The Impact of Health Care Structure on Community Benefit Spending

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Abstract

Federal tax law provides tax-exemptions for nonprofit hospitals in exchange for community benefit provisions. The one of the justifications for tax-exempt status has been known as "community benefits standard", which has been evolved over the years. The current idea of community benefit standard is that tax-exempt nonprofit hospitals are expected to promote the health of public or community to be charitable. In the meantime, nonprofit hospitals do not generally receive special treatment in antitrust law cases which might increase market power of nonprofit hospitals. An important problem with the community benefit standard is the inconsistency between the rationale of tax exemption to nonprofit hospitals and federal antitrust law approach to nonprofit hospitals. In this paper, I test the hypothesis that nonprofit hospitals provide more community benefits once they acquire more market power and find that there is no statistically significant evidence on the effect of hospital and insurer competition on the community benefit provision of nonprofit hospitals. Taking into account of insurer competition, nonprofit hospitals do not benefit their communities more with more market power.

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1. Introduction

Nonprofit hospitals in the United States are the largest nonprofit sector and account for 56 percent of non-government, community hospitals in 2018 according to American Hospital Association [1]. Nonprofit hospitals take advantage of being exempted from federal, state, and local taxes in comparison with for-profit hospitals if they meet the federal requirements specified in Section 501(c)(3) of the Internal Revenue Code (IRS) [2]. If nonprofit hospitals which are primarily operated and organized for charitable purposes are qualified for tax-exemption, they are required to provide community benefit activities to their communities to maintain their status (IRS, 2020).

As a possible advantage in competitive health market, tax-exemption provides indirect subsidies to nonprofit hospitals in the form of tax-exemption [3]. As a result, one may expect that better financial health and more market power for nonprofit hospitals may necessarily further the community benefit activities since nonprofit hospitals with tax-exempt status are primarily operated and organized for charitable purposes under the tax law. In the meantime, nonprofit hospitals do not receive special treatment in antitrust law cases. There is a little understanding and research in the literature on how competition in health care market affects nonprofit hospitals' behavior on community benefit provision. This study, therefore, aims to examine the relationship between competition and community benefit provision.

Federal tax law provides tax-exemptions for non-profit organizations since the beginning of federal taxation in 1913 (Fremont-Smith, 2008).To have tax-exempt status, entities meet at least one of the purposes listed in the Code

[1] The percentage of nonprofit hospitals compared to for-profit hospitals has been declining over the years; however, more than half of all hospitals are still nonprofit hospitals.

[2] It is worth highlighting that there is no consensus that tax-exemption status is an advantage for nonprofit firms (Alm & Teles, 2018).

[3] From the perspective of law, whether tax-exemption is subsidy is an ongoing debate (Halperin, 2010).

which includes “religious, charitable, scientific, educational, testing for public safety, literary, or to foster national or international amateur sports competition, and preventing cruelty to children and animals”. It is worth to note that IRS considers qualifying nonprofit hospitals as charitable organization under the federal tax law (IRS, 2020) [4].

The one of the justifications for tax-exempt status has been known as “community benefits standard”, which has been evolved over the years. The current idea of community benefit standard is that tax-exempt nonprofit hospitals are expected to promote the health of public or community to be “charitable”. IRS described the standard as “that the hospital benefits the community it serves through the promotion of health” and “it is operated to serve a public rather than a private interest”. Previously, a narrow definition of community benefit standard was a requirement for tax-exempt qualification between 1956 and 1969. IRS ruled “the charity care standard” in 1956 that requires nonprofit hospitals to provide health care for free or at the rates below-cost services to those who are unable to pay (IRS, 1956).

The need of charity care was reduced due to the enactment of Medicaid and Medicare as a national public health insurance in 1965. In 1969, a broader definition of community benefit replaced the previous definition and since then the definition of “community benefit” has been considered as a legal standard for qualification of tax-exempt status (IRS, 1969). Federal tax law no longer requires nonprofit hospitals to provide only charity care for tax-exemption.

The one of the problems with the new definition was that it was too ambiguous compared to the previous requirement which was only charity care to those in needs. With the new standard, a hospital can qualify for tax-

[4] This classification is not subject to only hospitals. It may include other kind of health care organization such as managed care organizations, homes for the aged, ambulatory care providers and so on.

exemption status even with an operating emergency room (Colombo, 2005). Another critic for the legal rationale of tax-exemption for nonprofit hospitals is that government regulators and the public are finding difficult to differentiate the activities of nonprofit hospitals, which increasingly resemble their competitors, from for-profit hospitals in many ways and especially in uncompensated care provision (Sloan, 1998, 2000) [5]. For instance, both NP and FP hospitals must provide necessary treatment to those in needs without regard to ability to pay at emergency room by the Emergency Medical Treatment and Labor Act which is federal law enacted in 1986 [6]. For-profit hospitals, like nonprofit hospitals, provide uncompensated care to those in need, which is recorded as bad debt; some of for-profit hospitals also provide any other type of community benefit activities rather than only uncompensated care (Authority, 2018).

An important problem with the community benefit standard, which is related to the subject of this paper, is the inconsistency between the rationale of tax exemption to nonprofit hospitals and federal antitrust law approach to nonprofit hospitals. Given that community benefit provision is unprofitable services, one potential financing of community benefit provision is cross-subsidization. Nonprofit hospitals may charge higher prices to

[5] An important difference is that private inurement (transfer of profits) or benefit defined by the IRS is not permissible for nonprofit organizations. Nonprofit hospitals can earn profits like for for-profit hospitals, but no profits of nonprofit hospitals can inure to the benefits of any individuals. As far as similarity of for-profit and nonprofit hospitals goes, Frank A. Sloan (1998) and Colombo (2005) conclude that there is no significant difference between for-profit and nonprofit hospitals in uncompensated care provision.

[6] Before the EMTALA, a hospital without emergency room wouldn't be qualified for tax-exempt as IRS 1969 ruling appear to imply if there was another hospital in the area with a proper emergency room. In this case, the second emergency room would be duplicative and unnecessary. IRS addressed this problem in 1983 issuing the Revenue Ruling 83-157 and allowed state or local health planning agency to decide if the second emergency room would be not needed. For example, if an eye hospital without an emergency room meets other the requirements and shows that the hospital promotes the health through the community benefits, then it qualifies for tax-exemption under the section 501(c)(3) (IRS, 1983).

some of patients to finance unprofitable services [7] . Capps et al posits that market power is necessary for cross-subsidization and higher market power may enhance nonprofit hospitals' ability to provide more community benefits (C. S. Capps et al., 2020) [8]. As C. S. Capps et al. (2020) highlight in their article, federal antitrust departments do not provide a special treatment for nonprofit hospitals and do not differentiate nonprofit hospitals from for-profit hospitals in antitrust cases. A report titled Improving Health Care: A Dose of Competition and issued by the Federal Trade Commission and the Antitrust Division of the Department of Justice analyzes the court cases and concludes that "Although institutional status has loomed large in debates and legal disputes, the best available evidence indicates that nonprofits exploit market power when given the opportunity to do so. Accordingly, the profit/nonprofit status of the merging hospitals should not be considered a factor in predicting whether a hospital merger is likely to be anticompetitive" (Commission & of Justice, 2004).

Despite the federal tax law encourages nonprofit hospitals provide social benefits to their communities by granting the tax-exemption status, a memorandum from the General Counsel of the IRS in 1991 issues a contradictory position to its policy toward the community benefit standard. The General Counsel Memoranda examines a series hospital-physician joint ventures and concludes that "Obtaining referrals or avoiding new competition may improve the competitive position of an individual hospital, but that

[7] David et al examines whether hospitals cross-subsidize unprofitable services and finds empirical evidence for cross-subsidizations (David et al., 2014).

[8] Modelling the nonprofit hospitals behavior which requires to set assumptions about the objective of nonprofit hospitals plays an important role regarding cross-subsidization. Also, market entry and exit of for-profit hospitals affects cross-subsidization of nonprofit hospitals. Horwitz and Nichols model the objective of nonprofit as output maximization, which allows cross-subsidization, and find that cross-subsidization decreases while for-profit hospitals penetration increases. As competition from for-profit hospitals increases, nonprofit hospitals behave like for-profit hospitals and offer less unprofitable services (Horwitz & Nichols, 2009).

is not necessarily the same as benefitting its community" (IRS, 1991; Ball, 1992). IRS memoranda indicates the IRS position which claims that any possible market share or power increase through joint ventures does not necessarily mean that nonprofit hospitals provide more services for charitable purposes.

Notwithstanding the IRS position and federal antitrust departments, if nonprofit hospitals are considered as charitable organizations, then any advancement on nonprofit hospitals' financial position would serve the purpose of tax-exemption. The question of whether nonprofit hospitals should get a competitive advantage in the health care market by obtaining tax exemption and receive a special treatment in the antitrust cases brings the importance of understanding how nonprofit hospitals provide community benefit provision with more market power. If competition in the hospital market limits the ability of nonprofit hospitals to provide more community benefit services or more market power increases the level of community benefit provision, it thus shows that the inconsistency caused by IRS and federal antitrust cases might undermine the charitable activities of nonprofit hospitals. It is salient to understand both the competition in health care market and its effect on the nonprofit hospitals' behavior toward the charitable activities.

The market structure of health care sector has been extensively studied in literature. It has been showed that competition in health care market, especially insurer and hospital competition, plays an important role in the allocation of healthcare resources. The literature especially focuses on the effect of market structure units on healthcare prices and qualities (Gaynor et al., 2015; Ho & Lee, 2017; Pauly, 2019). A vast amount of research shows that hospital prices are higher in more concentrated hospital markets while lower in less concentrated insurer markets. In more concentrated markets, hospitals and physicians charges higher prices to commercially insured pa-

tients (Melnick et al., 2011; Gaynor et al., 2015; Cooper et al., 2019). The impact of consolidation on health care market shows that hospital mergers result in higher hospital prices even if two hospitals are not geographically close to each other. Insurer consolidation also shows that insurance premiums are positively associated with more concentrated markets. Premiums are higher in more concentrated insurer markets (L. S. Dafny, 2010; L. Dafny, 2019) and also the insurer mergers lead to higher premiums (L. Dafny et al., 2015) [9].

The negotiation between hospitals and insurers determines prices and it also affects insurers' provider network. By building a provider network (C. Capps et al., 2003; C. S. Capps & Dranove, 2014; Gaynor et al., 2015) , insurers gain leverage in a negotiation since it enables insurers to steer patient's demand and choice of hospital selection. If hospital has an alternative hospital that an enrollee of insurer can select over it, the insurer can leverage the provider network while negotiating with that hospital over the price. As a reaction, hospitals can increase their market power by merging to have more bargaining leverage in negotiating with insurer. The lower hospital price due to insurer market power raises a concern regarding consumer welfare whether the lower hospital price can cause an increase in consumer welfare.

Pauly (1998) examines the consumer welfare under the managed care monopsony and concludes that health insurers can exercise monopsony power over the health providers in which input prices set below the competitive level (welfare-reducing) or health insurers can exercise monopsony power to break up health providers' monopoly power (welfare-increasing). He suggests that the one way to distinguish these two cases is to conduct an empirical analysis on the quantity of medical inputs. Research shows that there are

[9] For a comprehensive analysis about the competition in health care market, Mark Pauly's recent article here.

some evidence of welfare-increasing monopsony power which mean that hospitals in highly concentrated insurer markets offer more hospitals services instead of lowering the utilization of hospital services. (Pauly, 1998; Feldman & Wholey, 2001; Bates & Santerre, 2007).

Little is known about how hospital-insurer competition in health care market affects nonprofit hospital's behavior on community benefit provision. The literature, so far, examines only hospital competition and community benefit provision with limited studies. To my knowledge there is still no theoretical modelling on how hospital-insurer bargaining, or competition can affect the ability of hospitals to provide public services.

The economics literature, however, extensively studied the impact of competition on both private and public goods. Of the particular importance here is to determine what type good the community benefit provision is. Even though some studies consider community benefit provision as public good, it does not fit the economics definition of public good. Textbook version of pure public goods highlights two key characteristics inherent in goods and services: non-rivalrous and non-excludable. Most of the healthcare services in hospital, for example, are private goods, which are rivalrous and excludable. One would consider community benefit provision, which makes the community better off, as a public good with the assumption that altruistic members of that community would be better off if everyone in the community has access to proper medical services (Nicholson et al., 2000; Francois, 2003) [10].

However, considering the community benefit provision being not homogeneous, it is hard to assume that all community benefit provision is merely

[10]In addition to this argument, Burton Weisbord discusses in his article "collective-consumption services of individual-consumption goods" that some health care services such as medical care services for indigents, emergency rooms and open-heart surgery facilities are public goods. For these services, hospitals charge prices below profit-maximizing level and benefit many potential users simultaneously; he calls these services public goods with "output value", which is the option to utilize goods in the future. (Weisbrod, 1964, 1986)

one type of goods. IRS, with the latest requirement in 2009, accepts different type of community benefit provision from medical research to community health improvement services as well as uncompensated care to those in need. Medical research, for example, can be considered as a public good since medical knowledge is non-rivalrous and non-excludable to some degree (Kaul et al., 1999).

Providing indigent care to those who cannot afford to pay is unprofitable and nonprofit hospitals are expected to play an important role in providing those services in where for-profit hospitals or government hospitals fail to promote health of public or community (H. B. Hansmann, 1980; Salamon, 0000; Steinberg, 2003) [11] . The exemption of nonprofit hospitals from federal, state and local taxes and other implicit subsidies such as ability to access to tax-exempt bonds financing provide some advantages to nonprofit hospitals (Gentry & Penrod, 1998). An important theoretical advantage is that tax exemption provides cost advantages to nonprofit hospitals as an indirect subsidy (Harrison & Seim, 2019) . Empirical evidence shows that another advantage could be that tax exemption from local taxes in states and cities is associated with higher market share for nonprofit firms compared to for-profit firms which provide similar services (H. Hansmann, 1987) . Although Hansmann examines several different nonprofit firms along with nonprofit hospitals and nursing homes, another study finds that the higher state corporate income and local property tax rates is associated with a higher market share for nonprofit hospitals (Gulley & Santerre, 1993).

Even though there are possible advantages of tax-exemption status to hospitals, there are very limited studies which examines, both theoretically and empirically, the hospital competition and community benefits in the literature. As I am aware, all these studies examine the effect of competition

[11] Even though the sentence is simplified version of the argument, the existence of nonprofit firms is still open question (Steinberg, 2003)

only uncompensated care (or charity care), which is only one category of community benefits and includes bad debts [12]. The theoretical arguments on the association between competition and community benefits in the literature postulate various the objective of nonprofit hospitals. Frank and Salkever (1991)'s study model the supply of charity care by nonprofit hospitals and assumes that hospital aim is to maximize both revenue and indigent care with different motivations (Frank & Salkever, 1991). They propose two theoretical models: One of the hypothesizes posits the objective of nonprofit hospital is to maximize the utility of revenue and total level of charity care in the market. Hence, there might be crowding-out effect in charity care supply in unconcentrated market which means that hospitals might supply less charity care in the presence of other hospitals in the same market knowing that other hospitals might provide charity care as well. The second hypothesis posits that if the hospital's utility depends on not only charity care but also reputation for providing charity care, nonprofit hospital competes with other hospitals in the same market for providing charity care. The result of study supports the second hypothesis and finds that the total level of charity care increases if the total number of hospitals in the market increases. However, the theoretical model assumes that price is exogenous, and the study uses the data from Maryland in where hospital prices are regulated.

Gruber (1994) does not directly examine the association between charity care and competition but analyzes how nonprofit and for-profit hospitals response to price shopping, which was a policy change in California that allows selective contracting for insurers, in charity care provision (Gruber, 1994). The paper uses the modified version of Frank and Salkaver' model, in where hospital price is considered endogenous instead of exogenous and

[12]Hospitals record unrecoverable patient payment as bad debt. Garmon and Capps et al use the sum of bad debt and charity care as uncompensated care (Garmon, 2006; C. S. Capps et al., 2020).

finds that net revenues and income decreased in relatively competitive markets after the policy change. The study also finds that charity care provision fell more in relatively competitive markets. It is worth to mention that a handful of studies support this empirical finding that once payments to nonprofit hospitals decrease(increase), charity care provision decreases(increases) as a response [13].

While Frank and Salkaver (1991) and Gruber (1994) model the supply of charity care for nonprofit hospitals, Bank et al. develop another model for the supply of charity care of for-profit hospitals (Banks et al., 1997). Their model defines the objective of for-profit hospitals to provide charity care as a "business decision which may enhance a hospital's reputation, reduce the likelihood of civil liability or Medicare sanctions and strengthen relations with physicians" [14]. An important part of this objective is that it includes expected penalty cost, which could be defined as the perception of underproducing charity care, to the model. Authors gave following examples of the expected penalty cost in their article: "legal liability, Medicare sanctions, physician dissatisfaction or negative impact on demand by compensated care patients". The expected penalty cost is key parameter in the model to explain the how for-profit hospitals respond to market change compared to nonprofit hospitals. The expected penalty cost increases if the difference between the expected and actual level of charity care provision increases. Their theoretical model implies that nonprofit hospitals might reduce the supply of charity care as a response to an increase in competition while for-profit

[13] Although it is not directly related to the topic of this study, for-profit hospitals and nonprofit hospitals response differently to payment cuts. A recent study by He & Mellor (2016) examines the effect of Medicare payment on the provision of outpatient care to uninsured and finds that once there is Medicare payment cut, nonprofit hospitals provide less outpatient care to uninsured but for-profit hospitals increase the share of outpatient care to uninsured.

[14] As Bank et al highlight in their article, the objective of for-profit hospital to supply charity care comes from Gray's analysis (Gray, 1993).

hospitals might provide more charity care once facing more competition. The intuition is that nonprofit hospitals decrease charity care when demand falls since nonprofit hospital objective is subject to financial constraint (zero profit). For-profit hospitals, instead, provide more charity care by lowering the marginal cost of producing charity care once facing a demand fall. The study examines hospitals data in California between 1981 and 1989 and its empirical findings support the theoretical model developed in the article.

Although Banks et al have an important implication to understand how the supply of charity care in different market environment and payment policy change, it does not directly study the association between competition and charity care. Garmon directly examines the relationship between hospital competition and charity care found that there is no statistically significant evidence that increased competition leads to reduction in charity care in Florida and Texas (Garmon, 2006). A recent study that directly examines the relationship between hospital competition and charity care provision in the context of antitrust law finds that nonprofit hospitals do not provide more charity care provisions once they have more market power and concluded that there is no support of lenient antitrust treatment for nonprofit hospitals (C. S. Capps et al., 2020). The model used in the paper is a modified version of Phillipson and Posner' model (2009) in which Philipson and Posner posit that antitrust law should not distinguish nonprofit firms from for-profit firms (Philipson & Posner, 2009). Their key finding based on their model is that regardless of the objective of firms, nonprofit firms enjoy exploiting market power as profit maximizing firms and thus competition increases social's surplus whether in the mix market or nonprofit dominating market. Capps et al modify Philipson and Posner model by changing assumptions and postulate that some degree of market power is a necessary condition for nonprofit hospitals to provide charity care or unprofitable services. The study, however, finds that nonprofit hospitals with higher mar-

ket power do not provide more charity care using hospital data in California from 2001 to 2011.

Theoretical arguments on competition and charity care so far consider only hospital competition and have not been taking into account of hospital and insurer competition together. A recent strand of literature in health economics and industrial organization examines how hospital-insurer bargaining affects hospital prices, premiums and more generally equilibrium outcomes in health care market. As I am aware, there is no empirical study in the literature which examines how hospital and insurer competition affect the community benefit provision. This study, to my knowledge, is the first paper that examines the impact of hospital and insurer competition on hospitals' community benefit provision. I estimate models of uncompensated care provision of hospitals with different ownership and community benefit provision of nonprofit hospitals.

2. Identification

In a simple regression model, I would estimate the effect of hospital and insurer competition as independent variables on community benefit provision. As a dependent variable, community benefit provision is the dollar value of total community benefit provision provided by a hospital during the tax year. The key independent variables indicate the concentration of hospital market and insurer market based on patient choice of hospitals and insurance enrollment by following calculation of concentration methods in the literature. As a well-known and traditional method, Herfindahl-Hirschman index (HHI) that intends to capture the change and level of competition in defined market has been used in the literature from economics to health services research.

HHI approach is considered as non-generalizable approach that is not

derived from a theory but institution. It basically defines the market area based on geographic and political boundaries, and then takes into account patients that hospitals draw from defined area. Several studies use several different approaches to define market area from zip code to counties, to Metropolitan Statistical Areas, to community zones (Dranove & Ody, 2016; Azar et al., 2020) [15] . There has been some critics of these approaches on measurement issues. The main concern is that the calculation of market concentration based on geographic or political boundaries might have potential bias that misleads the result of any analysis with HHI index.

Imposing natural market boundaries assumes that hospitals are either in or out of relevant geographic markets which does not take into account of patients traveling out of geographic market. Smaller market area might suggest that many hospitals are in unconcentrated market while defining larger market area as hospital market might mislead researchers and policy makers that most of hospitals are in concentrated markets. Also, actual patient flows or bed size of hospital as selection of measurement for hospital concentration index might be an outcome of hospital competition. In addition to these concerns, the actual market share might depend on unobserved characteristics of patients or hospitals. Estimates of the effect of hospital competition on any outcome or variable reflect the true effect as well as the effect of unobservable hospital and patient factors. Kessler and McClellan (KM hereafter) introduce an approach to overcome the use of geographic boundaries (Kessler & McClellan, 2000). KM estimates the predicted market share of hospitals by accounting for predicted probabilities of each patient admission to every hospital in his or her potentially relevant geographic market.

In addition to those approaches, structural approaches to measure market concentration have gained popularity in the literature to overcome mis-

[15] Dranove and Ody's study examines and compares different concentration measures used in the literature.

measurement issues and potential biases mentioned above. One of those structural approaches is willingness to pay (WTP) approach was developed by Capps et al has been used extensively compared to other structural approaches in the literature (C. Capps et al., 2003) [16]. The approach is derived from the economic theory using structural models which accounts for the value of hospital being in the managed care network. The value reflects the price that a hospital is able to receive through negotiations with payers and differs considerably from the formula used to compute hospital specific Herfindahl Hirschman Index. Patient level data such as claims data, or discharge data enables a researcher to calculate market shares of hospitals for HHI approaches. For structural approach, price variable is needed along with those datasets.

Following Kessler and McClellan's approach, I will use predicted market shares of hospitals instead of actual market shares based on predicted patient flows. The actual market shares of hospitals might suffer endogeneity bias since actual market shares might be correlated with unobserved heterogeneity of both patient and hospital characteristics. KM approach calculates the probabilities of each admission of hospitals for each patient and then finds expected number of patients for each hospital by summing up probabilities. KM approach calculates predicted market shares of hospitals based on only observable hospital and individual characteristics. Instead of defining discrete geographic boundaries, I calculate travel (driving by car) distance as a maximum amount of time that each patient drives from their zip code census-tract centroid to hospital's zip code census-tract centroid. It enables me to create each patient's hospital choice sets. Also same as KM approach, I assume that travel cost increases with driving distances, which

[16] Martin Gaynor et al calls WTP approach as semi-structural approach since one step of analysis includes reduced-form estimates for the effect of hospital competition on the interest of outcome. Please see (Gaynor & Town, 2011).

is an important assumption for hospital choice.

Insurer market competition measure also suffers from potential endogeneity issues. The actual market share of insurer could be biased since a plan with an unobserved quality attribute or a plan benefit may affect the negotiated price, but it may also increase a given insurance carrier's market share. In addition, unobservable variables that might be correlated with higher service prices are likely to deter insurance carriers from entering the market. The latter effect will bias the insurance carrier HHI coefficient upward—higher quality plans are likely to have a higher market share, but, presumably, more market health insurers will have higher costs upon entering; hence, fewer of them will be drawn into the market. Population variables used in Dunn et al. study might be ideal instruments which are correlated with insurers but not with the outcome of interest (Dunn & Shapiro, 2014). In this study I use population estimates and demographics as an instrument for insurer HHI.

3. Data

The data for this study comes from several sources: Healthcare Cost Report Information System (HCRIS) database, Internal Revenue Services (IRS) Form 990, Decision Resource Groups (DRG) Managed Market Surveyor File, and The Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). I supplement the data with American Hospital Association (AHA), Area Health Resource File (AHRF), and American Community Survey (ACS). The American Hospital Association (AHA) asks all hospitals in the US to fill out annual nonmandatory survey for that year. The publicly available AHA Annual Survey provides the most complete data as to hospital information such as utilizations, affiliations, and finance for more than 6000 hospitals and 500

health systems. The data is available from 2012 to 2016.

I utilize IRS Form 990 which covers financial information of nonprofit hospitals and Schedule H. Every tax-exempt nonprofit hospital must return annual information to the IRS along with its charity activities. IRS Form 990 includes variety of organizational information from financial information of nonprofit hospital such as revenues and expenses to list of key officers and employees. If tax-exempt organizations answer "yes" to the question 20 on the Part IV of Form 990 which asks whether the organization operates one or more hospital facilities, they must report information regarding their financial assistance and certain other community benefit activities, their hospital and non-hospital facilities during that tax year on Schedule H, which is attached to Form 990. Schedule H provides the key source for the dependent variable, community benefit expense, of this study. Schedule H also provides additional information about community needs. Affordable Care Act enacted new requirements under section 501(r)(3) for tax-exempt hospitals to qualify for tax exemptions.

IRS considers eight categories of community benefits in Schedule H as follows:

1. Charity Care or Financial Assistance category includes free or discounted healthcare services to persons who are in need and eligible to the criteria of hospital's financial assistance program.

2. Unreimbursed Medicaid is the category that takes the difference between the cost of treating Medicaid patients and the payment received for those treatment from Medicaid.

3. unreimbursed costs include other means-tested programs such as the State of Children's Health Insurance Program and other state and local programs. It basically the difference between cost of treating those

patients and payments received for those treatments from the means-tested programs.

4. Community Health Improvement Services and Community Benefit Operations is the category that includes programs and activities operated or subsidized by the health organization for the purpose of community health improvement.

5. Health Profession Education means educational programs that it covers not only education of organization's employees but also health professionals in the community.

6. Subsidized Health Services category includes costs that organization provides clinical services even though it causes the financial loss to the organization. It does not include bad debts, means-tested programs costs, therefore there is no double accounting in the reporting.

7. Research category includes any research that aims to increase the generalized knowledge to public such as knowledge about behavioral or sociological studies related to health, or diseases.

8. Cast and In-kind Contributions for Community Groups is the category that includes any report that includes cash contributions or any other types of donation to other organizations, therefore they can provide other categories describe above.

In addition to these eight categories, Schedule H also covers community building activities spending reported in the second part of the form which are not considered as community benefits by IRS (Rosenbaum, 2016). Spending on "physical improvements and housing" such as providing housing for vulnerable population and spending on "community support" such as childcare for vulnerable residents in the community are some examples of com-

munity building activities spending. The difference between community benefit spending and community building activity spending might be vague but IRS considers any community building activity spending as community benefit spending if community building activity spending meets the health needs of the community. Hence, I exclude community building activities and use only community benefit expenses from 2012 to 2016. The Table 1 displays the percentage of total spending of each category along with the total community benefits.

Table 1: Total Community Benefits Provision by 8 Categories for All Non-profit Hospitals in the US

Year	2012	2013	2014	2015	2016
Charity Care(%)	24.2	24.8	20.5	18.0	17.6
Cash-in-kind Contributions(%)	2.6	2.8	3.2	2.8	2.8
Community Health Services(%)	4.3	4.2	4.3	4.3	4.1
Health Professions Education(%)	14.8	16.2	16.5	16.8	16.2
Unreimbursed Medicaid(%)	30.4	35.6	39.0	42.2	43.5
Unreimbursed Costs(%)	2.2	2.1	1.7	1.6	1.7
Subsidized Health Services(%)	8.4	9.1	9.5	9.1	9.2
Research(%)	13.1	5.2	5.3	5.2	5.0
Total Community Benefits($) *	68.3	63.3	63.6	68.2	73.3

1. * billion dollars

2. The data comes from IRS data for a period between 2012 and 2016 for all nonprofit hospitals that submitted IRS 990 tax form

The next data source I utilize for the study comes from Decision Resource Groups (DRG) Managed Market Surveyor File. The DRG data includes both public and commercial insurance enrollment for each health plan in the health insurance marketplace from 2012 to 2016. The next table shows that

the number of total populations with coverage increased over the years while the uninsured rate decreases. The rate of uninsured population decreased by 15% in 2015 after the expansion in Medicaid. The Medicaid expansion effect on the enrollment rate can be clearly seen in the table as well. The percentage of insurance coverage population by state is presented in the Figure 1 in Appendix.

The other data source I use in this study is Healthcare Cost Report Information System (HCRIS) database. Each Medicare-certified provider must submit an annual report to Center for Medicare and Medicaid Services (CMS). It is very comprehensive database which includes provider information such as facility characteristics, utilization data, cost, and charges by cost center (in total and for Medicare), Medicare settlement data, and financial statement data. HCRIS data allows me to construct hospital average price per discharge using the same approach used in Dafny's article [17] and examine how hospital average price per discharge varies based on competitiveness of health care market (L. Dafny, 2009).

The final data, HCUP SID, provides all inpatients discharge records, all-payer in 48 states and District of Columbia. I use it to calculate hospital competition for more robust identification. I also supplement the final data with Area Health Resource File and American Community Survey to obtain health care supply and demographics of the market.

3.0.1 Competition Measure

I calculate hospital market concentration using KM approach. Firstly, I select all nonfederal general medical and surgical hospitals with nonrural Medicare patients. I then estimate discrete-choice model of hospitals as a function of exogenous characteristics of hospitals and patients such as distance

[17] Please see Appendix for the average hospital price calculation.

from a hospital. I model the hospital choice of patient accounting for travel driving distance by car from patient zip-code census tract centroid to hospital location [18]. I also allow patient characteristics to affect his/her hospital choice. I create hospital choice sets of patients by limiting the travel distance up to 80 minutes by car. I include every hospital within 80 minutes driving from a patient location into hospital choice of a patient. Applying discrete-choice models of hospital demand, I obtain predicted probabilities of each discharge to estimate the expected number of admissions for each hospital in patient's hospital choice set. Secondly, I use expected number of admissions to calculate the predicted market concentration index at zip code level (Please see Appendix B for details of the model).

$$HHI_{it} = \sum_{i=1}^{N} s_{it}^2 \tag{1}$$

For insurers, I calculate Herfindahl-Hirschman index (HHI) by summing the square of market shares of commercial health plan in Metropolitan Services Area (MSA) including both fully and self-insured enrollments. The index ranges from 1 (perfect competition) to 10000 (a monopoly).

$$s_{it} = \frac{q_{it}}{\sum_{j=1}^{N} q_{jt}} \tag{2}$$

i represents the unit of insurer while s indicates the market share of i at time t. The market share s is calculated as in (2) and q represents total enrollment for health plan [19].

[18] I calculate the driving distance using OpenStreetMaps data. For that I firstly built a local OSRM server and then calculate driving distance between two points with the latitude and longitude of census tract centroid of each 5 digit-zipcode. HCUP data provides 5 digit-zipcode for each patient and hospital.

[19] I also calculate the hospital HHI based hospital staffed beds to examine how it varies throughout the US as AHA data provides national level data on hospital characteristics and size.

3.1 Descriptive Statistics

Table 2: Summary Statistics

	Mean	SD	Min	Max
A.Outcome of Interest				
Total CB Expense($)*	44.8	82.6	0.21	791.6
CB Expense / Total Exp.(%)	9.3	4.5	0.9	24.7
CB Expense by Bed($)	103,166.85	78,360.95	4,614.83	499,027.03
B.Competition Index				
Hospital HHI	3826	2167	874.74	9985
Insurance Market (MSA) HHI	1405.3	629.38	658	4011.8
C.Hospital Characteristics				
Bed Size	331.7	303.12	14	2829
Teaching Status	0.1	0.3	0	1
Average Hospital Price($)	4756	3011.1	798	24902.6
Total Operating Expense*	282.12	278.1	12.1	1,674.9
D.Market Characteristics				
Uninsured(%)	14.30	4.63	4.30	24.10
Privately Insured(%)	64.72	6.80	52.40	81.10
Poverty Rate(%)	11.22	2.08	6.20	19.60
Median Income($)	55,337	9,860.4	35,093	93,144
For-Profit Hospitals(#)	3.63	4.02	0	15
Public Hospitals(#)	2.73	4.36	0	13
Nonprofit Hospitals(#)	11.66	14.42	0	46

1. * million dollars

2. All summary statistics are calculated for 2012-2016 time period.

3. Outcome of Interests are derived from IRS Form 990 data, Hospital HHI is derived from HCUP data. Hospital price is calculated using variables from HCRIS data. Other hospital characteristics are from AHA survey, and market characteristics are from ACS and Health Services Area Files.

The Table 2 shows the descriptive statistics for nonprofit hospitals in the analytic sample [20]. The average community benefit expense of nonprofit

[20]In IRS 990 Schedule H, hospitals report total community benefit expenses, which in-

hospitals in states in the data sample is 44.8 million dollars and the percentage of community benefit expense as ratio of total operating expense is 9.3% which is similar to the national average.

Table 3: Summary Statistics of Insurer Market and Hospital HHIs by Year

Year	Mean	Median	SD	Min	Max
Hospital HHI					
2012	3807.8	3550.6	2194.7	925.5	9984.9
2013	3814.8	3583.6	2181.0	902.4	9976.3
2014	3869.6	3624.2	2173.5	912.4	9982.9
2015	3851.9	3696.3	2165.1	921.3	9690.3
2016	3783.9	3657.7	2134.2	874.7	9909.6
Insurance Market HHI*					
2012	1431.5	1298.2	665.1	727.5	3274.9
2013	1324.8	1189.4	563.4	675.4	3227.2
2014	1360.6	1204.6	584.4	684.6	3677.5
2015	1449.9	1290.5	708.8	658.0	4011.8
2016	1462.9	1282.0	608.1	834.1	3531.4

*MSA level

clude any expenses related to a category community benefits, as well as any revenue from that particular activities for that category. In the same line of IRS form, hospitals subtract those revenues from total community benefit expenses and report it under the net community benefit expense column. IRS form instruction specifically instructs hospitals not to report any negative numbers under that column. However, a researcher can quickly notice that there are negative numbers reported in the IRS data. Secondly some reported total community benefit expenses seem astronomically higher compared to total operating expenses which I consider them as an outlier and error. For that reason, I preferred winsorization of the data.I winsorized community benefit covariates above 97.5 percentile with the value at 97.5 percentile and below 2.5 percentile with the value at 2.5 percentile to remove the outliers.

The table 3 belows show the concentration level of both hospitals and insurers at MSA level from 2012 to 2016 for six states.The insurer HHI is generally more competitive than the hospital HHI. The summary statistics for both hospitals and insurers show that hospitals are highly concentrated while insurance market in MSA is moderately concentrated following the Department of Justice (DOJ) definition [21].

The limitation with the DOJ market delineation is that it has a strong assumption about the market concentration level, and it is not specifically designed for health care market. I instead categorize both hospital and insurer market concentration into three groups based on cutoff of the 40th and 60th percentile of their distributions rather than relying on the DOJ market delineation [22]. The intuition behind this hypothetical categorization of concentration is to examine how hospital average prices and community benefit provision are correlated with different market concentrations.

Table 4: Tabulation of Hospital and Insurer Competition Level with log of Uncompensated Care ($)

Insurer Market	Hospital Market			
	<40th	40th-60th	60th <	Total
<40th	8.106	7.986	4.308	6.938
40th-60th	6.617	6.495	5.612	6.109
60th <	4.445	4.655	4.275	4.48
Total	6.1	6.04	4.83	5.61

The same analysis with quantile cutoffs is shown in Table 12

The data covers from 2012 to 2016 for VT, MS, AR, FL, NY, UT.

I, firstly, examine how uncompensated care provision of each hospital in

[21] Unconcentrated if HHI $<$ 1500, moderately concentrated if 1,500 $<$ HHI $<$ 2,500 and, concentrated if HHI $>$ 2,500.

[22] I conduct the same analysis with quantile cutoffs(25th, 50th, 75th).

the data sample varies in hospital-insurer concentration index. Uncompensated care provision is related to hospital prices compared to other community benefit categories. Table 4 shows that the percentage of uncompensated care provision as ratio of total operating expenses decreases substantially in unconcentrated hospital markets once insurer markets become more concentrated. The same trend applies to the situation in where hospital market gets more concentrated in unconcentrated insurer market. It is plausible that insurers may not exploit enough off their bargaining power on hospitals over prices in more competitive market. In health care market with more insurer competition, hospitals provide less uncompensated care if hospitals get more concentrated. However, the table shows that if insurer market is more concentrated, hospitals do not tend to provide more uncompensated care to those in need once.

3.2 The Cross-Sectional Estimation of Hospital Average Price

The purpose of the price analysis is to analyze how hospital prices vary from unconcentrated to concentrated health care market. For that reason, I firstly examine how the average hospital price varies in the insurer-hospital concentration matrix and then analyze the cross-sectional variation of hospital and insurer market concentration by exploiting hospital average price differences in those hypothetical groups for descriptive purposes.

I present the two-way summary statistics of average hospital prices in hospital-insurer matrix in Table 4. In an unconcentrated hospital market, average hospital price decreases once insurer market concentration becomes more concentrated. Also, in concentrated insurer market, average hospital price follows, if any, upward trend towards more concentrated hospital market.

For descriptive purposes, I run the first simple specification without in-

Table 5: Tabulation of Hospital and Insurer Competition Level with log of Average Hospital Price ($)

Insurer Market	Hospital Market			
	<40th	40th-60th	60th <	Total
<40th	8.6	8.4	8.24	8.4
40th-60th	8.4	8.2	8.1	8.2
60th <	8.2	8.3	8.4	8.3
Total	8.4	8.3	8.2	8.3

The same analysis with quantile cutoffs is shown in Table 13

The data covers from 2012 to 2016 for VT, MS, AR, FL, NY, UT.

teraction terms of different concentration groups that takes the following function:

$$\ln(P_{it}) = \Phi_t + \gamma \ln(HHI^i_{mt}) + \vartheta \ln(HHI^S_{mt}) + \vartheta_1 D^l_{zt} \times HHI^S_{mt} + \beta x_{it} + \mu_{it} \quad (3)$$

where $\ln(P_{it})$ represents the logarithm of average hospital price for hospital i in time t. γ captures the effect of hospital market concentration at zip code z in time t while ϑ represents the effect of insurer market concentration at metropolitan service area in time t. HHI^i_{mt} is hospital hhi while HHI^S_{mt} is insurer HHI at MSA level. D represents the interaction terms for hospital-specific concentration. I also include the interaction of instrumental variables (IV) with interaction terms of market concentration in the IV estimates.

I present the result of cross-sectional analysis in the Table 5. OLS estimates show that average hospital prices tend to be lower in concentrated insurer market compared to the unconcentrated market while prices get

Table 6: Price Regression Results

	(OLS) log_price b/se	(IV) log_price b/se
log_hospital_hhi	-1.153***	-0.775***
	(0.18)	(0.22)
log_insurer_hhi	-0.290***	-0.322*
	(0.04)	(0.15)
2.hospital_hhi_competition#c.log_insurer_hhi	0.044***	0.231
	(0.01)	(0.17)
3.hospital_hhi_competition#c.log_insurer_hhi	0.077***	0.108
	(0.01)	(0.20)
constant	20.157***	17.316***
	(1.63)	(2.16)
N	1161	1161
R-sqr	0.152	0.035

higher once the hospital market becomes concentrated. However, the trend disappears in IV estimates even though both estimates indicate statistically significant association of market concentration with the average hospital price. Since a detail hospital price analysis is beyond of this study, I move to the next section for the econometric analysis of the main subject of the study.

4. Econometric Specification

4.1 Cross-Sectional Estimation

Firstly, I use only nonprofit(NP) hospitals in the IRS data sample with only community benefits expenses reported in IRS Form 990 data. It allows me to examine NP hospitals with more community benefit categories. In robustness check, I use uncompensated care expenses for a community benefit(CB) provision variable, which is only one category of community benefits, using HCRIS data in order to add for-profit (FP) hospitals to the analysis. As stated above, HCRIS includes only category of CBs for both NP and FP hospitals while IRS provides more comprehensive CB provision for only NP hospitals.

I begin with Pooled OLS and add fixed effects to the model to estimate the effect of hospital and insurer concentration on the CB provision controlling for market-level and hospital characteristics. The following function defines the specification:

$$\ln(P_{it}) = \Phi_t + \gamma \ln(HHI^i_{mt}) + \vartheta \ln(HHI^S_{mt}) + \beta x_{it} + \alpha_{it} + \mu_{it} \qquad (4)$$

in where Υ_{itm} defines the log of CB provision by hospital i in time t and metropolitan statistical area m. β represents the effect of control variables x such as hospital and market characteristics. α_i is hospital fixed effects. Hospital characteristics include ownership type as dummy variable to denote whether hospital is FP, NP or government hospitals [23] and teaching status which is a dummy variable indicating whether hospital is teaching hospital or not. To control for the market characteristics, I include percentage of

[23] It is included to the model in robustness checks

uninsured and privately insured population, logarithm of median income, poverty level, and number of primary care physicians at MSA level.

Table 7: Cross-Sectional Regression Results for NP Hospitals

	(OLS) Total CB b/se	(IV) Total CB b/se	(OLS) CB by Bed b/se	(IV) CB by Bed b/se
Insurer HHI(log)	-0.472***	-0.535**	-0.550***	-0.763***
	(0.13)	(0.19)	(0.15)	(0.23)
Hospital HHI(log)	-0.011	-0.014	0.015	0.005
	(0.18)	(0.18)	(0.20)	(0.20)
Constant	-5.223	-4.497	7.090	9.543*
	(4.58)	(3.89)	(4.52)	(4.30)
N	586	586	586	586
R-sqr	0.720	0.719	0.266	0.262

(1)*** indicates significance level at 1 percent, ** 5 percent, * 10 percent. Standard errors are displayed in parenthesis.

(2)All regressions control for market and hospital characteristics. Standard errors are clustered by hospital.

I start with IRS data which only includes NP hospitals with a broad CB provision . Table 7 shows estimates from a specification which accounts for cross-sectional variation. Two dependent variables; dollar value of CB expense in logarithm form and CB expense by bed in logarithm form, are used to estimate specifications. I estimate both OLS and IV models for each dependent variable. The standard errors are clustered by MSA which might take into account for any correlation in any unobserved components at MSA level . Any correlation in negotiation between health providers and insurers might be correlated within the MSA. The result from OLS indicates that the

association between insurer market concentration and CB provision by hospitals is statistically significant and negative in both dependent variables. It shows that a 1 percent change in insurer concentration decreases CB provision of NP hospitals by 0.47 and 0.55 percent respectively. It also indicates that there is no positive and statistically significant association between hospital market concentration and CB provision. Even though the relationship is not statistically significant, the magnitude of coefficient on hospital market concentration is way smaller than insurer market concentration'. Both coefficients on insurer HHI in IV estimates show negative and statistically meaningful relationship between insurer concentration and CB provision. The result suggests that IV estimates of insurer concentration are slightly higher than OLS estimates and it ranges from -0.54 to -0.76 percent. It appears that dollar value of CB provision in logarithm form has higher R2 values in both OLS and IV estimates compared to the logarithm of dollar value of CB provision by bed.

The final analysis I estimate the impact of hospital and insurer concentration on the CB expense using hospital fixed effect estimation. It isolates time variation within hospital by forgoing the between-hospital variation. This helps to remove unobserved factors that may be correlated with hospitals and examine how CB provision is affected over time by change in market concentration. The table 8 shows the result from panel estimates for both dependent variables. It presents that there is no statistically significant effect of market structure on CB provision in OLS and IV estimates.

I forgo the opportunity to use both time-invariant factors and between-hospitals variation over the time and states by using time-series variation. Fixed effects models assume that the unobserved heterogeneity is correlated with explanatory variables and does not estimate the time-invariant variables. The concern is that a study that does not control for omitted time-invariant variables such as hospital characteristics or the unobserved

Table 8: Panel Data Estimation for NP Hospitals

	(FE) Total CB b/se	(FE-IV) Total CB b/se	(CRE) Total CB b/se	(FE) CB by Bed b/se	(FE-IV) CB by Bed b/se	(CRE) CB by Bed b/se
Insurer HHI(log)	-0.240	0.271	0.309	-0.272	0.091	0.229
	(0.13)	(0.40)	(0.35)	(0.14)	(0.45)	(0.33)
Hospital HHI(log)	0.065	0.127	-0.161	0.094	0.138	-0.138
	(0.13)	(0.17)	(0.23)	(0.15)	(0.39)	(0.20)
Constant	-22.357***	-36.847**	-4.135	-13.527*	-23.836	1.339
	(6.00)	(13.41)	(10.67)	(6.77)	(21.41)	(16.31)
N	586	586	585	586	586	585
R-sqr	0.726	0.09	0.863	0.290	0.074	0.97

(1)*** indicates significance level at 1 percent, ** 5 percent, * 10 percent. Standard errors are displayed in parenthesis.

(2)All regressions control for market and hospital characteristics. Standard errors are clustered by hospital.

heterogeneity to the researcher could produce biased results in the model estimation. For that reason, I employ the correlated random effects (CRE) approach due to its ability to estimate the both within-clusters effect and between-clusters effect for the association of healthcare market concentration and the CB provision.

I follow the CRE regression method proposed by Wooldridge to account for both within-group variation and time-invariant variables which allows the inclusion of Mudlak specification. I estimate the following model:

$$\ln(P_{it}) = \Phi_t + \gamma \ln(HHI^i_{mt}) + \vartheta \ln(HHI^S_{mt}) + \beta x_{it} + \delta \overline{x}_i + \theta z_i + \alpha_i + \mu_{it} \quad (5)$$

Where the indexes are hospital, time, and MSA level. The first depen-

dent variable Υ used in the estimation is dollar value of CB expense in logarithm form for hospital i at time t and later it is changed to CB expense by bed in logarithm form. γ and ϑ represent respectively the marginal effect of hospital and insurer concentration on the CB provision. β captures the effect of control variables that vary over time while δ is the coefficient of each time averages of time-varying variables. θ represents the effect of the time-invariant variables. α_i is the individual-specific unobserved heterogeneity from the sample data; μ_{it} is the idiosyncratic error term. I maintained the assumption that both unobserved heterogeneity and idiosyncratic term are normally distributed and there is no serial correlation in idiosyncratic errors.

One drawback of the CRE approach stated in the literature is that CRE approach are appropriate for balanced panels. FE and RE models do not require further modification for unbalanced panels; however, CRE approach does. Wooldridge(Wooldridge, 2019) proposes an CRE approach for unbalance panels that fits for a type of the panel data in this study which lacks some hospitals over the years due to closures, mergers and acquisition or newly opening. I model the heterogeneity as functions of the number of complete cases available for each hospital and therefore drop any missing observations.

Column 3 and 6 in Table 8 show the result of CRE model for each dependent variable. Similar to the previous estimates, I do not find any meaningful relationship between market concentration and CB provision by NP hospitals.

4.2 Robustness Checks

In the second part of the analysis, I use uncompensated care (UC) expenses for a community benefit provision variable, which is only one category of community benefits, using HCRIS data in order to add for-profit hospitals

and government hospitals to the analysis. As stated above, HCRIS includes only one category of community benefits for both NP, FP and government hospitals while IRS provides more comprehensive community benefit provision for only NP hospitals. As in the IRS data sample, I use two dependent variables; dollar value of UC expense in logarithm form and UC expense by bed in logarithm form. Since I have FP and government hospitals in addition to NP hospitals, I also use interaction terms of hospital ownership with hospital market concentration.

Table 9: Cross-Sectional Estimates for All-type Hospitals

	(OLS) Uncomp. Care b/se	(OLS) Uncomp. Care b/se	(IV) Uncomp. Care b/se	(IV) Uncomp. Care b/se	(OLS) U. Care by Bed b/se	(OLS) U. Care by Bed b/se	(IV) U. Care by Bed b/se	(IV) U. Care by Bed b/se
Insurer HHI(log)	-0.309**	-0.224	-0.475*	-0.454	-0.275*	-0.179	-0.427	-0.271
	(0.11)	(0.12)	(0.22)	(0.25)	(0.12)	(0.14)	(0.30)	(0.35)
Hospital HHI(log)	-0.004	-0.133	-0.028	-0.166	0.075	0.184	0.054	0.171
	(0.18)	(0.11)	(0.18)	(0.10)	(0.19)	(0.12)	(0.18)	(0.12)
For-Profit	1.282		1.105		-1.682		-1.871	
	(2.67)		(2.65)		(2.77)		(2.69)	
Government	8.180*		8.656*		4.958		5.569	
	(3.52)		(3.48)		(3.53)		(3.67)	
Hospital HHI x For-Profit Hospitals	-0.152		-0.132		0.160		0.182	
	(0.30)		(0.30)		(0.31)		(0.30)	
Hospital HHI x Government Hospitals	-0.847*		-0.900*		-0.493		-0.560	
	(0.39)		(0.39)		(0.39)		(0.40)	
Constant	-15.100*	-16.008*	-10.757	-9.937	-3.305	-6.004	0.627	-3.633
	(6.53)	(7.37)	(6.21)	(5.97)	(7.25)	(8.51)	(7.66)	(9.05)
N	1169	1169	1169	1169	1169	1169	1169	1169
R-sqr	0.785	0.749	0.784	0.747	0.348	0.243	0.346	0.243

(1)*** indicates significance level at 1 percent, ** 5 percent, * 10 percent. Standard errors are displayed in parenthesis.

(2)All regressions control for market and hospital characteristics. Standard errors are clustered by hospital.

I report these estimates in Table 9 along with interaction terms separately

to see how ownership affects the UC provision by each hospital. The first 4 column show the result of OLS and IV estimate for UC expense in logarithm form while the last 4 column show for UC expense by bed in logarithm form. It appears that coefficient on insurer market concentration in the specification with interaction term is statistically significant for UC expense in logarithm form. The OLS estimates show that 10 percent increase in insurer concentration decreases UC expense by 3.1 percent. However, the OLS model without interaction terms does not show a statistically significant result for market concentration of both insurers and hospitals.

As a second and last step in panel-type estimates, I run the same panel-type specification for HCRIS data sample as in the cross-sectional estimation and report the estimates in Table 10 and 11. Both OLS estimates for both dependent variables show statistically significant relationship with insurer concentration. Even though the relationship between hospital concentration and UC provision is overall not statistically significant, it does not appear same result for government hospitals. Compared to NP hospitals government hospitals tend to provide less UC provision once insurer concentration increases. Estimates in OLS indicate that every 1 percent increase in insurer market concentration results in an increase in UC provision of -0.19 to -0.32 percent which are similar magnitude of previous analysis; however, estimates using IVs for each model show that the magnitude of coefficient on insurer concentration does not reflect downward bias but there is no statistically significant association with UC provision. For both OLS and IV estimates, models with dollar value of UC provision in logarithmic form has higher R2 values compared to the models with the log of dollar value of UC provision by staffed beds.

As a final exercise in the second step, I exploit more variations by using CRE models. As in the OLS and IV estimates, government hospitals provide less UC provision for an increase in insurer market concentration relative to

Table 10: Panel Data Estimation for All-type Hospitals

	(FE)	(FE)	(FE-IV)	(FE-IV)	(CRE)	(CRE)
	b/se	b/se	b/se	b/se	b/se	b/se
Outcome of Interest: Uncompensated Care (log)						
Insurer HHI(log)	-0.321***	-0.244**	-0.463	-0.440	-0.061	-0.105
	(0.07)	(0.08)	(0.31)	(0.25)	(0.20)	(0.18)
Hospital HHI(log)	0.009	-0.140	-0.012	-0.167	0.273	0.135
	(0.10)	(0.08)	(0.20)	(0.16)	(0.35)	(0.28)
For-Profit	1.574		1.412		0.469	
	(1.44)		(3.18)		(3.42)	
Government	8.605***		8.983***		8.399***	
	(2.05)		(1.25)		(1.39)	
Hospital HHI x For-Profit Hospitals	-0.185		-0.167		-0.057	
	(0.16)		(0.36)		(0.38)	
Hospital HHI x Government Hospitals	-0.895***		-0.937***		-0.875***	
	(0.23)		(0.15)		(0.17)	
Constant	-11.176**	-11.643**	-7.273	-6.357	4.960	-0.732
	(3.59)	(3.67)	(9.38)	(7.08)	(4.48)	(1.99)
N	1169	1169	1169	1169	1169	1169
R-sqr	0.778	0.742	0.130	0.202	0.979	0.922

(1)*** indicates significance level at 1 percent, ** 5 percent, * 10 percent. Standard errors are displayed in parenthesis.

(2)All regressions control for market and hospital characteristics. Standard errors are clustered by hospital.

the NP hospitals. However, both hospital and insurer market concentration do not have statistically significant relationship with UC provision.

Table 11: Panel Data Estimation for All-type Hospitals

	(FE)	(FE)	(FE-IV)	(FE-IV)	(CRE)	(CRE)
	b/se	b/se	b/se	b/se	b/se	b/se
Outcome of Interest: Uncompensated Care by Bed (log)						
Insurer HHI(log)	-0.284***	-0.191*	-0.409	-0.253	-0.023	-0.040
	(0.08)	(0.08)	(0.44)	(0.34)	(0.20)	(0.20)
Hospital HHI(log)	0.095	0.181*	0.077	0.172	0.300	0.286
	(0.11)	(0.09)	(0.28)	(0.16)	(0.34)	(0.28)
For-Profit	-1.346		-1.511		-1.821	
	(1.54)		(3.49)		(3.65)	
Government	5.530*		6.009*		5.746*	
	(2.27)		(2.37)		(2.33)	
Hospital HHI x For-Profit Hospitals	0.122		0.141		0.179	
	(0.17)		(0.39)		(0.40)	
Hospital HHI x Government Hospitals	-0.557*		-0.610*		-0.583*	
	(0.25)		(0.27)		(0.27)	
constant	-0.554	-2.722	2.790	-1.080	7.591	0.073
	(3.84)	(3.91)	(11.25)	(6.24)	(6.83)	(4.53)
N	1129	1129	1129	1129	1128	1128
R-sqr	0.330	0.225				

(1)*** indicates significance level at 1 percent, ** 5 percent, * 10 percent. Standard errors are displayed in parenthesis.

(2)All regressions control for market and hospital characteristics. Standard errors are clustered by hospital.

5. Conclusion

This paper studies how hospital and insurer competition are related to the community benefit provision of nonprofit hospitals. The theoretical approach

in the literature shows that depending on the objective of a nonprofit hospital, nonprofit hospitals may provide more socially valuable services once they have more market power or nonprofit hospitals may behave similar to for-profit hospitals by reducing consumer welfare. Some empirical findings, on the other hand, show no statistical evidence for the association between hospital market power and charity care while some early studies show that increased competition (reduced concentration) decreases the uncompensated care provision of hospitals. However, there is no theoretical modelling that directly examines how hospital and insurer competition impact the socially valuable services of hospitals. This paper empirically examines this question and finds that there is no statistically significant evidence on the effect of hospital and insurer competition on the community benefit provision of nonprofit hospitals.

The analysis of this paper provides no evidence for the possible inconsistency between IRS approach to nonprofit hospitals and current antitrust treatment for nonprofit hospitals. It is also not enough to justify the current legal rationale of tax-exemption of nonprofit hospitals. However, the result that nonprofit hospitals do not provide more community benefit provision once they acquire more market power may emphasize the importance of understanding the determinant of nonprofit hospitals' decision on the level of community benefit provision for both tax policy and health policy implications. This study has several limitations. I use only data for several states and therefore the result may not be representative of all hospitals in the US. Due to data limitations, I could only add one categories of community benefit provision, which is uncompensated care provision, for for-profit hospitals. Secondly, the measure of dependent variable is a dollar value of community benefit provision. It does not enable me to observe how the quantity of uncompensated care varies in different market structure. Lastly, this study does not examine the quality of uncompensated care. Including the quality

of charity care at the patient level for further study would be valuable. Instead of using a regression analysis, a theoretical model of hospital-insurer bargaining with socially valuable services would provide a structure to estimate the impact of market structure on charity care and more generally community benefit activities of nonprofit hospitals.

6. Tables

Table 12: Tabulation of Hospital and Insurer Competition Level with log of Uncompensated Care ($)

Insurer Market	Hospital Market				
	<25th	25th-50th	50th -75th	75th <	Total
<25th	8.432	7.666	6.8	3.352	6.938
25th-50th	6.541	6.951	5.976	5.477	6.088
50th -75th	5.205	5.675	6.473	5.331	5.602
75th <	4.017	4.781	3.231	2.859	3.752
Total	6.13	6.27	5.5	4.48	5.61

Table 13: Tabulation of Hospital and Insurer Competition Level with log of Average Hospital Price ($)

Insurer Market	Hospital Market				
	<25th	25th-50th	50th -75th	75th <	Total
<25th	8.53	8.5	8.33	8.14	8.41
25th-50th	8.44	8.31	8.11	8.13	8.21
50th -75th	8.43	8.4	8.5	8.36	8.42
75th <	8.12	8.22	8.09	8.23	8.17
Total	8.41	8.37	8.24	8.21	8.31

7. Appendix A

Price Calculation

This appendix explains the calculation of the average price per discharge for a given year which follows Dafny and Lewis et al.'s approach. The formula to calculate the price is obtained from Lewis et al. paper (Lewis Pflum, 2017) and it is as follows:

$$Price = \frac{[[\text{Gross Inpatient Rev.} * \text{discount}] - \text{Medicare Payments}]}{Non - Medicare\ Discharges} \tag{6}$$

$$Discount = 1 - \frac{\text{Total Contractual Adjustment}}{Gross\ Inpatient\ Rev. + Gross\ Outpatient\ Rev.} \tag{7}$$

Each element of formula is obtained from HCRIS data and the list of lines as follows:

1. Gross Inpatient Revenue comes from Worksheet G, line 28 from Form CMS-2552-10 and Worksheet G, line 25 from Form CMS-2552-96.

2. Medicare Payment comes from Worksheet E, Part A line 59, column 1 from Form CMS-2552-10 and Worksheet E, Part A, line 16 from Form CMS-2552-96.

3. Non-Medicare Discharges is the difference between Worksheet S-3 line 7, column 8 and Worksheet S-3 line 7, column 7, Worksheet S-3 line 7, column 6, Worksheet S-3 line 7, column 5.

4. Total Contractual adjustments come from Worksheet G-3, line 2, column 1 from both Form CMS-2552-10 and CMS-2552-96.

5. Total Gross Revenue comes from Worksheet G-2, line 28, column 3 from Form CMS-2552-10 and from Worksheet G-2, line 25, column 3 from Form CMS-2552-96.

8. Appendix B

The Model of Hospital Competition Measure

I model that indirect utility that a patient receives by selecting a hospital over alternatives in a hospital choice set is a function of travel cost which increases with driving distance, hospital, and patient characteristics. It is given by:

$$\mu_{ij} = f\left(d_{ij}(D_i, D_j)\right) + g\left(X_i, Z_j\right) + \varepsilon_{ij} \tag{8}$$

where $f\left(d_{ij}(D_i, D_j)\right)$ is the driving distance to hospital j's location from patient i's location, $g\left(X_i, Z_j\right)$ is a function of hospital and patient observable characteristics, and ε_{ij} is independently and identically distributed with Weibull distribution and captures unobservable characteristics of hospital and patient. The probability of patient i selecting hospital j over the alternative choice set is given by:

$$\rho_{ij} = \frac{e^{(f_{ij} g_{ij})}}{\sum_{j=1}^{J} e^{(f_{ij}{}' g_{ij}{}')}} \tag{9}$$

I estimate the parameters of this model using multinomial maximum likelihood and then obtain predicted probabilities, $\hat{\rho}_{ij}$, of admission of each patient to hospital. For every zip code of patient location, I calculate predicted share of patients from zip code k to hospital j which is shown as:

$$\hat{\rho}_{jk} = \frac{\sum i \; living \; in \; zip \; k \; \hat{\rho}_{ij}}{\sum_{j=1}^{J} \sum i \; living \; in \; zip \; k \; \hat{\rho}_{ij}} \tag{10}$$

Due to possibility that each hospital may have different demand function from each zip code surrounding its location, it is possible that hospital might differentiate among patients from different zip code. To account for that possibility, $\hat{\rho}_{jk}$ is translated to zip code level for patients living in that zip code:

$$HHI_k = \sum_{j=1}^{J} \hat{\rho}_{jk}^2 \tag{11}$$

The next step is to calculate the hospital-level share of competition by creating a weighted average share of zip code that a hospital is predicted to serve.

$$\hat{\theta}_{kj} = \frac{\sum i \; living \; in \; zip \; k \; \hat{\rho}_{ij}}{\sum_{i=1}^{N} \hat{\rho}_{ij}} \tag{12}$$

$$HHI_j = \sum_{k=1}^{K} \hat{\theta}_{kj}.HHI_k \tag{13}$$

The $\hat{\theta}_{kj}$ is the predicted share of patients from zip code k and then HHI_j represents the weighted average of competition accounting for all zip codes a hospital serves. The concern is that unobserved factors of hospital choice might be correlated with patient health. To account for that concern, KM approach assigns hospital-level share of predicted HHI to patients depend on $\hat{\rho}_{jk}$.

$$HHI'_k = \sum_{j=1}^{J} \hat{\rho}_{jk}.HHI_j \tag{14}$$

Compared to HHI_k, HHI'_k accounts for weighted expected share of hospitals. HHI'_k in a panel data set includes variations of over time in the market such as mergers and closure, and individual preferences of hospital choice. Table X and Y shows the summary statistics of demand function and HHI'_k.

Table 14: Summary Statistics of HCUP Data

State	AR	MS	UT	VT	FL	NY
	mean/sd	mean/sd	mean/sd	mean/sd	mean/sd	mean/sd
Age (year)	77.88	77.45	77.46	78.58	78.29	79.01
	8.2	8.2	8.0	8.4	8.3	8.5
Female (%)	59%	59%	57%	55%	55%	57%
	0.5	0.5	0.5	0.5	0.5	0.5
Distance (minute)	25.93	25.04	16.09	21.72	16.16	14.65
	20.5	19.4	14.1	17.9	13.3	13.7
Choice Set	14.57	14.53	28.11	4.35	35.30	49.96
	9.5	6.4	13.5	1.3	17.2	30.5
Preferred Closest Hospital (%)	41%	35%	43%	80%	44%	46%
	0.5	0.5	0.5	0.4	0.5	0.5
Discharge	81359.64	86992.75	38942.05	11356.69	700763.75	479058.71
	3787.4	5743.6	4386.4	446.2	10654.0	19207.9
N	405893	433046	192068	56696	3503002	2391404

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