590
	Net income ($1000s)	$20,500	$19,502	$20,649	$22,035	$26,554	$3,993	$4,425
	Charity ($1000s)	$3,595	$3,953	$3,903	$4,378	$5,739	$7,428	$6,918
	Charity + Bad debt ($1000s)	$8,794	$8,791	$9,106	$10,499	$16,395	$19,009	$22,646
	Charity: DRG measure	1,056.60	1,005.98	970.29	1,037.76	1,049.29	1,045.66	1,049.57
Medical care CPI (2001 = 100)		100	104.69	108.91	113.67	118.48	123.24	128.69

Table 3. Scale and charity provision, full sample period

Control	Variable	Mean	S.D.	Min	Max	% of Total
Nonprofit (N = 1446)	Beds - staffed	218	153	12	911	68.2%
	Discharges	11,197	7,947	27	48,664	70.1%
	Net patient rev. ($1000s)	$149,725	$185,798	$0	$1,467,459	69.2%
	Charity	$6,791	$13,178	$0	$126,227	63.3%
	Charity + Bad debt	$15,542	$20,868	$0	$183,617	62.8%
	Charity: Volume measure	478	628	0	4,617	53.6%
	Hospital-HHI: Full Sample	3,660	1,525	1,526	8,523	
	Hospital-HHI: Private	3,699	1,435	1,707	10,000	
	Hospital-HHI: Medicare	4,791	1,566	1,705	9,189	
For-profit (N = 580)	Beds - staffed	136	88	2	434	17.1%
	Discharges	6,505	4,487	39	20,065	16.3%
	Net patient rev. ($1000s)	$79,304	$70,236	$909	$405,639	14.7%
	Charity	$5,868	$10,321	$0	$82,052	21.9%
	Charity + Bad debt	$12,469	$14,962	-$3,260	$118,556	20.2%
	Charity: Volume measure	236	247	0	1,630	10.6%
	Hospital-HHI: Full Sample	2,774	1,241	1,391	7,905	
	Hospital-HHI: Private	2,793	1,101	1,352	7,689	
	Hospital-HHI: Medicare	3,601	1,243	1,165	8,551	
Government (N = 448)	Beds - staffed	151	142	15	737	14.6%
	Discharges	6,968	8,244	16	44,559	13.5%
	Net patient rev. ($1000s)	$112,067	$158,442	$2,490	$994,627	16.1%
	Charity	$5,123	$16,586	$0	$173,952	14.8%
	Charity + Bad debt	$13,572	$30,971	$0	$376,573	17.0%
	Charity: Volume measure	1,030	2,046	0	16,401	35.8%
	Hospital-HHI: Full Sample	3,951	1,332	1,495	7,324	
	Hospital-HHI: Private	4,037	1,494	1,979	10,000	
	Hospital-HHI: Medicare	4,894	1,359	1,590	8,750	

Table 4. Cross-sectional and fixed effects results, log-log specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No ownership interactions[A]			Ownership interactions [A]			Payer mix controls [B]		
	Charity Care	Uncomp. Care	Charity Volume	Charity Care	Uncomp. Care	Charity Volume	Charity Care	Uncomp. Care	Charity Volume
Cross-Sectional									
Ln(Hosp-HHI)	0.608***	0.126**	0.273***	0.0414	-0.0723	0.424***	0.0186	-0.0138	0.534***
	(0.132)	(0.0593)	(0.0456)	(0.133)	(0.0606)	(0.0580)	(0.149)	(0.0692)	(0.0595)
Ln(Hosp-HHI) * For-Profit				0.0731	0.351**	0.104	0.0769	0.323**	0.0639
				(0.345)	(0.154)	(0.110)	(0.351)	(0.157)	(0.107)
Ln(Hosp-HHI) *Government				3.501***	0.704***	-1.130***	3.545***	0.619***	-1.308***
				(0.467)	(0.215)	(0.115)	(0.482)	(0.229)	(0.118)
Observations	2,297	2,294	2,297	2,297	2,294	2,297	2,297	2,294	2,297
R-squared	0.397	0.617	0.699	0.422	0.621	0.710	0.422	0.622	0.716
Hospital Fixed-Effects									
Ln(Hosp-HHI)	0.874	0.215	0.168	0.799	0.218	0.152	0.791	0.202	0.160
	(0.574)	(0.272)	(0.191)	(0.582)	(0.273)	(0.189)	(0.588)	(0.278)	(0.190)
Ln(Hosp-HHI) * For-Profit				0.0605	-0.000848	0.0143	0.0598	-0.00125	0.0144
				(0.0528)	(0.0178)	(0.0202)	(0.0527)	(0.0180)	(0.0203)
Ln(Hosp-HHI) *Government				0.0816	-0.0277	-0.0100	0.0829	-0.0286	-0.00919
				(0.0976)	(0.0315)	(0.0227)	(0.0976)	(0.0320)	(0.0231)
Observations	2,297	2,294	2,297	2,297	2,294	2,297	2,297	2,294	2,297
R-squared	0.826	0.858	0.946	0.826	0.858	0.946	0.827	0.858	0.946

[A] Specification also includes year dummies, For-profit and Government hospital dummies, Ln(Total Discharges)

[B] Specification also includes year dummies, For-profit and Government hospital dummies, Ln(Total Discharges), HSA % Privately insured, HSA % Self-pay

Notes Heteroskedasticity-robust standard errors are reported in parentheses below the estimated coefficients.

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

Table 5. Full covariates results, log-log specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full			Full sample, including HRR fixed effects			Excluding rural hospitals		
	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume
Ln(Hosp-HHI)	-0.140	-0.114	0.550***	-0.279	-0.289**	0.252***	-0.172	-0.0670	0.428***
	(0.158)	(0.0730)	(0.0637)	(0.258)	(0.117)	(0.0908)	(0.178)	(0.0793)	(0.0784)
Ln(Hosp-HHI) * 1[FP]	0.0193	0.324**	0.0262	-0.0862	0.335**	0.0997	0.243	0.377***	0.172
	(0.352)	(0.159)	(0.108)	(0.383)	(0.142)	(0.121)	(0.397)	(0.128)	(0.132)
Ln(Hosp-HHI) * 1[Govt.]	3.622***	0.636***	-1.135***	3.905***	0.859***	-1.138***	6.843***	1.684***	-1.520***
	(0.476)	(0.220)	(0.113)	(0.558)	(0.249)	(0.126)	(0.747)	(0.330)	(0.174)
1[FP]	-0.449	-2.577**	-0.330	0.484	-2.605**	-0.938	-1.940	-2.836***	-1.508
	(2.801)	(1.261)	(0.880)	(3.042)	(1.129)	(0.978)	(3.157)	(1.027)	(1.061)
1[Govt.]	-31.50***	-5.521***	9.868***	-33.70***	-7.337***	9.976***	-58.20***	-14.14***	13.26***
	(3.990)	(1.844)	(0.948)	(4.656)	(2.064)	(1.046)	(6.170)	(2.749)	(1.446)
Teaching hosp.	0.131	0.0715	0.589***	-0.0667	0.0200	0.551***	0.568**	0.172	0.481***
	(0.225)	(0.124)	(0.0804)	(0.229)	(0.134)	(0.0817)	(0.220)	(0.120)	(0.0894)
Ln(Total discharges)	1.423***	1.047***	1.026***	1.481***	1.054***	1.045***	1.680***	1.200***	0.988***
	(0.0641)	(0.0373)	(0.0266)	(0.0660)	(0.0431)	(0.0290)	(0.0756)	(0.0452)	(0.0379)
Rural hosp	0.444**	0.263***	-0.309***	0.705***	0.306***	-0.322***			
	(0.189)	(0.0767)	(0.0577)	(0.191)	(0.0850)	(0.0616)			
Ln(HSA population)	-0.0423	-0.0507*	-0.0526**	-0.0864	-0.0736**	-0.0469**	-0.135**	-0.102***	-0.0500*
	(0.0567)	(0.0279)	(0.0210)	(0.0590)	(0.0296)	(0.0215)	(0.0654)	(0.0283)	(0.0270)
HSA: median income	-0.329	0.217**	-0.331***	-0.969***	-0.0987	-0.487***	-0.271	0.239**	-0.214*
	(0.259)	(0.104)	(0.0995)	(0.320)	(0.142)	(0.113)	(0.276)	(0.114)	(0.110)
HSA: %Uninsured	-1.997	5.057**	7.679***	5.165	5.852***	8.450***	-0.143	5.192**	7.885***
	(4.123)	(1.966)	(1.383)	(4.201)	(1.844)	(1.510)	(5.414)	(2.462)	(1.790)
HSA: %Privately insured	0.986	-0.317	0.449*	2.060***	-0.120	0.530**	1.244	-0.511	0.155
	(0.766)	(0.340)	(0.253)	(0.783)	(0.333)	(0.264)	(0.859)	(0.384)	(0.299)
year==2002	0.0683	0.116	0.0337	0.0815	0.118	0.0354	0.0428	0.0916	0.0565
	(0.184)	(0.0784)	(0.0637)	(0.180)	(0.0775)	(0.0613)	(0.210)	(0.0883)	(0.0738)
year==2003	0.290	0.227***	0.0741	0.308*	0.231***	0.0725	0.273	0.191**	0.0786
	(0.183)	(0.0810)	(0.0654)	(0.178)	(0.0797)	(0.0631)	(0.207)	(0.0926)	(0.0767)
year==2004	0.546***	0.445***	0.112*	0.551***	0.445***	0.108*	0.461**	0.419***	0.120
	(0.187)	(0.0805)	(0.0676)	(0.182)	(0.0796)	(0.0654)	(0.212)	(0.0928)	(0.0798)
year==2005	0.927***	0.562***	0.176***	0.944***	0.567***	0.166***	0.817***	0.528***	0.184**
	(0.182)	(0.0723)	(0.0640)	(0.178)	(0.0710)	(0.0621)	(0.206)	(0.0809)	(0.0749)
year==2006	1.222***	0.683***	0.241***	1.241***	0.689***	0.232***	1.150***	0.643***	0.244***
	(0.178)	(0.0738)	(0.0618)	(0.175)	(0.0721)	(0.0601)	(0.201)	(0.0781)	(0.0720)
year==2007	1.236***	0.755***	0.241***	1.249***	0.760***	0.234***	1.080***	0.702***	0.267***
	(0.182)	(0.0740)	(0.0618)	(0.178)	(0.0724)	(0.0604)	(0.204)	(0.0810)	(0.0718)
Constant	-0.871	-1.414	-4.312***	6.480*	3.492**	-0.505	-2.530	-2.723*	-4.213***
	(3.089)	(1.333)	(1.263)	(3.630)	(1.771)	(1.387)	(3.552)	(1.604)	(1.524)
Observations	2294	2291	2294	2294	2291	2294	1830	1827	1830
R-squared	0.421	0.623	0.723	0.459	0.641	0.741	0.365	0.534	0.615

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Price regressions

	(1)	(2)	(3)	(1)	(2)	(3)
	Ln(Price per DRG unit)			Ln(Top DRG price index)		
	Base	Base + HRR FE	Base + Hospital FE	Base	Base + HRR FE	Base + Hospital FE
Ln(Hosp-HHI)	0.549***	0.457***	0.149	0.549***	0.402***	0.0672
	(0.0418)	(0.0584)	(0.143)	(0.0401)	(0.0525)	(0.128)
Ln(Hosp-HHI) * 1[FP]	-0.161**	-0.0707	0.00795	-0.105*	-0.00760	0.0183
	(0.0679)	(0.0808)	(0.0185)	(0.0611)	(0.0720)	(0.0128)
Ln(Hosp-HHI) * 1[Govt.]	-0.197***	-0.275***	-0.0362*	-0.225***	-0.296***	-0.0226
	(0.0741)	(0.0788)	(0.0196)	(0.0630)	(0.0683)	(0.0187)
1[FP]	1.277**	0.592		0.868*	0.142	
	(0.547)	(0.646)		(0.495)	(0.577)	
1[Govt.]	1.525**	2.183***		1.760***	2.342***	
	(0.612)	(0.650)		(0.521)	(0.565)	
Teaching hosp.	0.495***	0.458***		0.344***	0.324***	
	(0.0333)	(0.0333)		(0.0306)	(0.0310)	
Rural hosp	-0.0308	-0.0638*		0.0372	0.00298	
	(0.0380)	(0.0386)		(0.0331)	(0.0314)	
Casemix index	0.214***	0.213***	0.128**	0.117***	0.116***	0.137**
	(0.0436)	(0.0434)	(0.0551)	(0.0386)	(0.0365)	(0.0543)
Ln(HSA population)	0.0164	0.0321**		0.0110	0.0213**	
	(0.0126)	(0.0126)		(0.00949)	(0.00962)	
HSA: median income	0.377***	0.312***		0.322***	0.335***	
	(0.0533)	(0.0665)		(0.0498)	(0.0625)	
HSA: %Uninsured	1.519*	0.229		1.266	0.670	
	(0.921)	(0.968)		(0.800)	(0.823)	
HSA: %Privately insured	-0.127	-0.246		0.00872	-0.295**	
	(0.154)	(0.160)		(0.139)	(0.145)	
year==2002	0.133***	0.131***	0.133***	0.163***	0.163***	0.162***
	(0.0426)	(0.0412)	(0.0311)	(0.0388)	(0.0373)	(0.0296)
year==2003	0.254***	0.251***	0.242***	0.281***	0.280***	0.273***
	(0.0389)	(0.0374)	(0.0285)	(0.0360)	(0.0346)	(0.0273)
year==2004	0.393***	0.388***	0.373***	0.412***	0.408***	0.398***
	(0.0381)	(0.0365)	(0.0283)	(0.0353)	(0.0337)	(0.0267)
year==2005	0.449***	0.448***	0.425***	0.462***	0.459***	0.445***
	(0.0382)	(0.0366)	(0.0288)	(0.0348)	(0.0332)	(0.0272)
year==2006	0.517***	0.513***	0.491***	0.530***	0.527***	0.511***
	(0.0384)	(0.0366)	(0.0291)	(0.0359)	(0.0342)	(0.0274)
year==2007	0.634***	0.630***	0.617***	0.660***	0.657***	0.647***
	(0.0383)	(0.0366)	(0.0303)	(0.0352)	(0.0335)	(0.0282)
Constant	-0.310	1.031	7.342***	0.322	1.364*	7.863***
	(0.703)	(0.898)	(1.167)	(0.662)	(0.810)	(1.045)
Observations	2278	2278	2279	2267	2267	2268
R-squared	0.308	0.380	0.740	0.307	0.393	0.729

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Summary statistics for unprofitable service offerings

	Nonprofit		For profit		Government	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
ER	92.9%	25.7%	79.5%	40.4%	93.1%	25.4%
Trauma	56.3%	49.6%	35.3%	47.8%	56.3%	49.7%
Psychiatric	31.2%	46.3%	28.6%	45.2%	31.0%	46.3%
OB	80.8%	39.4%	68.6%	46.4%	66.6%	47.2%
Neonatology	56.6%	49.6%	29.5%	45.6%	38.8%	48.8%
Burn ICU	4.9%	21.6%	3.1%	17.4%	5.3%	22.5%

Table 8. Probit regressions for unprofitable service offerings

HRR fixed effects, robust standard errors

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ER	Trauma	Psychiatric	OB	Neonatology	Burn ICU
Ln(Hosp-HHI)	1.333***	0.136	0.145	1.751***	1.313***	0.128
	(0.304)	(0.164)	(0.199)	(0.207)	(0.176)	(0.299)
Ln(Hosp-HHI) * 1[FP]	0.246	0.945***	0.234	-0.127	-0.0102	1.860***
	(0.306)	(0.203)	(0.238)	(0.213)	(0.209)	(0.374)
Ln(Hosp-HHI) * 1[Govt.]	0.106	1.844***	0.731***	0.731**	1.575***	-1.343**
	(0.491)	(0.274)	(0.281)	(0.293)	(0.285)	(0.603)
1[FP]	-2.403	-7.703***	-2.188	0.641	-0.734	-15.26***
	(2.398)	(1.607)	(1.874)	(1.682)	(1.658)	(2.990)
1[Govt.]	-1.552	-15.12***	-5.625**	-6.197***	-13.06***	10.82**
	(3.977)	(2.246)	(2.296)	(2.385)	(2.334)	(4.769)
Teaching hosp.	0.952***	1.623***	1.142***	0.341**	1.065***	0.828***
	(0.169)	(0.141)	(0.128)	(0.146)	(0.157)	(0.163)
Rural hosp	-0.0744	-0.0975	-1.666***	-0.711***	-0.860***	
	(0.186)	(0.110)	(0.174)	(0.123)	(0.114)	
Casemix index	-0.278*	-0.00494	-1.740***	-0.106	0.0481	-0.103
	(0.145)	(0.0998)	(0.194)	(0.119)	(0.109)	(0.183)
Ln(HSA population)	-0.348***	-0.0716**	0.247***	0.127***	0.294***	0.137*
	(0.0528)	(0.0321)	(0.0394)	(0.0344)	(0.0335)	(0.0725)
HSA: median income	-1.922***	-0.431**	0.511**	-0.655***	-0.355*	-1.943***
	(0.332)	(0.197)	(0.239)	(0.225)	(0.204)	(0.440)
HSA: %Uninsured	-16.56***	-7.027***	-16.79***	-12.39***	-15.76***	-2.788
	(4.179)	(2.689)	(3.967)	(3.079)	(3.006)	(5.504)
HSA: %Privately insured	0.891	0.277	-0.362	2.036***	0.0898	4.603***
	(0.651)	(0.517)	(0.594)	(0.604)	(0.532)	(0.932)
year==2002	-0.00154	-0.00136	0.0318	0.00670	0.00650	0.0182
	(0.151)	(0.104)	(0.121)	(0.114)	(0.107)	(0.217)
year==2003	0.0369	0.0235	0.0402	0.0209	0.00805	0.00664
	(0.153)	(0.104)	(0.119)	(0.114)	(0.107)	(0.217)
year==2004	0.119	0.0398	0.121	0.0682	0.0479	0.0324
	(0.156)	(0.105)	(0.120)	(0.115)	(0.109)	(0.218)
year==2005	0.190	0.102	0.136	0.135	0.117	0.0852
	(0.158)	(0.106)	(0.120)	(0.116)	(0.110)	(0.220)
year==2006	0.189	0.0891	0.155	0.118	0.121	0.0619
	(0.160)	(0.107)	(0.121)	(0.117)	(0.109)	(0.220)
year==2007	0.204	0.0961	0.154	0.111	0.104	0.0367
	(0.160)	(0.108)	(0.121)	(0.119)	(0.111)	(0.220)
Constant	19.57	9.882	-11.91	-2.482	-15.64	15.94***
	(0)	(0)	(0)	(0)	(0)	(5.618)
Observations	1,646	2,233	2,073	2,185	2,267	1,369

IX. Appendix A. Results based on Hosp-HHI constructed using only Medicare patients

Table 9. Cross-sectional and fixed effects results, log-log specifications (Hosp-HHI based on Medicare patients only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No Fixed Effects [A]			Ownership interactions [A]			Payer mix controls [B]		
	Charity Care	Uncomp. Care	Charity Volume	Charity Care	Uncomp. Care	Charity Volume	Charity Care	Uncomp. Care	Charity Volume
Cross-Sectional									
Ln(Hosp-HHI)	0.513***	0.118*	0.224***	-0.127	-0.106	0.337***	-0.187	-0.0345	0.475***
	(0.164)	(0.0700)	(0.0577)	(0.158)	(0.0722)	(0.0730)	(0.170)	(0.0785)	(0.0722)
Ln(Hosp-HHI) * For-Profit				0.000274	0.313*	0.331**	0.0311	0.297	0.319**
				(0.401)	(0.184)	(0.143)	(0.405)	(0.187)	(0.139)
Ln(Hosp-HHI) *Government				4.024***	0.905***	-1.240***	4.115***	0.796***	-1.450***
				(0.586)	(0.264)	(0.140)	(0.603)	(0.280)	(0.138)
Observations	2283	2280	2283	2283	2280	2283	2283	2280	2283
R-squared	0.391	0.616	0.694	0.416	0.620	0.705	0.416	0.622	0.712
Hospital Fixed-Effects									
Ln(Hosp-HHI)	0.0430	-0.592**	0.145	-0.0281	-0.580**	0.134	-0.0412	-0.587**	0.134
	(0.518)	(0.285)	(0.139)	(0.520)	(0.286)	(0.137)	(0.522)	(0.286)	(0.137)
Ln(Hosp-HHI) * For-Profit				0.0664	0.000527	0.0173	0.0657	-9.88e-05	0.0175
				(0.0500)	(0.0180)	(0.0191)	(0.0500)	(0.0182)	(0.0192)
Ln(Hosp-HHI) *Government				0.0757	-0.0318	-0.00210	0.0766	-0.0327	-0.00135
				(0.0915)	(0.0297)	(0.0169)	(0.0915)	(0.0302)	(0.0172)
Observations	2283	2280	2283	2283	2280	2283	2283	2280	2283
R-squared	0.825	0.855	0.946	0.825	0.855	0.946	0.825	0.855	0.946

[A] Specification also includes year dummies, For-profit and Government hospital dummies, Ln(Total Discharges)

[B] Specification also includes year dummies, For-profit and Government hospital dummies, Ln(Total Discharges), HSA % Privately insured, HSA % Self-pay

Notes: Heteroskedasticity-robust standard errors are reported in parentheses below the estimated coefficients.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

Table 10. Full covariates results, log-log specification (Hosp-HHI based on Medicare patients only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full			Full sample, including HRR fixed effects			Excluding rural hospitals		
	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume
Ln(Hosp-HHI)	-0.348*	-0.118	0.500***	-0.596**	-0.305**	0.154	-0.382*	-0.0515	0.361***
	(0.183)	(0.0841)	(0.0781)	(0.271)	(0.125)	(0.104)	(0.201)	(0.0905)	(0.0910)
Ln(Hosp-HHI) * 1[FP]	-0.120	0.259	0.293**	-0.217	0.275	0.462***	0.0672	0.280*	0.500***
	(0.405)	(0.187)	(0.141)	(0.432)	(0.171)	(0.156)	(0.448)	(0.162)	(0.167)
Ln(Hosp-HHI) * 1[Govt.]	4.416***	0.897***	-1.200***	4.467***	0.943***	-1.199***	7.550***	1.834***	-1.718***
	(0.595)	(0.264)	(0.138)	(0.657)	(0.285)	(0.146)	(0.735)	(0.317)	(0.172)
1[FP]	0.665	-2.131	-2.529**	1.559	-2.214	-3.942***	-0.585	-2.148	-4.244***
	(3.338)	(1.532)	(1.180)	(3.552)	(1.409)	(1.294)	(3.690)	(1.335)	(1.388)
1[Govt.]	-39.12***	-7.892***	10.71***	-39.43***	-8.271***	10.78***	-66.15***	-15.89***	15.40***
	(5.115)	(2.274)	(1.182)	(5.614)	(2.427)	(1.249)	(6.301)	(2.745)	(1.476)
Teaching hosp.	0.274	0.114	0.556***	0.0321	0.0288	0.501***	0.791***	0.235**	0.405***
	(0.213)	(0.120)	(0.0837)	(0.222)	(0.130)	(0.0844)	(0.197)	(0.106)	(0.0921)
Ln(Total discharges)	1.426***	1.026***	1.014***	1.515***	1.038***	1.027***	1.721***	1.180***	0.960***
	(0.0673)	(0.0365)	(0.0273)	(0.0675)	(0.0411)	(0.0290)	(0.0781)	(0.0430)	(0.0382)
Rural hosp	0.564***	0.250***	-0.313***	0.818***	0.285***	-0.363***			
	(0.191)	(0.0754)	(0.0584)	(0.191)	(0.0818)	(0.0611)			
Ln(HSA population)	-0.0556	-0.0370	-0.0467**	-0.102*	-0.0649**	-0.0428*	-0.166**	-0.0922***	-0.0416
	(0.0593)	(0.0274)	(0.0218)	(0.0616)	(0.0290)	(0.0222)	(0.0666)	(0.0282)	(0.0275)
HSA: median income	-0.486*	0.155	-0.372***	-0.954***	-0.143	-0.499***	-0.402	0.171	-0.273**
	(0.263)	(0.103)	(0.0992)	(0.322)	(0.142)	(0.115)	(0.278)	(0.112)	(0.108)
HSA: %Uninsured	-3.868	4.929***	6.622***	5.446	6.170***	7.925***	-2.357	5.111**	6.839***
	(4.052)	(1.910)	(1.347)	(4.172)	(1.837)	(1.503)	(5.236)	(2.388)	(1.674)
HSA: %Privately insured	1.095	-0.237	0.212	2.228***	-0.000262	0.384	0.913	-0.584	-0.00489
	(0.765)	(0.335)	(0.250)	(0.777)	(0.324)	(0.261)	(0.860)	(0.390)	(0.294)
year==2002	0.0960	0.141*	0.0485	0.104	0.143*	0.0466	0.0550	0.117	0.0715
	(0.186)	(0.0780)	(0.0636)	(0.181)	(0.0764)	(0.0608)	(0.213)	(0.0882)	(0.0732)
year==2003	0.325*	0.253***	0.0787	0.333*	0.257***	0.0782	0.264	0.209**	0.0952
	(0.185)	(0.0799)	(0.0657)	(0.180)	(0.0784)	(0.0631)	(0.209)	(0.0915)	(0.0761)
year==2004	0.551***	0.456***	0.112*	0.549***	0.458***	0.114*	0.436**	0.420***	0.129
	(0.188)	(0.0812)	(0.0681)	(0.183)	(0.0801)	(0.0657)	(0.213)	(0.0938)	(0.0798)
year==2005	0.942***	0.577***	0.174***	0.948***	0.585***	0.171***	0.782***	0.529***	0.196***
	(0.183)	(0.0727)	(0.0647)	(0.179)	(0.0713)	(0.0626)	(0.206)	(0.0817)	(0.0752)
year==2006	1.241***	0.697***	0.236***	1.252***	0.707***	0.235***	1.125***	0.643***	0.250***
	(0.180)	(0.0744)	(0.0622)	(0.176)	(0.0726)	(0.0603)	(0.204)	(0.0792)	(0.0719)
year==2007	1.253***	0.770***	0.239***	1.255***	0.778***	0.241***	1.055***	0.704***	0.277***
	(0.184)	(0.0746)	(0.0622)	(0.180)	(0.0732)	(0.0605)	(0.205)	(0.0818)	(0.0716)
Constant	2.710	-0.697	-3.459***	8.847**	4.162**	0.555	0.842	-2.022	-2.910*
	(3.189)	(1.346)	(1.274)	(3.753)	(1.789)	(1.430)	(3.629)	(1.589)	(1.495)
Observations	2280	2277	2280	2280	2277	2280	1819	1816	1819
R-squared	0.418	0.621	0.718	0.455	0.640	0.739	0.367	0.524	0.610

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11. Price regressions, (Hosp-HHI based on Medicare patients only)

	(1)	(2)	(3)	(1)	(2)	(3)
	Ln(Price per DRG unit)			Ln(Top DRG price index)		
	Base	Base + HRR FE	Base + Hospital FE	Base	Base + HRR FE	Base + Hospital FE
Ln(Hosp-HHI)	0.670***	0.563***	0.169	0.675***	0.550***	0.206*
	(0.0483)	(0.0631)	(0.143)	(0.0466)	(0.0581)	(0.113)
Ln(Hosp-HHI) * 1[FP]	-0.240***	-0.130	0.00647	-0.145**	-0.0449	0.0166
	(0.0810)	(0.0922)	(0.0177)	(0.0735)	(0.0827)	(0.0121)
Ln(Hosp-HHI) * 1[Govt.]	-0.248***	-0.344***	-0.0358*	-0.330***	-0.415***	-0.0235
	(0.0900)	(0.0919)	(0.0188)	(0.0785)	(0.0811)	(0.0179)
1[FP]	2.010***	1.130		1.269**	0.485	
	(0.676)	(0.764)		(0.615)	(0.687)	
1[Govt.]	2.012***	2.846***		2.710***	3.428***	
	(0.768)	(0.786)		(0.667)	(0.692)	
Teaching hosp.	0.520***	0.470***		0.365***	0.333***	
	(0.0338)	(0.0342)		(0.0304)	(0.0309)	
Rural hosp	0.00962	-0.0363		0.0697**	0.0254	
	(0.0384)	(0.0393)		(0.0334)	(0.0320)	
Casemix index	0.192***	0.192***	0.127**	0.101***	0.0995***	0.134**
	(0.0428)	(0.0428)	(0.0545)	(0.0381)	(0.0358)	(0.0538)
Ln(HSA population)	0.0285**	0.0447***		0.0205**	0.0321***	
	(0.0123)	(0.0126)		(0.00942)	(0.00965)	
HSA: median income	0.295***	0.245***		0.234***	0.262***	
	(0.0528)	(0.0670)		(0.0497)	(0.0628)	
HSA: %Uninsured	0.763	-0.0407		0.597	0.474	
	(0.900)	(0.953)		(0.781)	(0.811)	
HSA: %Privately insured	-0.321**	-0.317**		-0.168	-0.340**	
	(0.154)	(0.160)		(0.141)	(0.145)	
year==2002	0.138***	0.139***	0.130***	0.166***	0.167***	0.160***
	(0.0425)	(0.0411)	(0.0311)	(0.0388)	(0.0372)	(0.0297)
year==2003	0.251***	0.252***	0.238***	0.274***	0.275***	0.269***
	(0.0389)	(0.0374)	(0.0285)	(0.0361)	(0.0346)	(0.0274)
year==2004	0.383***	0.382***	0.366***	0.401***	0.402***	0.394***
	(0.0383)	(0.0367)	(0.0281)	(0.0354)	(0.0337)	(0.0267)
year==2005	0.436***	0.439***	0.418***	0.450***	0.452***	0.442***
	(0.0383)	(0.0366)	(0.0284)	(0.0350)	(0.0330)	(0.0269)
year==2006	0.499***	0.501***	0.482***	0.511***	0.513***	0.505***
	(0.0385)	(0.0367)	(0.0288)	(0.0359)	(0.0340)	(0.0271)
year==2007	0.615***	0.617***	0.607***	0.644***	0.644***	0.643***
	(0.0385)	(0.0367)	(0.0299)	(0.0353)	(0.0334)	(0.0279)
Constant	-0.641	0.632	7.150***	0.0294	0.704	6.697***
	(0.717)	(0.882)	(1.195)	(0.674)	(0.805)	(0.958)
Observations	2,265	2,265	2,266	2,258	2,258	2,259
R-squared	0.312	0.386	0.741	0.317	0.405	0.730

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

X. Appendix B. Results based on Hosp-HHI constructed using only privately insured patients

[Available upon request from authors]

XI. Appendix C. Results based on hospitals that experienced large changes in Hosp-HHI

Table 12. Full covariates results, (Hosp-HHI based on all patients; hospitals in top and bottom 25% of change in Hosp-HHI)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full			Full sample, including HRR fixed effects			Excluding rural hospitals		
	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume	Charity care	Uncomp. care	Charity volume
Ln(Hosp-HHI)	-0.319	-0.391***	0.257***	-0.299	-0.389***	0.168	-0.451*	-0.381***	0.0731
	(0.233)	(0.101)	(0.0860)	(0.375)	(0.147)	(0.142)	(0.269)	(0.108)	(0.106)
Ln(Hosp-HHI) * 1[FP]	-0.369	0.463**	0.0921	-0.762	0.405**	0.139	0.0894	0.563***	0.360**
	(0.500)	(0.225)	(0.136)	(0.555)	(0.181)	(0.161)	(0.570)	(0.146)	(0.160)
Ln(Hosp-HHI) * 1[Govt.]	3.425***	0.743***	-0.367**	3.808***	1.121***	-0.289*	5.604***	1.775***	-0.309
	(0.656)	(0.280)	(0.148)	(0.731)	(0.291)	(0.158)	(1.049)	(0.366)	(0.216)
1[FP]	2.653	-3.759**	-0.868	5.877	-3.170**	-1.273	-0.635	-4.360***	-3.012**
	(4.015)	(1.793)	(1.116)	(4.453)	(1.451)	(1.311)	(4.577)	(1.185)	(1.303)
1[Govt.]	-29.67***	-6.413***	3.257***	-33.22***	-9.541***	2.650**	-47.63***	-14.69***	3.112*
	(5.503)	(2.356)	(1.241)	(6.130)	(2.432)	(1.326)	(8.625)	(3.074)	(1.801)
Teaching hosp.	-0.342	-0.344	1.389***	-0.0134	-0.146	1.422***	0.0806	-0.266	1.234***
	(0.535)	(0.346)	(0.114)	(0.492)	(0.355)	(0.109)	(0.521)	(0.320)	(0.133)
Ln(Total discharges)	1.392***	0.947***	1.008***	1.479***	0.933***	0.977***	1.760***	1.185***	0.964***
	(0.0914)	(0.0444)	(0.0240)	(0.0926)	(0.0477)	(0.0279)	(0.133)	(0.0674)	(0.0359)
Rural hosp	0.212	0.108	-0.309***	0.985***	0.245**	-0.342***			
	(0.231)	(0.0872)	(0.0640)	(0.252)	(0.106)	(0.0727)			
Ln(HSA population)	0.0203	0.00764	-0.0429**	0.000910	0.00342	-0.0220	-0.187*	-0.104**	-0.0334
	(0.0832)	(0.0362)	(0.0201)	(0.0860)	(0.0378)	(0.0227)	(0.105)	(0.0411)	(0.0280)
HSA: median income	-1.333***	-0.205	-0.545***	-2.674***	-0.619***	-0.937***	-1.248***	-0.238	-0.320**
	(0.386)	(0.138)	(0.122)	(0.466)	(0.186)	(0.159)	(0.410)	(0.156)	(0.146)
HSA: %Uninsured	-3.948	0.126	3.178*	3.927	-1.838	1.235	0.143	1.201	1.888
	(5.027)	(2.566)	(1.638)	(4.983)	(2.163)	(1.734)	(6.686)	(3.085)	(2.113)
HSA: %Privately insured	3.824***	0.261	-0.119	5.355***	0.788*	0.354	3.780***	0.0117	-0.470
	(1.050)	(0.431)	(0.264)	(1.026)	(0.455)	(0.313)	(1.146)	(0.488)	(0.303)
year==2002	-0.0521	-0.00127	0.0317	-0.0562	-0.00515	0.0359	-0.0690	-0.0297	0.0328
	(0.255)	(0.115)	(0.0745)	(0.239)	(0.110)	(0.0707)	(0.308)	(0.145)	(0.0889)
year==2003	0.134	0.137	0.0890	0.147	0.143	0.0967	0.169	0.0882	0.0792
	(0.251)	(0.112)	(0.0778)	(0.233)	(0.105)	(0.0743)	(0.300)	(0.140)	(0.0941)
year==2004	0.493*	0.401***	0.109	0.473**	0.406***	0.113	0.406	0.395***	0.101
	(0.254)	(0.109)	(0.0855)	(0.235)	(0.103)	(0.0819)	(0.304)	(0.137)	(0.107)
year==2005	0.935***	0.525***	0.196**	0.943***	0.540***	0.205***	0.919***	0.505***	0.179*
	(0.242)	(0.0940)	(0.0766)	(0.228)	(0.0875)	(0.0736)	(0.286)	(0.110)	(0.0927)
year==2006	1.158***	0.605***	0.234***	1.172***	0.616***	0.237***	1.237***	0.583***	0.208**
	(0.239)	(0.106)	(0.0754)	(0.229)	(0.100)	(0.0714)	(0.279)	(0.113)	(0.0905)
year==2007	1.087***	0.653***	0.233***	1.097***	0.665***	0.237***	0.957***	0.601***	0.242***
	(0.249)	(0.103)	(0.0749)	(0.237)	(0.0979)	(0.0715)	(0.303)	(0.116)	(0.0907)
Constant	10.22**	5.674***	0.776	22.94***	10.03***	5.601***	9.434*	5.175**	0.271
	(4.396)	(1.706)	(1.554)	(5.407)	(2.265)	(2.081)	(5.087)	(2.132)	(2.032)
Observations	1148	1147	1148	1148	1147	1148	829	828	829
R-squared	0.460	0.632	0.803	0.539	0.675	0.823	0.356	0.490	0.641

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13. Price regressions (Hosp-HHI based on all patients; hospitals in top and bottom 25% of change in Hosp-HHI)

	(1)	(2)	(3)	(1)	(2)	(3)
	Ln(Price per DRG unit)			Ln(Top DRG price index)		
	Base	Base + HRR FE	Base + Hospital FE	Base	Base + HRR FE	Base + Hospital FE
Ln(Hosp-HHI)	0.418***	0.419***	0.281***	0.254***	0.146	0.109
	(0.0511)	(0.0475)	(0.0847)	(0.0692)	(0.157)	(0.140)
Ln(Hosp-HHI) * 1[FP]	0.0685	0.0792	0.203*	0.219**	0.0626**	0.0487**
	(0.0952)	(0.0914)	(0.116)	(0.108)	(0.0271)	(0.0194)
Ln(Hosp-HHI) * 1[Govt.]	-0.259***	-0.259***	-0.165	-0.238***	0.0339	0.0202
	(0.0990)	(0.0835)	(0.107)	(0.0917)	(0.0343)	(0.0276)
1[FP]	-0.525	-0.563	-1.534	-1.604*		
	(0.776)	(0.747)	(0.935)	(0.876)		
1[Govt.]	2.062**	2.083***	1.309	1.899**		
	(0.818)	(0.694)	(0.892)	(0.766)		
Teaching hosp.	0.641***	0.392***	0.673***	0.447***		
	(0.0652)	(0.0531)	(0.0684)	(0.0556)		
Rural hosp	-0.000619	0.0799*	-0.0490	0.0257		
	(0.0523)	(0.0426)	(0.0549)	(0.0397)		
Casemix index	0.307***	0.160***	0.291***	0.140***	0.162**	0.161***
	(0.0650)	(0.0525)	(0.0674)	(0.0488)	(0.0631)	(0.0612)
Ln(HSA population)	-0.0154	-0.0173	0.000942	-0.00430		
	(0.0197)	(0.0131)	(0.0197)	(0.0137)		
HSA: median income	0.306***	0.280***	0.258**	0.355***		
	(0.0827)	(0.0773)	(0.108)	(0.0978)		
HSA: %Uninsured	-1.995*	-1.341	-4.063***	-2.845***		
	(1.121)	(0.949)	(1.180)	(0.959)		
HSA: %Privately insured	-0.382*	-0.232	-0.463*	-0.539**		
	(0.213)	(0.188)	(0.241)	(0.218)		
year==2002	0.134**	0.180***	0.134**	0.180***	0.131***	0.180***
	(0.0570)	(0.0489)	(0.0558)	(0.0472)	(0.0462)	(0.0409)
year==2003	0.239***	0.255***	0.239***	0.252***	0.228***	0.254***
	(0.0529)	(0.0498)	(0.0512)	(0.0476)	(0.0427)	(0.0389)
year==2004	0.392***	0.408***	0.391***	0.406***	0.373***	0.400***
	(0.0516)	(0.0470)	(0.0494)	(0.0444)	(0.0417)	(0.0376)
year==2005	0.417***	0.434***	0.420***	0.431***	0.399***	0.424***
	(0.0517)	(0.0463)	(0.0500)	(0.0441)	(0.0435)	(0.0389)
year==2006	0.486***	0.515***	0.485***	0.511***	0.466***	0.505***
	(0.0532)	(0.0487)	(0.0508)	(0.0460)	(0.0434)	(0.0390)
year==2007	0.647***	0.663***	0.645***	0.657***	0.635***	0.661***
	(0.0529)	(0.0472)	(0.0508)	(0.0450)	(0.0449)	(0.0402)
Constant	1.940*	2.227**	3.476**	2.793**	7.066***	7.352***
	(1.054)	(0.965)	(1.507)	(1.260)	(1.283)	(1.147)
Observations	1,140	1,133	1,140	1,133	1,141	1,134
R-squared	0.313	0.314	0.408	0.442	0.707	0.706

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

XII. Appendix D. Construction of price measures

Both price measures analyzed in this paper are constructed using information on hospitals' actual revenue from private payers as a percentage of their total list charges to private payers. The percentages are derived from the OSHPD financial disclosure reports, which provide gross and net inpatient revenue from third party payers, separately for "traditional" insurance products (i.e., fee-for-service plans) and managed care insurance products. Individual patient records in the hospital discharge data identify (1) the list charges associated with the visit, (2) the payer category (private, Medicare, Medicaid, ...), and (3) whether the plan type is traditional or managed care. This facilitates matching the plan type discount factor to the patient's plan type.

The steps in computing the two price measures are as follows:

1. Compute the hospital-level ratio of net revenue to gross revenue in each year, separately for private traditional and private managed care products, using the following variables:
    a. factor_tr = netrv_thrd_tr / (netrv_thrd_tr + c_adj_thrd_tr)
    b. factor_mc = netrv_thrd_mc / (netrv_thrd_mc + c_adj_thrd_mc)

2. The resulting ratios are predominantly, but not universally between 0 and 1. Cap at the cross-hospital, within-year 5th and 95th percentiles of each "factor."
    a. Drop Kaiser hospitals, which do not report financial data and generally do not treat non-Kaiser patients, before computing percentiles.

3. Use discharge level information on the payer category and plan type to estimate the net payment from the available patient-level data on list charges:
    a. Payment = 1[Traditional]*factor_tr*charges + 1[MCO]*factor_mc*charges

4. Construct two price measures
    a. Casemix adjusted price:
        i. price_per_drg_unit = Sum(Payment) / Sum(DRG units)
        ii. "DRG units" are the case weights attached to DRGs; these weights indicate the national average relative cost of care (e.g., a patient in a

DRG with a weight of 4 is twice as costly to treat on average as a patient in a DRG with a weight of 2.)

b. Basket of common DRGs price:

i. price_top_drgs = Average(Payment) in common DRGs (i.e., DRGs present at nearly all hospitals)

ii. Impute, for a small number of hospital-years without all of the common DRGs, based on full sample averages.[51]

iii. Table 14 lists the DRGs used in constructing the price index.

5. As shown in Figure 6, the two price measures are highly correlated and have similar magnitudes.

Table 14. Common DRGs used to construct the price index

DRG	MDC	Category	Description
088	04	M	Chronic Obstructive Pulmonary Disease
089	04	M	Simple Pneumonia & Pleurisy Age >17 w cc
097	04	M	Bronchitis & Asthma Age >17 w/o cc
127	05	M	Heart Failure & Shock
138	05	M	Cardiac Arrhythmia & Conduction Disorders w cc
ta	05	M	Cardiac Arrhythmia & Conduction Disorders w/o cc
143	05	M	Chest Pain
167	06	P	Appendectomy w/o Complicated Principal Diagnoses w/o cc
174	06	M	Gastrointestinal Hemorrhage w cc
182	06	M	Esophagitis, Gastroenteritis & Misc Digest Disorders Age >17 w cc
183	06	M	Esophagitis, Gastroenteritis/Misc Digest Disorders Age >17 w/o cc
204	07	M	Disorders of Pancreas except Malignancy
294	10	M	Diabetes Age >35
296	10	M	Nutritional & Misc Metabolic Disorders Age >17 w cc
320	11	M	Kidney & Urinary Tract Infections Age >17 w cc
359	13	P	Uterine & Adnexa Proc for Non-Malignancy w/o cc
416	18	M	Septicemia Age >17

[51] It would likely be possible to obtain a better price index by regressing each component price in the index on the other prices and the casemix adjusted price (pric_per_drg_unit).

Figure 6. Scatter plot of the two price measures