A Comparison of U.S. Hospital Margins in 14 Large Markets and An Analysis of Non-Profit Hospital Network Executive Compensation in those Markets

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Contents

List of Tables

List of Figures

A Comparison of U.S. Hospital Margins in Fourteen Large Markets

And

An Analysis of Non-Profit Hospital Network Executive Compensation

Executive Summary

U.S. Hospital Margins in Fourteen Large Markets

- This paper explains why patient revenues at large governmental hospitals in four large Core Based Statistical Areas in Texas and Florida – Dallas, Houston, San Antonio, and Miami – were inadequate to meet hospital operating costs. The patient revenue shortfall in these four CBSAs of $4.4 billion accounts for 42 percent of the entire hospital patient revenue shortfall nationwide among 4,072 hospitals for 2017.
- At a high level, the *large number of uninsured persons* in these CBSAs, as the result of restrictive Medicaid eligibility rules, receive health care services at a *small number of governmental hospitals* where this revenue shortfall occurs. By concentrating large numbers of uninsured persons lacking means to pay for health care services to a few governmental hospitals, patient revenues in these hospitals become grossly inadequate to cover operating costs.
- At a structural level, this analysis identifies a contrast in two approaches towards financing hospital health care services to populations with incomes below 200 percent of the federal policy level.
    - One approach adopted by states like Texas and Florida is to restrict eligibility for Medicaid. One consequence of restrictive Medicaid eligibility is an increase in uninsured patients.
        - Restricting Medicaid eligibility and increasing the number of uninsured *increases* hospital profitability for hospitals that accept Medicare because it reduces Medicaid inpatient days and Medicare hospitals are not required to provide inpatient services for the uninsured. (Table 12)
            - The restriction in Medicaid inpatient days in these four CBSAs increased hospital intermediate sufficiency margins by $1.1 billion over what they would have been had these hospitals had the same average number of Medicaid inpatient days as a comparison group of CBSAs for 2017.
        - At the same time this creates enormous demand for uninsured health care services, which is provided by a small number of governmental hospitals. These hospitals *experience large shortfalls* in patient revenues due to treating large numbers of uninsured persons. These revenue shortfalls are offset by large governmental payments raised with local hospital district taxes, generally as property taxes.
        - In the four CBSAS, these governmental payments are, on average, ten times greater than anywhere else in the United States in 2017. (f.n. 12)
            - A single hospital in Houston had a governmental appropriation of $717 million in contrast to the entire governmental appropriation for all hospitals in the state of Washington of $58 million for 2017. (f.n. 12)

- A second approach adopted by states like California, Washington, and Iowa is to expand eligibility for Medicaid and adopt the expansion of the Medicaid program under the Affordable Care Act. One consequence is a decrease in uninsured patients.
    - Expanding Medicaid eligibility l increases Medicaid inpatient days at hospitals, which reduces the intermediate sufficiency margin.
    - Because most patients are covered through expanded Medicaid eligibility, hospital patient revenue shortfalls are much smaller (Table 8) and governmental appropriations are also much smaller than for the first approach used by Texas and Florida. (f.n. 12)

- We find that hospital intermediate sufficiency margins under the first approach are larger, by about 5 percentage points, than under the second approach in our comparison of the Dallas, Houston, San Antonio, and Miami CBSAs (first approach) with San Francisco, Seattle, and Des Moines (second approach) for 2017. (Table 7)
    - However, this difference is essentially the result of a shift in profit away from governmental hospitals to for-profit hospitals in the Dallas, Houston, San Antonio, and Miami CBSAs when compared with governmental hospitals in San Francisco, Seattle, and Des Moines CBSAs. All seven CBSAs have very similar intermediate sufficiency margins for non-profit hospitals. But governmental hospitals in Dallas, Houston, San Antonio and Miami have overall margins of 2 percent versus 18 percent for San Francisco, Seattle, and Des Moines. (Table 8)

Non-Profit Hospital Network Executive Compensation in Fourteen Large Markets

- We analyze the compensation of hospital executives within non-profit hospital networks
    - Median CEO total compensation in these networks was $2.1 million for networks with net patient revenues excess of $5 billion; $1.8 million for patient revenues between $1 and $5 billion; and $0.9 million for patient revenues less than $1 billion. (Figure 1)
    - Median CFO total compensation in these networks was $1.3 million; $1.2 million; and $0.9 million respectively. (Figure 1)
- We create a measure of total executive-team-compensation-per-hospital by allocating the compensation of the CEO, CFO, Vice Presidents, and Chief Medical Officers and Chief Nursing Officers to each non-profit hospital in a network of non-profit hospitals.
    - In total we allocate 409 executives in 26 non-profit hospital networks across 136 non-profit hospitals. (Table 15)
    - The median executive team compensation in these hospitals was $5.1 million for hospitals with patient revenues greater than $600 million; $1.3 million for hospitals with patient revenues between $35 and $600 million; and $0.2 million for hospitals with patient revenues less than $35 million. (Table 15)
    - We find a strong positive correlation between executive team compensation and hospital intermediate sufficiency margin dollar amounts. (Figure 2)
    - As with our hospital models of intermediate sufficiency margin, we also find that Medicaid inpatient days and small revenue hospitals reduce executive team compensation,
        - but that executive teams at transplant center hospitals realize a compensation premium.
        - Unlike the intermediate sufficiency margin model, we find no effect on executive compensation from the level of income of persons in the same zip code as the hospital (Table 18).

Introduction

Our hospital cost comparison report of March 15, 2021 (the "2021 report") analyzed the payments received by hospitals for providing health care services, focusing on the sufficiency of the amounts to cover the direct costs incurred in providing such care.[1] We analyzed a nationwide data set of 4,072 U.S. short-term acute care hospitals accepting Medicare for 2017, and developed two measures of the adequacy of patient revenues to pay for operating expenses: the gross sufficiency margin and the intermediate sufficiency margin. These measures are similar to financial accounting measures for gross profit and operating margin, respectively, but are more narrowly defined by restricting revenues to direct payments for patient services to highlight the sufficiency of payments for patient care.[2] In summary, we found that nationwide, payments to short-term acute care hospitals for inpatient and outpatient services were sufficient to cover the direct costs of patient care with a 19.2% surplus nationwide; however, there was a wide variation in this margin by hospital type, averaging at 31.3% for for-profits, 24.1% for non-profits, and 8.1% for governmental hospitals.

Another notable finding from the 2021 report was that hospital markets with losses were concentrated in a few large markets, and that the losses were almost entirely incurred by governmental hospitals. We analyzed the 28 largest Core-based Statistical Areas (CBSAs) in terms of population, which as a group accounted for 129.7 million people or approximately 40 percent of the U.S. population.[3] These 28 CBSAs covered 40 percent of all positive intermediate sufficiency margin and 73 percent of all negative margin among our nationwide sample. Going further, we found that the losses in the largest 28 CBSAs were concentrated in just four CBSAs: Dallas, Houston, San Antonio, and Miami. These four CBSAs, housing 22.8 million people or approximately 7 percent of the U.S. population, alone had 42 percent of the nationwide margin losses. Of the $4,527 million in negative margin in these four CBSAs, almost all, $4,485, was in governmental hospitals. Only 5 of the 107 for-profit hospitals in these four large loss CBSAs had a negative margin.

Fourteen CBSAs

What explains the $4.5 billion loss in the intermediate sufficiency margin for governmental hospitals in these 4 CBSAs? To answer this, we construct a CBSA-based subset of our nationwide dataset, selecting first the four metropolitan CBSAs with very large governmental losses, and then selecting two further groupings comprised of ten other CBSAs in total. Each of the CBSA groups is discussed in this section but also detailed in Table 2. While three of our four starting-point CBSAs – Dallas, Houston, and San Antonio

[1] See "A Comparison of U.S. Hospital Margins: Are Patient Revenues Sufficient to Pay for Health Care Services?", March 15, 2021, District Economics Group. Hereafter the "2021 report."

[2] Many hospitals in the United States have revenues from sources other than patient revenues such as investment portfolios, insurance activities, rental activities, clinical trial activities, fundraising, and donations. We exclude these additional sources of revenue from this analysis because they make it difficult to compare the sufficiency of payments received for health care services. At the same time, hospitals in the United States often have expenses unrelated to the direct provision of health care services, such as payments to a parent organization – a university or a corporation – that can significantly increase reported "costs" of a hospital and obscure the direct cost of providing for health care and these too are excluded from this analysis.

[3] A core-based statistical area, or CBSA, is a set of one or more counties that are anchored by an urban area of at least 10,000 persons plus adjacent counties that are connected to the urban area by commuting routes. Many CBSAs consist of multiple cities adjacent to one another. In this paper we only refer to the first city of a CBSA, for example the Dallas CBSA, rather than the Dallas-Fort Worth-Arlington CBSA.

– are all located in the same state and so, in choosing the other ten CBSAs, we select a more geographically varied set. Together, the fourteen CBSAs we analyze span 11 states. Additionally, each is a metropolitan area with at least 10 hospitals.

The first additional CBSA group that we construct is for similarity to the main four. It is comprised of seven CBSAs with similar hospital type distributions as the main four CBSAs. We focus on selecting individual CBSAs that have a *substantial* presence of each entity type: for-profit, non-profit, and governmental to compare with the main four CBSAs' large governmental losses. With that criterion, we select the Richmond, Las Vegas, Denver, Kansas City, Riverside, Los Angeles, and New Orleans CBSAs as our comparison CBSAs. Overall, the main four CBSA hospitals are 56.0 percent for-profit, 28.8 percent non-profit, and 15.2 percent governmental whereas the comparison CBSA hospitals are 43.1 percent for-profit, 40.4 percent non-profit, and 16.5 percent governmental. There are other aggregate elements that are similar, by construction, between the two groups: the main four CBSAs have 191 hospitals in total and cover a population of 22,827,463 whereas the comparison grouping of CBSAs has 218 hospitals and covers a population of 27,584,415.

The second additional grouping is for contrast to the main four. It is comprised of three CBSAs with very few to no for-profit hospitals but that also have substantial governmental hospital presence – Des Moines, Seattle, and San Francisco – which together have 68 hospitals and cover a population of 9,279,413. Both the Des Moines and Seattle CBSAs have no for-profits whereas the San Francisco CBSA has two, though they comprise less than 1 percent of all its hospitals. Following suit, the counterfactual hospitals are overall 0.03 percent for-profit, 60.3 percent non-profit, and 36.8 percent governmental.

The distribution of hospitals in the fourteen CBSAs

Hospitals in the U.S. that accept Medicare are required to file annual reports with the Centers for Medicare and Medicaid Services (CMS) detailing their facility characteristics and utilization as well as their revenues and costs. We focus solely on short-term acute care hospitals and use data from their filings for 2017 throughout this report – in this section we use it specifically to understand the distribution of hospitals, whether by entity type or net patient revenues, within our fourteen CBSAs of interest.[4] Among these hospitals are for-profit hospitals, non-profit hospitals (some owned by church affiliated groups and some owned by universities), and non-profit hospitals that are owned by government entities (for example by a city, a county, or a special hospital district).

Of the 502 short-term acute care hospitals located in our fourteen CBSAs of interest, 477 are analyzed in this paper and detailed in Tables 1 and 2. The 25 hospitals that were removed lacked sufficient revenue and cost data for calculating our margin measures and were therefore excluded (see Appendix I). Table 1 shows the distribution of the 477 hospitals by entity type and net patient revenue grouping: 203 for-profit (43 percent), 184 non-profit (39 percent), and 90 governmental (19 percent). Notably, 358 or

[4] We identify short-term acute care hospitals using CMS Cost Report worksheet S-2, Part 1, line 3, column 4. Other hospitals that identify by type as long-term care, cancer, psychiatric, rehabilitation, religious nonmedical health care institutions, children's, alcohol and drug, or "other" in their Medicare cost report filings are not included in this analysis. Posing a contrast to short-term acute care hospitals, ambulatory surgery centers (ASC), also known as "outpatient surgery centers" or "same day surgery centers" do not provide inpatient or emergency department services and do not – if standalone – file cost reports.

three-fourths of the hospitals had net patient revenues between $35 and $600 million, and of the 52 hospitals with net patient revenues greater than $600 million, only 6 were for-profit (12 percent).

Among the most important dimensions of this comparison are the size of a hospital in terms of patient revenue, and the ownership structure of a hospital as for-profit, non-profit, or governmental. We find, as did the 2021 report, that for-profit hospitals are more profitable than non-profit hospitals, which are more profitable than governmental hospitals. We also find that while smaller hospitals are the least profitable overall, on average, the smallest for-profit hospitals are more profitable than the largest governmental hospitals.[5]

Table 1. Counts of short-term acute care hospitals located within the fourteen CBSAs and filing CMS Cost Reports for 2017, by net patient revenue and hospital type.

Hospital Type	Net Patient Revenues			Total
	< $35 million	$35-$600 million	> $600 million	
For-profit	33	164	6	203
Non-Profit	10	145	29	184
Governmental	24	49	17	90
Total	67	358	52	477

Table 2 also details the distribution of the 477 hospitals by CBSA grouping as well as hospital type. The main four CBSAs contain 191 of the hospitals (40 percent), the seven comparison CBSAs contain 218 (46 percent), and the three counterfactual CBSAs contain 68 (14 percent). Consistent with the overall distribution shown in Table 1, for-profit hospitals are the predominant entity type in the main four and comparison groupings. While each of the CBSAs within the main four grouping are disproportionately for-profit, the within-group distribution by type can vary between CBSAs. For example, in the comparison grouping, the Las Vegas, Kansas City, and Riverside CBSAs have mostly for-profit hospitals whereas the Richmond, Denver, Los Angeles, and New Orleans CBSAs do not. By construction there are little to no for-profit hospitals in the counterfactual CBSAs, evidenced by their 3 percent share among that group.

[5] Comparisons of the hospital intermediate sufficiency margin can be made using Table 3 of the 2021 report and Table 6 of this report.

Table 2. Counts of short-term acute care hospitals within the fourteen CBSAs and filing CMS Cost Reports for 2017, by CBSA grouping and hospital type.

CBSA grouping	for-profit	non-profit	governmental	total hospital count	population[6] (millions)
Main Four	**107**	**55**	**29**	**191**	**22.8**
Dallas-Fort Worth-Arlington, TX Metro Area	43	26	8	77	7.3
San Antonio-New Braunfels, TX Metro Area	12	1	4	17	2.5
Miami-Fort Lauderdale-Pompano Beach, FL Metro Area	21	12	10	43	6.1
Houston-The Woodlands-Sugar Land, TX Metro Area	31	16	7	54	6.9
Comparison	**94**	**88**	**36**	**218**	**27.6**
Richmond, VA Metro Area	4	4	2	10	1.3
Las Vegas-Henderson-Paradise, NV Metro Area	11	4	1	16	2.2
Denver-Aurora-Lakewood, CO Metro Area	6	11	2	19	2.9
Kansas City, MO-KS Metro Area	15	10	7	32	2.1
Riverside-San Bernardino-Ontario, CA Metro Area	13	11	7	31	4.5
Los Angeles-Long Beach-Anaheim, CA Metro Area	39	43	10	92	13.3
New Orleans-Metairie, LA Metro Area	6	5	7	18	1.3
Counterfactual	**2**	**41**	**25**	**68**	**9.3**
San Francisco-Oakland-Berkeley, CA Metro Area	2	19	9	30	4.7
Des Moines-West Des Moines, IA Metro Area	-	5	9	14	0.7
Seattle-Tacoma-Bellevue, WA Metro Area	-	17	7	24	3.9
Overall	**203**	**184**	**90**	**477**	**59.7**

Gross and intermediate sufficiency margins with governmental appropriations

As with the 2021 report, this analysis uses two measures of the sufficiency of payments received by a hospital for patient services to cover the direct costs of providing such care. For U.S. hospitals that accept Medicare in 2017, we construct the gross sufficiency margin as a measure akin to a gross margin in financial accounting. For each hospital we construct an analog to the cost of goods sold as the sum of hospital labor costs plus the costs of medical, pharmaceutical, and surgical supplies used in the hospital. It differs from a financial accounting gross margin in that revenues are more narrowly defined than total revenues to only include revenues received by a hospital for direct patient services for health care. Our second measure of sufficiency of payments is the intermediate sufficiency margin. This measure is akin to a net margin in financial accounting by expanding costs included in the gross margin by bad debt, charity, interest expense, equipment rental and repairs, health IT purchases, and capital insurance costs. These two measures are purposely built to focus on the adequacy of patient revenues for health care services to a hospital to meet each hospital's costs.

[6] CBSA population data estimates for 2017 downloaded from U.S. Census Bureau's Metropolitan and Micropolitan Statistical Areas Totals: 2010-2020. https://www.census.gov/programs-surveys/popest/technical-documentation/research/evaluation-estimates/2020-evaluation-estimates/2010s-totals-metro-and-micro-statistical-areas.html. To access, select Datasets, 2010-2019, metro, totals, cbsa-est2019-alldata.csv.

Governmental appropriations

New to this paper is an expansion of the gross and intermediate sufficiency margins. Rather than using only payments for patient services in the denominator, we now add governmental appropriations.[7] Including government payments to hospitals was prompted by the unexpected finding in the 2021 report that, absent government payments as a source of hospital revenue, 41%, or $4.5 billion of $11.0 billion nationwide, of hospital revenue shortfall from patient revenues *across the entire U.S.* was concentrated in four large CBSAs – Dallas, San Antonio, Houston, and Miami. This paper explains why this was the case in 2017.

For this analysis, we begin with the measure of hospital net patient revenue provided by the CMS Cost Reports and used in our hospital comparison paper. We consider a hospital's net patient revenue to be comprised of its payments from Medicare, Medicaid, and non-Medicare and non-Medicaid sources. The CMS Cost Reports show payments for patient health care services through Medicaid or Medicare separately along with total net patient revenues. As part of Medicaid, we also include net revenue from the Children's Health Insurance Program (CHIP), Disproportionate Share Hospitals (DSH), and state or local government indigent care programs.[8] Payments from Medicare include direct payments from Medicare plus the copayments that the Medicare beneficiary is required to pay.[9] To calculate the payments from non-Medicaid and non-Medicare sources, we subtract the Medicaid and Medicare payments from each hospital's net patient revenues. This third component includes payments from private insurance, unions, employers, and individuals (as copayments, deductibles, and payments by uninsured persons).

Governmental appropriations are described by the CMS as grants, appropriations, or transfers received or expected from government entities for purposes related to operation of the hospital. They can include funds from government entities for general operating support as well as for special purposes, such as funding a hospital's uncompensated care, but cannot include funds received for non-operating purposes, such as research or capital projects. Although these governmental funds are designated as "other income" in the CMS Cost Reports, they are directly linked to hospital operations and are therefore appropriate to include in the denominator of our sufficiency margin. Note that hospitals do not need to be governmental entities to receive this form of governmental funding but that the majority that do so are.[10]

Of the 477 hospitals in our fourteen CBSA sample, 64 hospitals – 42 governmental, 21 non-profit, and 1 for-profit – received governmental appropriations in FY 2017.[11] Table 3 summarizes these 64 hospitals, providing the count of receiving hospitals as well as the mean governmental appropriation by individual

[7] Net patient revenues are total patient revenues less any discounts and rebates. This is a measure of actual payments to a hospital for patient care. Worksheet G-3, line 3, column 1 of the Medicare Cost Reports.
[8] Worksheet S-10, column 1 of the Medicare Cost Reports: Medicaid revenue and DSH/supplemental payments on lines 2-4; CHIP revenue on line 9; and other state/local government program revenue on line 13.
[9] Worksheet E-1, Part 1 of the Medicare Cost Reports. Medicare program liability/payments include total interim payments (paid to provider and payable on individual bills) and net settlement payments. This is done for both Inpatient Part A and Part B.
[10] Worksheet S-10, line 18, column 1 of the Medicare Cost Reports.
[11] The lone for-profit hospital was Texas Health Heart & Vascular Hospital Arlington, a specialty hospital in the Dallas CBSA. It is a joint venture between Texas Health Arlington Memorial Hospital – a non-profit entity – and physician investors. Its governmental appropriation was approximately $450,000.

CBSA and CBSA grouping. Overall, the mean appropriation is $64.3 million. Among the CBSA groupings, the main four CBSA hospitals have an average appropriation of $278.5 million, which is 10 times greater than the average for the comparison group and fourteen times greater than the average for the counterfactual group. At the individual CBSA level, Houston has the highest average appropriation among its 3 receiving hospitals, followed by San Antonio and Miami, whereas Seattle and Kansas City have the lowest.

Table 3. Count of hospitals receiving governmental appropriation and mean appropriation values, by CBSA grouping and individual CBSA.

CBSA Grouping	Count with Governmental Appropriation	Mean Governmental Appropriation
Main Four	**10**	**$278,538,266**
Dallas-Fort Worth-Arlington, TX Metro Area	3	$197,609,746
San Antonio-New Braunfels, TX Metro Area	2	$283,731,937
Miami-Fort Lauderdale-Pompano Beach, FL Metro Area	2	$267,897,316
Houston-The Woodlands-Sugar Land, TX Metro Area	3	$363,098,307
Comparison	**34**	**$28,126,682**
Richmond, VA Metro Area	2	$34,248,185
Las Vegas-Henderson-Paradise, NV Metro Area	4	$7,858,391
Denver-Aurora-Lakewood, CO Metro Area	3	$46,454,574
Kansas City, MO-KS Metro Area	9	$4,662,168
Riverside-San Bernardino-Ontario, CA Metro Area	8	$59,520,516
Los Angeles-Long Beach-Anaheim, CA Metro Area	7	$26,590,609
New Orleans-Metairie, LA Metro Area	1	$12,755,646
Counterfactual	**20**	**$18,813,171**
San Francisco-Oakland-Berkeley, CA Metro Area,	9	$32,158,787
Des Moines-West Des Moines, IA Metro Area,	6	$10,999,667
Seattle-Tacoma-Bellevue, WA Metro Area	5	$4,167,265
Overall	**64**	**$64,343,020**

The hospital that received the largest governmental appropriation in our fourteen CBSA sample is Harris Health System's Ben Taub Hospital in the Houston CBSA which received $717.0 million.[12] The second and third largest appropriations also went to Texas hospitals with Dallas's Parkland Memorial Hospital receiving $575.7 million and San Antonio's University Hospital receiving $564.4 million. While the Texas hospitals have by far the largest governmental appropriations, a greater proportion and count of hospitals in the Des Moines CBSA receive government appropriations than hospitals in the Texas CBSAs. The Des Moines CBSA had the highest share of receiving hospitals at 42.86 percent (6 of its 14 hospitals, all of which were governmental) and the San Francisco CBSA had the second highest at 30.0 percent (9

[12] To put this $717 million governmental appropriation to single hospital in perspective, it is larger than the *entire* state-wide governmental appropriations to all Medicare accepting hospitals for every state except Texas ($2,722), New York ($1,136 million) and California ($728 million) for 2017. These states are followed by Florida and Massachusetts which received $658 million and $384 million in total governmental appropriations, respectively. Among the states with CBSAs in this analysis, Colorado had governmental appropriations of $175 million; Iowa $99 million; Virginia $69 million; Kansas $59 million; Washington $58 million; Louisiana $58 million; and Nevada $51 million.

of its 30 hospitals, 6 governmental and 3 non-profit), while the Dallas CBSA had the lowest at 3.90 percent (3 of its 77 hospitals, 1 of each entity type).

Parkland Memorial, the hospital that received the second largest appropriation in our sample, provides an interesting example of governmental appropriations provided through intergovernmental transfer. As the only public hospital located in Dallas, Parkland receives ad valorem tax revenues through a special hospital taxing district to subsize its costs of providing health care services to uninsured patients who qualify for tax-supported care through a program called Parkland Health*Plus*. The program is designed for Dallas County indigent patients with family incomes up to 200% FPL and no third-party coverage such as state Medicaid, Medicare, or private insurance. According to Parkland's FY 2017 annual financial report, the levied property tax of 27.94 cents per $100 of assessed value amounted to $575.7 million in revenues in that fiscal year, the same amount as shown for the governmental appropriation in their CMS Cost Report filing. These revenues were collected on Parkland's behalf by Dallas County.[13]

So why are the government appropriations for the Texas and Miami CBSA hospitals so large? Both Texas and Florida provide the most restrictive Medicaid coverage and neither adopted the expansion of Medicaid under the Affordable Care Act. As a result, both Texas and Florida routinely are among the states with the highest proportion of the population uninsured. In 2017, 17.3% of the population of Texas was uninsured, and 12.9% in Florida. For the comparison group, Nevada uninsured were 11.2% of the population, for Missouri 9.1%, for Virginia 8.8%, for Louisiana 8.4%, for Colorado 7.5% and for California 7.2%. Among the counterfactual CBSAs, California had an uninsured rate of 7.2%, for Washington 6.1% and for Iowa 4.7%.[14] In short, there is a disproportionately large population with health care coverage unmet through federal or private insurance channels in the Texas and Miami CBSAs leaving state and local governments to address health care for a large uninsured population.

With a large unmet health care need in Texas and Florida, what explains so few hospitals in the main four CBSAs receiving governmental appropriations? Why do governmental appropriations appear to be "point loaded" onto a few hospitals in these CBSAs? In short, the few governmental hospitals receiving large governmental appropriations are the providers of health care for the uninsured in those CBSAs, leaving other hospitals in the main four CBSAs to take the smaller Medicaid population as well as the "normal" Medicare and private insurance patients. A smaller Medicaid population due to restrictive policies, resulting in a larger uninsured population, results in hospital patient market segmentation, as discussed in this paper. It is this market segmentation that created the -$4.5 billion intermediate sufficiency margin in the four CBSAs shown in the 2021 report.

Table 4 shows the averages of the gross sufficiency margin and its components, each as a share of net patient revenues plus governmental appropriations, by hospital net patient revenue size and type for the 477 hospitals in our fourteen CBSA sample. The average gross sufficiency margin across all 477 hospitals is 37.6%. One key finding illustrated in Table 4 is that across all net patient revenue sizes, for-profit hospitals have the highest average gross sufficiency margins and governmental hospitals generally have the lowest. This variation is largely driven by the share of direct labor costs for hospitals' salaries and wages: in each size grouping, for-profit hospitals have lower direct labor costs than non-profit hospitals, which generally have lower direct labor costs than governmental hospitals. In general, labor

[13] Dallas County Hospital District's Financial Report for FY 2017: https://www.parklandhealth.org/Uploads/Public/Documents/PDFs/Reports-Discolures/Parkland%20Financial%20Statements%202017.pdf

[14] 2017 state uninsured rates from https://www.census.gov/library/visualizations/interactive/uninsured-rate.html

costs consume 20 percent more of hospital net patient revenue for governmental hospitals than for-profit hospitals.

However, this does not mean that governmental hospitals have higher labor costs than for-profit hospitals, but only that labor costs *as a share of net patient revenues including governmental appropriations* are higher in governmental hospitals. If governmental hospitals have lower revenues, which might be the case if most health care services are provided to uninsured and Medicaid patients, then it is revenues that are lower and not necessarily the actual cost of labor.[15]

Table 4. Averages of gross sufficiency margin and its components for the 477 short-term acute care hospitals in the fourteen CBSAs filing CMS Cost Reports for 2017, by hospital net patient revenue size and type.

Size of NPR	Hospital Category	Average Gross Sufficiency Margin as Share of NPR w/ Gov't Appr. (1) 100% – (2) – (3)	Average Medical, Surgical, and Pharmacy Expenses as Share of NPR w/ Gov't Appr. (2)	Average Labor (Including Contact Labor) as Share of NPR w/ Gov't Appr. (3)
Any	For-profits	45.5%	17.0%	37.4%
	Non-profits	36.1%	20.8%	43.2%
	Governmental	23.0%	21.5%	55.5%
	All	37.6%	19.3%	43.0%
< $35 million	For-profits	43.0%	18.3%	38.7%
	Non-profits	22.7%	18.0%	59.3%
	Governmental	26.0%	19.4%	54.6%
	All	33.9%	18.6%	47.4%
$35-$600 million	For-profits	45.8%	16.9%	37.3%
	Non-profits	36.6%	20.7%	42.7%
	Governmental	21.8%	20.8%	57.5%
	All	38.8%	19.0%	42.2%
> $600 million	For-profits	52.6%	13.1%	34.3%
	Non-profits	37.8%	22.4%	39.8%
	Governmental	22.4%	26.5%	51.1%
	All	34.5%	22.6%	42.9%

Note: Shares in rows may not sum exactly to 100% due to rounding.

Table 5 also details the averages of the gross sufficiency margin and its components for the 477 hospitals in our fourteen CBSA sample but by CBSA grouping. The main four CBSAs have, on average, the highest gross sufficiency margin, lowest medical, surgical, and pharmaceutical supply expenses, and lowest direct labor costs, each shown as a share of net patient revenues and governmental appropriations. Notably, the counterfactual CBSA grouping – the group with little to no for-profit hospitals – features the opposite: on average, it has the lowest gross sufficiency margin, the highest share of medical, surgical, and pharmaceutical supply expenses, and the highest share of direct labor costs.

[15] We believe that this is largely the case. As detailed in Table 8, governmental appropriations in the main four CBSAs serve to cover the governmental hospital cost "hole" created by the large uninsured patient population. But unlike Medicaid, Medicare, or private insurance, we speculate that there might not be an explicit "profit" component to these governmental payments.

Table 5. Averages of gross sufficiency margin and its components for the 477 short-term acute care hospitals in the fourteen CBSAs filing CMS Cost Reports for 2017, by CBSA grouping and individual CBSA.

CBSA Grouping	Average Gross Sufficiency Margin as Share of NPR w/ Gov't Appr.	Average Medical, Surgical, and Pharmacy Expenses as Share of NPR w/ Gov't Appr.	Average Labor (Including Contact Labor) as Share of NPR w/ Gov't Appr.
Main Four	**41.70%**	**18.35%**	**39.94%**
Dallas-Fort Worth-Arlington, TX Metro Area	47.60%	17.54%	34.87%
San Antonio-New Braunfels, TX Metro Area	39.91%	21.56%	38.53%
Miami-Fort Lauderdale-Pompano Beach, FL Metro Area	36.87%	18.81%	44.32%
Houston-The Woodlands-Sugar Land, TX Metro Area	37.71%	18.15%	44.15%
Comparison	**36.38%**	**19.25%**	**44.37%**
Richmond, VA Metro Area	45.65%	19.05%	35.30%
Las Vegas-Henderson-Paradise, NV Metro Area	35.60%	17.85%	46.55%
Denver-Aurora-Lakewood, CO Metro Area	45.45%	19.02%	35.53%
Kansas City, MO-KS Metro Area	38.33%	19.20%	42.48%
Riverside-San Bernardino-Ontario, CA Metro Area	35.74%	20.59%	43.67%
Los Angeles-Long Beach-Anaheim, CA Metro Area	32.30%	19.23%	48.47%
New Orleans-Metairie, LA Metro Area	40.86%	18.68%	40.46%
Counterfactual	**30.22%**	**22.28%**	**47.50%**
San Francisco-Oakland-Berkeley, CA Metro Area	29.90%	18.83%	51.27%
Des Moines-West Des Moines, IA Metro Area	26.52%	22.52%	50.97%
Seattle-Tacoma-Bellevue, WA Metro Area	32.78%	26.45%	40.78%

Note: Shares in rows may not sum exactly to 100% due to rounding.

The dependent variable for our analysis is the *intermediate sufficiency margin* which begins with the gross sufficiency margin, detailed in both Tables 4 and 5 and subtracts the costs of charity care, bad debt expense, interest expense, equipment rental and repairs and maintenance, capital insurance, and health information technology purchases. These additional direct costs, as shown in Table 6, reduce the average gross sufficiency margin of for-profit hospitals by 6.8%, of non-profit hospitals by 6.6%, and of governmental hospitals by 11.8%. Across all hospital types, the reduction on average is 7.6%.

Table 6. Averages of intermediate sufficiency margin and its components as shares of net patient revenue with governmental appropriations of the 477 hospitals in the fourteen CBSAs, by hospital size and type.

Size of Net Patient Revenue (NPR)	Hospital Category	Avg Gross Sufficiency Margin as Share of NPR w/ Gov't Appr.	Avg Bad Debt Cost as Share of NPR w/ Gov't Appr.	Avg Charity Care Cost as Share of NPR w/ Gov't Appr.	Avg Interest Expense as Share of NPR w/ Gov't Appr.	Avg Equipment Rental and Repairs as Share of NPR w/ Gov't Appr.	Avg Health IT Purchases as Share of NPR w/ Gov't Appr.	Avg Capital Insurance as Share of NPR w/ Gov't Appr.	Avg Intermediate Sufficiency Margin as Share of NPR w/ Gov't Appr.
Any	For-profits	45.5%	2.1%	3.7%	2.4%	1.8%	0.4%	0.2%	38.8%
	Non-profits	36.1%	1.7%	3.2%	1.7%	1.5%	0.5%	0.2%	29.5%
	Governmental	23.0%	4.5%	5.3%	1.9%	1.9%	0.3%	0.4%	11.3%
	All	37.6%	2.4%	3.8%	2.0%	1.7%	0.4%	0.2%	30.0%
< $35 million	For-profits	43.0%	2.9%	3.8%	1.8%	2.1%	1.9%	0.3%	37.5%
	Non-profits	22.7%	2.5%	5.6%	1.4%	4.0%	-	0.3%	13.6%
	Governmental	26.0%	7.2%	3.1%	2.1%	2.1%	0.2%	0.4%	13.5%
	All	33.9%	4.6%	3.8%	1.9%	2.3%	1.1%	0.3%	25.3%
$35-$600 million	For-profits	45.8%	2.0%	3.7%	2.5%	1.8%	0.2%	0.2%	38.7%
	Non-profits	36.6%	1.8%	3.2%	1.7%	1.5%	0.6%	0.2%	29.9%
	Governmental	21.8%	4.0%	6.3%	2.0%	1.7%	0.5%	0.4%	9.7%
	All	38.8%	2.2%	3.9%	2.0%	1.7%	0.4%	0.2%	31.2%
> $600 million	For-profits	52.6%	1.0%	4.2%	-	0.5%	-	0.0%	47.3%
	Non-profits	37.8%	0.9%	2.4%	1.8%	1.0%	0.2%	0.1%	33.2%
	Governmental	22.4%	2.3%	5.6%	1.0%	2.2%	-	0.1%	12.5%
	All	34.5%	1.4%	3.6%	1.6%	1.6%	0.2%	0.1%	28.1%

Note: The reporting of these costs is not consistent in the hospitals' cost report filings. The averages reflect the data available within each category. Each column averages over the individual hospitals' data: this is why the intermediate sufficiency margin column is not equivalent to subtracting the component columns from the gross sufficiency margin column.

Governmental hospitals typically spend a greater share of net patient revenues plus governmental appropriations on bad debt and charity care than for-profit and non-profit hospitals (gray shaded columns). This holds true overall and for both the $35-$600 million and the greater than $600 million net patient revenue groupings but not for the smallest size grouping, hospitals with less than $35 million in net patient revenues. Additionally, across all net patient revenue sizes, non-profit hospitals spend the least on bad debt and typically the least on charity care proportionally. These findings are consistent with our previous nationwide analysis. Charity care, as reported on the CMS Cost Reports, is largely constructed to satisfy the requirement that a a hospital that accepts Medicare must provide a certain amount of charity care. It is not intuitive to us why for-profit hospitals that accept Medicare provide almost as much charity care as governmental hospitals do.

Unlike bad debt and charity care costs, the four other sources of hospital expenditures shown on Table 6, health information technology (IT), interest expense, capital insurance, and rentals and repairs and maintenance of equipment do not show any meaningful variation as a share of hospital net patient revenues plus governmental appropriations across for-profit, non-profit, or governmental types. However, as might be expected, these costs are a greater share of net patient revenues for small hospitals than for large hospitals.

Table 7 also summarizes the additional direct costs included in the intermediate sufficiency margin for each CBSA and CBSA group. The main four CBSAs have the highest average *gross* sufficiency margin incorporating governmental appropriations at 41.7%, which is 5.3 percentage points higher than that of the comparison CBSAs. However, despite this large differential, the average *intermediate* sufficiency margin of the main four CBSAs is not the highest among the groupings: it comes second, although very close to that of the comparison group. The decrease from adding these additional costs to the main four CBSAs average gross sufficiency margin is attributable to bad debt and charity care cost (highlighted in yellow on Table 7). It is somewhat intuitive that the main four CBSAs could have larger bad debt and charity costs than either the comparator or counterfactual CBSA groups because they have the smallest Medicaid and largest uninsured populations.

Table 7. Averages of intermediate sufficiency margin and its components as shares of net patient revenue with governmental appropriations of the 477 hospitals in the fourteen CBSAs, by CBSA grouping and individual CBSA.

CBSA Grouping	Avg Gross Sufficiency Margin as Share of NPR w/ Gov't Appr.	Avg Bad Debt Cost as Share of NPR w/ Gov't Appr.	Avg Charity Care Cost as Share of NPR w/ Gov't Appr.	Avg Interest Expense as Share of NPR w/ Gov't Appr.	Avg Equipment Rental and Repairs as Share of NPR w/ Gov't Appr.	Avg Health IT Purchases as Share of NPR w/ Gov't Appr.	Avg Capital Insurance as Share of NPR w/ Gov't Appr.	Avg Intermediate Sufficiency Margin as Share of NPR w/ Gov't Appr.
Main Four	**41.7%**	**3.8%**	**6.4%**	**2.1%**	**2.4%**	**0.7%**	**0.2%**	**30.6%**
Dallas-Fort Worth-Arlington, TX	47.6%	3.4%	6.3%	2.4%	2.0%	3.8%	0.1%	36.5%
San Antonio-New Braunfels, TX	39.9%	3.6%	6.1%	1.8%	1.5%	-	0.1%	29.8%
Miami-Fort Lauderdale-Pompano Beach, FL	36.9%	3.6%	6.3%	1.0%	1.8%	0.6%	0.3%	26.1%
Houston-The Woodlands-Sugar Land, TX	37.7%	4.8%	6.8%	3.2%	3.4%	0.5%	0.4%	25.8%
Comparison	**36.4%**	**1.5%**	**2.3%**	**1.9%**	**1.5%**	**0.2%**	**0.2%**	**30.9%**
Richmond, VA	45.7%	1.1%	8.8%	1.0%	2.3%	-	0.1%	34.3%
Las Vegas-Henderson-Paradise, NV	35.6%	1.6%	2.2%	6.1%	1.8%	0.1%	0.1%	29.9%
Denver-Aurora-Lakewood, CO	45.5%	0.8%	1.6%	1.1%	0.6%	0.1%	0.1%	42.4%
Kansas City, MO-KS	38.3%	3.3%	3.4%	1.7%	1.6%	0.5%	0.2%	30.9%
Riverside-San Bernardino-Ontario, CA	35.7%	1.7%	1.2%	2.6%	1.3%	0.2%	0.1%	30.4%
Los Angeles-Long Beach-Anaheim, CA	32.3%	1.1%	1.7%	1.5%	1.6%	0.2%	0.2%	27.8%
New Orleans-Metairie, LA	40.9%	1.3%	2.3%	2.0%	1.7%	0.2%	0.6%	34.9%
Counterfactual	**30.2%**	**1.3%**	**1.8%**	**1.8%**	**1.8%**	**0.2%**	**0.1%**	**25.4%**
San Francisco-Oakland-Berkeley, CA	29.9%	1.4%	2.1%	1.8%	2.0%	0.2%	0.1%	24.2%
Des Moines-West Des Moines, IA	26.5%	1.4%	1.0%	1.1%	1.0%	-	0.2%	23.2%
Seattle-Tacoma-Bellevue, WA	32.8%	1.0%	1.9%	2.5%	1.1%	-	0.1%	28.3%

Note: The reporting of these costs is not consistent in the hospitals' cost report filings. The averages reflect the data available within each category. Each column averages over the individual hospitals' values: this is why the intermediate sufficiency margin column is not equivalent to subtracting the component columns from the gross sufficiency margin column.

Tables 6 largely agrees with nationwide version on table 3 of the 2021 report. Table 7, however, shows a large difference between the main four CBSAs versus the comparator and counterfactual CBSAs due to much larger reductions in the gross margin for bad debt and charity care.

Table 8 shows the impact on the intermediate sufficiency margin from including governmental appropriations as a part of hospital net patient revenue. The left column shows without governmental appropriations and the right column with governmental appropriations. The left column mirrors one of the key findings from the 2021 report: large losses among the governmental hospitals in the main four CBSAs. After the inclusion of governmental appropriations, the losses disappear at the CBSA level, even for the governmental hospitals. It is worth noting that because governmental appropriations are concentrated amongst governmental hospitals, adding them into the denominator raised the average margins for each CBSA's governmental hospital group, not just that of the main four. Adding governmental appropriations increased the margin for non-profit hospitals as well. Finally, we note that governmental hospitals in the counterfactual CBSAs (lacking for-profit hospitals) have much higher margins than governmental hospitals in either the main four or comparison CBSAs before and after governmental appropriations. See Appendix II for a similar breakdown to Table 8 but at the individual CBSA level.

Table 8. Averages of intermediate sufficiency margins calculated without and with governmental appropriations included in the denominator by CBSA and hospital entity type for the 477 hospitals in the fourteen CBSAs.

CBSA Grouping and Hospital Type	Average Intermediate Sufficiency Margin	
	NPR w/out Gov't Appropriations	NPR w/ Gov't Appropriations
Main Four	**27.63%**	**30.56%**
For-profits	38.56%	38.56%
Non-profits	29.94%	30.03%
Governmental	-17.05%	2.05%
Comparison	**27.65%**	**30.93%**
For-profits	39.00%	39.00%
Non-profits	27.63%	29.37%
Governmental	-1.90%	13.46%
Counterfactual	**23.03%**	**25.43%**
For-profits	38.90%	38.90%
Non-profits	28.84%	28.84%
Governmental	12.23%	18.75%
Overall	**26.99%**	**30.00%**
For-profits	38.77%	38.77%
Non-profits	28.59%	29.50%
Governmental	-2.86%	11.25%

Data and variables

Table 9 lists each of the variables used in our analysis of the intermediate sufficiency margins calculated for the 477 short-term acute care hospitals in our main four, comparison, and counterfactual CBSAs, including variable descriptions, counts, ranges, and mean values. As with our 2021 report, we focus our analysis away from patient-specific measures because these are not well-reported in the CMS Cost Reports and instead focus on modeling the amount of intermediate margin that can be explained by

factors mostly outside of each individual hospital.[16] Our modeling, detailed in Table 12, includes almost all of the variables used in our 2021 report and for comparison, we provide the variables' corresponding parameters from that nationwide analysis.[17] A discussion of the important similarities and differences between the fourteen CBSA and nationwide hospital samples is threaded throughout.

The first panel of Table 9 details two dependent variables: the intermediate sufficiency margin, both with and without governmental appropriations included in the net patient revenue measure. The version without these additional governmental funds shows that the hospitals in the fourteen CBSAs are on average slightly more profitable than the nationwide sample, with means of 27.0% and 25.0% respectively. After incorporating governmental appropriations into net patient revenue, the average margin for the hospitals in the fourteen CBSAs increases 3 percentage points to 30.0%, as also shown in Table 8. The panels that follow in Table 9 summarize the explanatory variables and are organized by each variable's level of aggregation, which this section details at length. We explain the variation in hospital margins by considering factors that vary with geographic coverage, in descending order, as: 1) nationwide; 2) state specific; 3) rural or urban specific; 4) specific to a CBSA; 5) specific to the 5-digit zip code in which a hospital is located; and lastly, 6) specific to the hospital.[18]

Nationwide

The nationwide variables are specific to each hospital entity type such as for-profit, non-profit with a church affiliation or non-profit without a church affiliation, which in most cases means a university affiliation, or governmental. For-profit hospitals comprise 42.6% of the hospitals in the fourteen CBSAs, a much higher share than their 19.6% share in the nationwide sample of our 2021 report. The share of non-profits, consisting of both the church and non-church affiliated, is much lower in the fourteen CBSAs, measuring at 38.6% of the hospitals in the fourteen CBSAs but 58.1% of the hospitals nationwide.

We also use a dummy variable for whether a hospital has net patient revenues less than $35 million. As Table 1 shows, there are 67 small hospitals within the fourteen CBSAs, spanning all entity types but predominantly for-profit, and as Table 6 shows, these low patient revenue hospitals also have the lowest intermediate sufficiency margins on average. While the latter finding is consistent with the 2021 report, it is important to note that these small net patient revenue hospitals were disproportionately governmental rather than for-profit in the nationwide sample. Additionally, the proportion of hospitals with net patient revenues less than $35 million in the fourteen CBSAs sample, 14.0%, is much lower than their nationwide share, 31.2%, indicating that the fourteen CBSA sample, which includes no rural areas, is skewed toward hospitals of larger net patient revenue sizes.

[16] In a perfect world, access to patient details for each hospital providing medical conditions and information about payments from all sources for each patient would likely explain most of the intermediate margin. However, we show that a significant portion of a margin is influenced by factors beyond the specific hospital.

[17] We no longer use hospital case-mix indices and focus on comparisons to the 2021 report model without case-mix, which was our preferred model in that paper. We also do not utilize the dummy variable reflective of if a hospital is located in Minnesota because it is not applicable to the set hospitals in the fourteen CBSAs. Additionally, we remove the two Medicaid expansion dummies because of the collinearity introduced into the models between the two dummies and the Medicaid enrollment below 200% FPL variable when narrowing from the nationwide sample to the fourteen CBSA sample. See "Medicaid Expansion" section and Appendix IV for detail.

[18] Core-based Statistical Areas are used by CMS to establish hospital wage indices that include both metropolitan statistical areas and micropolitan statistical areas, as well as rural areas.

We create a dummy variable for hospitals with words such as "hip and knee", "orthopedic", "women", and "children" in their name. We label these hospitals as specialty hospitals. Although specialized, these hospitals needed to identify as short-term acute care hospitals in their CMS Cost Report filings to be included in our analysis.[19] Of the 10 specialty hospitals we identify in our fourteen CBSA data set, 8 are for-profit, 2 are non-profit, and none are governmental. We expect higher margins on specialty hospitals because of their focus on medical procedures with higher payments such as knee and hip replacement surgery. Our models strongly support this hypothesis.

Finally, we create a dummy for hospitals that identify as transplant centers in their CMS Cost Reports. Among the 477 hospitals in the fourteen CBSAs, 46 are organ transplant centers, with both the Dallas CBSA and Los Angeles CBSA having 8 at the high end, and the Las Vegas CBSA having 1 at the low end. Similar to our expectations for the specialty hospital dummy, we anticipate that the transplant hospital dummy variable would increase margins because these facilities are associated with specialized health care services that often receive large payments. We, however, do not find support for this hypothesis in our modeling.

The hospital type that does not specifically have a dummy variable is governmental, of which there are 90 (out of 477 hospitals) in the fourteen CBSA data set. Therefore, as the omitted entity type, the coefficients for the for-profit and non-profit dummy variables should be interpretated as additions or subtractions from the intermediate margin compared to governmental hospitals. A positive coefficient on the for-profit dummy variable means that relative to governmental hospitals, for-profit hospitals have a greater margin.

State level

The state level variables test several policy-relevant hypotheses. During 2017, 27 states had right-to-work laws that make union organization difficult.[20] Of the 11 states encompassing our fourteen CBSAs, 7 had right-to-work laws in place in 2017: Florida, Iowa, Kansas, Louisiana, Nevada, Texas, and Virginia. With that, 262 of the 477 hospitals included in our analysis, or 54.9%, were in right-to-work states, a slightly lower share than the 62.2% nationwide. Since hospital labor costs are a large component of the intermediate sufficiency margin, we test whether in right-to-work laws support higher margins. Most for-profit hospitals locate in right-to-work states and as shown in Table 4, have significantly lower direct labor costs than non-profit and governmental hospitals.[21] However, we do not find support for the hypothesis that the hospitals in our fourteen CBSAs located in right-to-work states have larger margins. The 2021 report showed a statistically significant improvement to the intermediate sufficiency margin of hospitals located in right-to-work states.[22]

[19] See footnote 3.

[20] The 27 states with right-to-work laws during 2017 were: Alabama, Arizona, Arkansas, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, West Virginia, and Wyoming. www.ncsl.org/research/labor-and-employment/right-to-work-laws-and-bills.aspx

[21] For example, of the 179 health care facilities (of which 175 are hospitals) operated by the Hospital Corporation of America, a for-profit health system, during 2017, 161 were in states with right-to-work laws. See HCA Healthcare Inc., SEC form 10-K for fiscal year ending December 31, 2017, page 46.

[22] In the 2021 report, the coefficient on the right-to-work dummy variable was 0.0176 and significant. That model used our nationwide hospital data set of CMS cost reports and included 4,072 hospitals.

Another policy-relevant state level variable in our analysis is the portion of each state's population with income below 200 percent of the Federal poverty level (FPL) covered under the state Medicaid program. Nationwide, states vary widely on this measure from a high of 120 percent for Massachusetts to a low of 45.8 percent for Utah.[23] Within the 11 states relevant to our model, the range tightens from a high of 96.3 percent for California to a low of 50 percent for Kansas. We expect that the greater the proportion of a state's population with income below 200 percent of the FPL that are eligible for state Medicaid coverage, the lower the intermediate margin because this would increase the number of persons with state Medicaid, which generally pays less for patient health care than either Medicare or Commercial payers. We do not find evidence to support this hypothesis in the fourteen CBSA-focused model.

Another state level variable used is the United Health Foundation's America's Health Rankings composite measure of five dimensions of population health in each state.[24] This measure is normalized so that the U.S. average score is 0. A value less than 0 means that a state's population health ranking is lower than the national average and a positive value means that a state's health ranking is greater than the national average. The five dimensions are: 1) social and economic factors; 2) physical environmental factors; 3) clinical care; 4) population behaviors (such as tobacco use); and 5) health outcomes. This variable is intended to provide some control for the overall population health of persons in a state and to test the hypothesis that population health measured at a state level influences the intermediate margin. We anticipate that the sign of this variable would be negative because healthier populations require fewer hospitalizations, which would result in fewer procedures and lower payments but, this variable is not significant in our estimated models. This variable was also not significant in the 2021 report.

In the 2021 report, we tested an additional state-specific feature that could influence the intermediate sufficiency margin: an absence statewide of for-profit hospitals. We created dummy variables for each of the five states that had no for-profit hospitals – Alaska, Vermont, Delaware, Maine, and Minnesota – and we found that no state had an impact on the margin except for Minnesota.[25] However, none of the fourteen CBSAs are in Minnesota and so, as shown in Table 12, we remove that variable from our new models.

Medicaid expansion

A third geographic distinction separates the states participating in the expansion of Medicaid under the Affordable Care Act from states that did not during 2017.[26] Of the 11 states included in our fourteen

[23] See www.kff.org/interactive/medicaid-state-fact-sheets/. A percentage greater than 100 means that a state extended Medicaid coverage to persons with incomes above 200 percent of the federal poverty level.

[24] See www.AmericasHealthRankings.org

[25] Minnesota has neither for-profit nor governmental hospitals, has a relatively high 85 percent of the population with income less than 200 percent of the FPL eligible for state Medicaid, adopted the expansion of Medicaid under the Affordable Care Act, and has a state sponsored health insurance plan for working uninsured Minnesota residents ("Minnesotacare"). In the 2021 report, the dummy variable for Minnesota was consistently positive and significant in our models adding on average nearly 10 points to the margin. Minnesota matters in terms of improving hospital intermediate margins.

[26] Through 2017, 19 states had not adopted the Medicaid expansion under the Affordable Care Act. After 2017, 7 of these have adopted the expansion: Virginia, Maine, Idaho, Utah, Nebraska, Oklahoma, and Missouri. As of 2021 the twelve remaining states that do not participate in the Medicaid expansion are: Texas, Wyoming, South Dakota, Kansas, Wisconsin, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Tennessee.

CBSA analysis, 7 had expanded Medicaid (California, Colorado, Louisiana, Iowa, Nevada, Virginia, and Washington) and 4 had not (Florida, Kansas, Missouri, and Texas). None of the main four CBSAs but all of the counterfactual CBSAs expanded Medicaid. We create two dummy variables for hospitals located in states that elected the expansion, one for urban area hospitals and one for rural area hospitals. In the 2021 report, both urban and rural Medicaid expansion variables improved hospital intermediate sufficiency margins nationwide and were statistically significant. We expect that hospitals in states electing the Medicaid expansion under the Affordable Care Act would have greater intermediate sufficiency margins because it both reduces uncompensated care and encourages persons newly covered under the expansion to seek medical care. However, for models estimated on the fourteen CBSA hospital sample, *we remove both* the urban and rural Medicaid expansion dummies due to collinearity introduced from narrowing down the nationwide sample to the fourteen CBSAs across 11 states.[27]

Appendix IV details the variance inflation factors associated with our fourteen CBSA model with and without the two Medicaid expansion dummy variables, the latter of which is shown in Table 12.

Core-Based Statistical Areas

A fourth geographic aggregation focuses on the Core-Based Statistical Area (CBSA) which includes census bureau aggregation schemes for metropolitan statistical areas and micropolitan statistical areas. We use the CBSA to define a market area for hospitals. For each CBSA, we construct a Hirschman Herfindahl index (HH) of the level of competition among all short-term acute care hospitals using each hospital's net patient revenue as its measure of size. The index is the sum of the squared value of each hospital's share of total net patient revenue in a CBSA. The smallest CBSA of the fourteen, Richmond, Virginia has 10 hospitals and a population of 1.3 million persons. (A CBSA with a single hospital would have an index equal to 1, signifying no competition.) The focus on large CBSAs also explains the substantial difference in Table 9 of the average HH index between the fourteen CBSA and nationwide samples, measuring at 0.074 and 0.519 respectively. The average HH index of 0.074 indicates very competitive markets as would be expected given that the sample was constructed from large CBSAs, metropolitan areas with many hospitals in each.

In multi-hospital CBSAs, if each hospital has an identical amount of net patient revenue, the index number would equal 1 divided by the number of hospitals in the market. As the number of hospitals in the market becomes very large and as hospital revenues are more equal, the HH index approaches 0. The largest CBSA nationwide is Los Angeles with 90 hospitals and 13.3 million persons, and an HH index based upon net patient revenues in each of these hospitals of 0.029 indicating a very competitive, but not perfectly competitive, market.[28] Another large CBSA we focus on is Dallas with 77 hospitals, a population of 7.3 million, and an HH index of 0.029 as well. We expect more competitive markets to have lower intermediate sufficiency margins, but we do not find a significant effect.[29]

[27] "Detecting Multicollinearity Using Variance Inflation Factors," Penn State Stat 462: Applied Regression Analysis. https://online.stat.psu.edu/stat462/node/180/

[28] For the Los Angeles CBSA, if all hospitals had the same amount of net patient revenue, then the HH index would be approximately 0.011, and no hospital would have market power over any other hospital.

[29] In the 2021 report using 4,072 hospitals nationwide, we also did not find a statistically significant effect using the HH market concentration index at the geographic level of a CBSA.

5-digit zip code level

The last unit of geographic aggregation is the 5-digit zip code of each hospital's address. Using federal individual income tax return data aggregated to the 5-digit zip code level we construct a ratio of the number of persons in households with adjusted gross income (AGI) greater than $100,000 to the number of persons in households with AGI less than $25,000 in the zip code of each hospital. The range of this variable for the 477 hospitals in our dataset has a low value of 0.022, where there are very few tax returns filed with AGI greater than $100,000, and a high value of 15.374, indicating that for every person in a household with AGI less than $25,000 there are 15.374 persons in households with AGI greater than $100,000. Additionally, the mean of this variable is 1.865 in the fourteen CBSA sample, which is notably 60 percent higher than the mean of 1.164 in the nationwide sample, indicating a higher prevalence of persons in households with AGI greater than $100,000.

Households with AGI greater than $100,000 are more likely to have commercial insurance coverage while households with AGI less than $25,000 are more likely to have Medicaid coverage. Because 5-digit zip codes are relatively small geographic areas determined by local postal delivery capabilities, we assume that persons living in households within the same zip-code as a hospital are more likely to use that hospital for health care services.[30] Commercial insurance generally pays more for hospital health care services than either Medicare or Medicaid and so, we expect the intermediate sufficiency margin to increase with this variable, and it does.

Often government policy locates the provision of health care services to areas where health needs are unmet through market-based incentives. This means that governmental hospital facilities are often located based on an unmet need for health care services and often in low-income neighborhoods. On the other hand, for-profit entities *should* use market-based incentives to determine the location of hospitals. With the 2021 report we found this to be the case nationwide, with for-profits locating in the highest income areas on average. However, within the fourteen CBSAs it is non-profit hospitals that tend to locate in the highest income neighborhoods, with an average zip code income of $107,847, followed by for-profit hospitals at $85,217 and governmental hospitals at $70,685 (see the first table of Appendix III). Not only is the average income lower in 5-digit zip codes where governmental hospitals are located, but the ratio of persons in high-income households to low-income households in the fourteen CBSAs is 94 percent greater where non-profit hospitals locate than where governmental hospitals locate (2.43 in 5-digit zip codes with non-profit hospitals versus 1.25 in 5-digit zip codes with governmental hospitals, see the first table of Appendix III).

Hospital level

The nationwide, state level, CBSA, and 5-digit zip code level variables do not make use of hospital-specific information but instead address broader issues about population health and income and competition among hospitals as well as state-specific features around Medicaid availability, labor law,

[30] Tax returns, and the persons reported on tax returns, do not represent the entire population. Approximately 13 percent of the U.S. resident population is not accounted for on federal individual income tax returns filed each year. Most of these persons are elderly with social security as the principal source of income. Because most social security income is not subject to income tax, the elderly often do not have a requirement to file because their taxable income is below the filing requirement of $23,300 for a married couple over the age of 65 and $11,950 for a single person over the age of 65. See "The Income Tax Position of Persons Not Filing Returns for Tax Year 2005" by Joshua Lawrence, Michael Udell, and Tiffany Young, presented at the IRS Research Conference of 2012.

and adoption of the Affordable Care Act. The following five hospital-specific variables rely upon hospital information reported in the CMS Cost Reports rather than patient-specific information.

The first hospital-specific dummy variable is for hospitals with large emergency department patient use, calculated as non-salary emergency department costs greater than 10 percent of net patient revenues. Emergency departments are often the front door of the hospital for many outpatients with, on average, almost 90 percent of emergency department cases being treated as outpatient care, and 10 percent being admitted for inpatient care.[31] This is especially true for areas with large uninsured populations who, lacking primary care physicians, use a hospital's emergency department as the point of contact for health care. Texas, Missouri, and Florida have the largest portions of their populations with incomes below 200% of the federal poverty level as uninsured because they provide the fewest eligible persons with Medicaid and did not adopt the Medicaid expansion under the Affordable Care Act.[32] Additionally, hospitals that serve areas with large uninsured populations will tend to have larger charity care costs and bad debt expenses. Because payments for outpatient care are less than inpatient care, and because hospitals that serve large uninsured populations have greater costs for charity care and bad debts, high outpatient care use of the emergency department can be expected to reduce margins. When hospital margins were examined *excluding* governmental transfers to hospitals in the 2021 report, we found significant support for this hypothesis but, when we *include* such governmental payments, this result goes away. It appears that in the main four CBSAs governmental payments to hospitals appear to "hold harmless", or "true-up" a negative intermediate sufficiency margin as a subsidy to hospital net patient revenues. Table 8 shows the large impact of governmental payments on hospital intermediate sufficiency margins in the main four, comparator, and counterfactual CBSAs.

The second hospital-specific variable focuses on the proportion of hospital inpatient days covered under Medicaid and the Children's Health Insurance Program (CHIP). The mean of this variable is very similar between the nationwide and fourteen CBSA samples, indicating that, on average, hospitals in the two samples care for similar shares of patients covered under state Medicaid and CHIP programs. The greater the number of hospital inpatient days paid for by Medicaid, the lower the expected hospital margin because Medicaid pays less than Medicare or Commercial insurers for most inpatient care. We consistently find strong support for this hypothesis.

The last 3 hospital-specific variables are dummy variables for hospital affiliation with a broader network of hospitals. Before describing the variables, it is important to first define our concept of a hospital network in relation to that of a health system.

Health systems and hospital networks

A health system broadly describes an arrangement between two or more health care organizations or providers - typically at least one acute care hospital and at least one group of physicians – whether connected contractually or through common ownership.[33] An example is Catholic Health Initiatives (CHI)

[31] See Table 24, National Hospital Ambulatory Medical Care Survey: 2017 Emergency Department Summary Tables, https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf.

[32] See https://www.commonwealthfund.org/childrens-health-insurance-program. For example, neither Texas nor Florida allow single persons without children to qualify for Medicaid, regardless of income. In most states, single persons with income below 100% of the federal poverty level are eligible for Medicaid.

[33] Defining Health Systems, Agency for Healthcare Research and Quality (2017). https://www.ahrq.gov/chsp/chsp-reports/resources-for-understanding-health-systems/defining-health-systems.html

which operated 1,231 sites of care, including 100 hospitals and 16 long-term care facilities, and employed approximately 4,700 physicians and advanced practice clinicians across 17 states in FY 2017.[34] CHI is one of the largest and most expansive health systems in the United States and shows a high degree of vertical integration by encompassing all levels of health care – hospitals, physician practices, outpatient facilities, surgical facilities, testing facilities, and even rehabilitation, nursing and assisted care facilities. In this analysis, we focus on the hospitals within our fourteen CBSAs that are part of a health system and the effect of their affiliation on the hospitals' intermediate margins and executive compensation.

We view the collection of short-term acute care hospitals and other facilities that are part of the same health system as a hospital network, ranging from just one hospital for networks like Advanced Diagnostics Healthcare and Virginia Mason Medical Center to a high of 146 for HCA Healthcare. Interestingly, it is not the case that all facilities within the same system identify as the same type of entity – government/public, non-profit, or for-profit. Often, strategic partnerships and joint ventures result in for-profit hospitals within a non-profit network, and governmental hospitals within non-profit networks. Notably, of the 60 hospital networks that we identify with hospitals in the fourteen CBSAs, 23 have a mix of entity types. For example, Memorial Hermann Health System is one of the largest non-profit and community-owned health systems in Southeast Texas.[35] In our data from 2017, Memorial Hermann had 10 short-term acute care hospitals – 6 non-profits that it owned and operated as well as 4 for-profits that were joint ventures.[36,37]

The geographic scope of hospital networks is another interesting element for analysis. A hospital network can exist solely within one CBSA or one state, as with Memorial Hermann's 10 hospitals all located in Texas in the Houston CBSA. However, a hospital network can also span multiple CBSAs or states and so, while our focus is on the 60 networks that have hospitals in the fourteen CBSAs, we include the hospitals located outside of the fourteen CBSAs but still within the 60 networks for some network-specific calculations.

When hospitals in the same network are in different states or regions, the parent organization often sets up regional structures to manage its hospitals in that area, or partners with other organizations in the area for a similar purpose. Examples of both come from CHI which spanned 10 main regions operationally, encompassing 17 states, in FY 2017. In that year, CHI's hospitals in Arkansas were under CHI St. Vincent, a regional health network set up by CHI specifically to manage its operations in that state. In contrast, CHI's Iowa hospitals operated under and were managed by Mercy Health Network, a joint operation with Trinity Health Corporation based in Livonia, Michigan. Through the shared effort, the two organizations made joint acquisitions in Iowa and its neighboring markets and integrated their financials, governance practices, and clinical efforts. Additionally, CHI's Colorado region hospitals

[34] Overview: Fiscal Year 2017 CHI (2017). https://www.catholichealthinitiatives.org/content/dam/chi-national/website/documents/CHI%20FY%202017%20Overview%20PowerPoint%20(includes%20map)%20-%20v.%20Final.pdf

[35] About Our Organization, Memorial Hermann. https://www.memorialhermann.org/about-us/our-organization

[36] The Memorial Hermann Tomball, First Colony and Surgical First Colony hospitals were joint ventures with Emerus Holdings Inc. https://memorialhermann.org/about-us/newsroom/press-releases/memorial-hermann-and-emerus-announce-joint-venture-to-improve-access-to-high-quality-care

[37] Physicians have an ownership or investment interest in Memorial Hermann Kingwood. https://www.memorialhermannkingwood.com/about-us

operated under Centura Health, a joint venture between CHI and Adventist Health System based in Altamonte Springs, Florida. These are just a few examples, but they evidence the complicated ownership structure that can come about as health systems expand and partner in their efforts.[38] Hospitals that are neither in a health system or a part of a hospital network are called standalone hospitals in our analysis.

To test the impact of network affiliation, we create three dummy variables for the size of networks. Of the 477 short-term acute care hospitals included in our modeling of the fourteen CBSAs, 369 were identified to be part of a hospital network: 68 in hospital networks with 5 or fewer hospitals, 75 in hospital networks with between 6 and 20 hospitals, 128 in hospital networks with between 21 and 50 hospitals, and 98 in hospital networks with more than 50 hospitals (see Appendix V). The three dummy variables included in our modeling identify groupings along this distribution, specifically hospitals in networks comprised of 6-20 hospitals, 21-50 hospitals, and greater than 50 hospitals. Notably, compared with those in the nationwide sample used in the 2021 report, the network-affiliated hospitals in the fourteen CBSA sample are more likely to be affiliated with larger networks, as evidenced by the differences in the means of the three dummy variables between the two samples. For example, 20.5 percent of the hospitals in our fourteen CBSAs identify as being part of a network consisting of more than 50 hospitals whereas among nationwide hospitals, it is 12.5 percent.

In our 2021 report of the nationwide sample of hospitals, we found that network affiliation strongly sorted along hospital entity lines with approximately 73 percent of for-profits, 50 percent of non-profits, and 15 percent of governmental hospitals affiliating with a network. In the fourteen CBSAs, however, the affiliated share of hospitals in each entity type group is higher than their corresponding shares nationwide, and notably the for-profits and non-profits belong to networks at similar proportions. In this sample, 84 percent of for-profits, 86 percent of non-profits, and 44 percent of governmental hospitals are part of a hospital network. We expect network affiliation to be positively correlated with greater intermediate margins, and that this benefit increases with the number of hospitals in a network. However, we only find a significant positive effect on the margin for hospitals affiliated with networks consisting of between 20 and 50 hospitals. Hospitals in networks of this size are overrepresented in the fourteen CBSAs compared with nationwide.

Out of the 477 hospitals in our data set, 108 were standalone and not affiliated with a hospital network. Each of the fourteen CBSAs had at least one independent hospital, ranging from a low of 1 in the Denver CBSA to a high of 21 in the Los Angeles CBSA. The San Antonio CBSA, furthermore, had the highest share of these standalone hospitals with 41 percent, or 7 of its 17 hospitals, identified as so (see Table 14). Overall, the unaffiliated hospitals had an average intermediate margin including governmental appropriations of 22.4 percent compared to 32.2 percent for the network-affiliated hospitals.[39]

[38] Catholic Health Initiatives Annual Report for FY 2017: http://www.khpi.org/blog/wp-content/uploads/2017/09/chi-annual-rpt-fy2017.pdf.

[39] This difference in intermediate sufficiency margins is statistically significant with a p-value of 0.004.

Table 9. Descriptions, counts, ranges, and means of variables used in the fourteen CBSA comparison with corresponding parameters from the 2021 report on a nationwide data set of hospitals.

		Nationwide Hospital Comparison Sample			Fourteen CBSA Comparison Sample		
Margins							
Variable	Description	N	Range	Mean	N	Range	Mean
Int.Margin.Without.Govt. Appropriations	DEG-calculated measure of the sufficiency of payments for patient care to cover hospital costs: labor, medical supplies, bad debt, charity care, interest, Health IT, equipment rental and maintenance, and capital insurance. **This is calculated as a share of only net patient revenues.**	4329	(-3.990, 0.957)	0.250	477	(-3.990, 0.874)	0.270
Int.Margin.With.Govt. Appropriations	DEG-calculated measure of the sufficiency of payments to cover hospital costs: labor, medical supplies, bad debt, charity care, interest, Health IT, equipment rental and maintenance, and capital insurance. **This is calculated as a share of net patient revenues and governmental appropriations**.	N/A	N/A	N/A	477	(-1.719, 0.874)	0.300
Nationwide							
Variable	Description	N	Range	Mean	N	Range	Mean
Dummy.For-Profit	Dummy variable for for-profit hospitals.	4429	(0,1)	0.196	477	(0,1)	0.426
Dummy.Non-Profit.Church	Dummy variable for church-affiliated non-profit hospitals.	4429	(0,1)	0.119	477	(0,1)	0.090
Dummy.Non-Profit.Other	Dummy variable for non-church-affiliated non-profit hospitals.	4429	(0,1)	0.462	477	(0,1)	0.296
Dummy.Revenues<$35Mil	Dummy variable for if a hospital's net patient revenues are less than $35 million.	4329	(0,1)	0.312	477	(0,1)	0.140
Dummy.Specialty.Hospital	Dummy variable for if a hospital specializes in a particular field (ex: hip and knee, orthopedic, women and children).	4429	(0,1)	0.014	477	(0,1)	0.021
Dummy.Transplant.Center	Dummy variable for if a hospital operates a transplant center.	4429	(0,1)	0.046	477	(0,1)	0.096
Statewide							
Variable	Description	N	Range	Mean	N	Range	Mean
Dummy.Right.to.Work	Dummy variable identifying if a hospital is located in a right-to-work state. (1)	4429	(0,1)	0.622	477	(0,1)	0.549
Health.Outcome.Ranking	Ranking scheme from America's Health Rankings. For each state, it is the weighted sum of the **number of standard deviations its core outcomes** (in behavorial health, mortality, and physical health) are from the national avg. (2)	4422	(-0.373, 0.283)	-0.030	477	(-0.354, 0.217)	0.045
Dummy.Minnesota	Dummy variable identifying if a hospital is located in Minnesota.	4429	(0,1)	0.028	N/A	N/A	N/A
Medicaid.Coverage	Calculated as the share of the state population enrolled in Medicaid over the share of the state population below 200% federal poverty level. (3)	4429	(0.458, 1.200)	0.712	477	(0.500, 0.963)	0.731
Medicaid Expansion and Rural/Urban Level							
Variable	Description	N	Range	Mean	N	Range	Mean
Dummy.RuralxMedicaid. Expansion	Interaction between dummy variables for if a hospital identifies as rural and if a hospital is located in a state with expanded Medicaid.	4429	(0,1)	0.284	477	(0,1)	0.044

Dummy.UrbanxMedicaid. Expansion	Interaction between dummy variables for if a hospital identifies as urban and if a hospital is located in a state with expanded Medicaid.	4429	(0,1)	0.347	477	(0,1)	0.488
CBSA or Zip Code Level							
Variable	Description	N	Range	Mean	N	Range	Mean
CBSA.Market.Competition. Index	A Herfindahl-Hirschmann index of market competition within a CBSA, based upon a hospital's share of the CBSA's total net patient revenues. CBSAs with a single hospital are assigned an index value of 1, indicating no competition.	4428	(0.022, 1.000)	0.519	477	(0.029, 0.269)	0.074
Zip.Code.Income.Disparity. Ratio	The ratio of exemptions on returns with AGI greater than $100,000 to exemptions on returns with AGI less than $25,000 in a hospital's zip code. (4)	4345	(0.000, 15.676)	1.164	470	(0.022, 15.374)	1.865
Hospital Level							
Variable	Description	N	Range	Mean	N	Range	Mean
Medicaid.Days%	Share of a hospital's total days that are for patients insured by Medicaid/Chip.	4411	(0.000, 0.869)	0.087	475	(0.000, 0.796)	0.093
Dummy.Emergency>10%. Net.Patient.Revenue	Dummy variable identifying if a hospital's emergency department non-salary costs are greater than 10% as a share of the hospital's net patient revenues.	4150	(0,1)	0.040	448	(0,1)	0.031
Dummy.Network.5-20.hospitals	Dummy variable identifying if a hospital is part of a network consisting of greater than 5 and less than or equal to 20 hospitals.	4429	(0,1)	0.208	477	(0,1)	0.157
Dummy.Network.20-50.hospitals	Dummy variable identifying if a hospital is part of a network consisting of greater than 20 and less than or equal to 50 hospitals.	4429	(0,1)	0.111	477	(0,1)	0.268
Dummy.Network.> 50.hospitals	Dummy variable identifying if a hospital is part of a network consisting of greater than 50 hospitals.	4429	(0,1)	0.125	477	(0,1)	0.205

Notes:

(1) The 28 states with right-to-work laws in 2017 were: Alabama, Arizona, Arkansas, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Nebraska, Nevada, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin and Wyoming.

(2) The health.outcome.ranking variable takes a health outcome score for each state and measures how many standard deviations away the state outcomes are from the national average. A score of 0 represents the national average. A positive score means the health outcomes in that state are better than average. The health outcome score for each state is based on measures of behavioral health (depression, alcohol use, drug use), mortality (drug deaths, premature death, suicide), physical health (frequent physical distress, high health status, low birthweight, and chronic conditions like arthritis, asthma, cancer, and diabetes), and risk factors (high blood pressure, high cholesterol, obesity).See www.AmericasHealthRankings.org

(3) The proportion of each state's population below 200 percent of the federal poverty level that is covered under state Medicaid is from the Kaiser Family Foundation analysis of state Medicaid enrollment for 2017, https://www.kff.org/interactive/medicaid-state-fact-sheets.

(4) The ratio of exemptions on individual income tax returns with adjusted gross income (AGI) greater than $100,000 to returns with AGI below $25,000 is from https://www.irs.gov/statistics/soi-tax-stats-individual-income-tax-statistics-2017-zip-code-data-soi. This ratio compares the number of persons living in high income households to the number of persons living in low income households in the same 5-digit zip code where the hospital is located. Nationwide, about 73 million exemptions (or 25 percent of all exemptions on filed tax returns) were reported on individual tax returns with AGI greater than $100,000, and the same amount on returns with AGI less than $25,000. (See Table 1.4, All Returns: Sources of Income, Adjustments, and Tax Items by Size of Adjusted Gross Income, Tax Year 2017, at https://www.irs.gov/statistics/soi-tax-stats-individual-statistical-tables-by-size-of-adjusted-gross-income). However, about 42 million persons were not accounted for on filed income tax returns. The ratio calculated does not account for the number of persons in each 5-digit zip code that were non-filers.

Table 10 shows similar data to Table 9 in that it provides the counts and mean values of the set of independent variables included in the fourteen CBSA analysis. Where the two tables differ is that the right-side columns of Table 9 provide the counts and means for the fourteen CBSA sample of 477 hospitals – the sample of all Medicare accepting hospitals we analyze – whereas Table 10 provides the same parameters but only for the 442 hospitals for which we have complete data. The mean values of the variables for this subset of 442 hospitals are detailed by the main four, comparison, and counterfactual CBSA groups that we want to compare.

The mean values of the variables are very similar between the 477 and 442 observation data sets. Looking at Table 10, for the 442 observations data set, among the nationwide-level variables, the transplant center dummy is the only variable consistent across the three CBSA groupings. The for-profit dummy variable varies substantially, with for-profits accounting for 42.1% of hospitals in the fourteen CBSAs overall, 56.0 percent of the main four CBSA hospitals, 41.8 percent of the comparison CBSA hospitals, and 3.1 percent of the counterfactual CBSA hospitals. This is by design as we selected the comparison CBSAs to be similar to the main four CBSAs on the mix of hospital types, and the counterfactual CBSAs to not have for-profit hospitals. As a result, the counterfactual CBSAs have more non-profits – both church affiliated and non-church affiliated – than the comparison CBSAs, which in turn have more than the main four CBSAs.

Table 10. Means of independent variables used in Large CBSA Comparison models for the sample of hospitals estimated on, overall and by CBSA grouping.

Data aggregation	Variable	Main Four	Comparison	Counterfactual	All
Nationwide	Intercept	1.000	1.000	1.000	1.000
	Dummy.For-Profit	0.560	0.418	0.031	0.421
	Dummy.Non-Profit.Church	0.043	0.124	0.172	0.097
	Dummy.Non-Profit.Other	0.250	0.309	0.453	0.305
	Dummy.Revenues<$35Mil	0.152	0.072	0.141	0.115
	Dummy.Specialty.Hospital	0.038	0.010	0.000	0.020
	Dummy.Transplant.Center	0.098	0.093	0.078	0.093
State	Dummy.Right.to.Work	1.000	0.242	0.219	0.554
	Health.Outcome.Ranking	0.012	0.054	0.118	0.046
	Medicaid.Coverage	0.550	0.835	0.907	0.727
CBSA	CBSA.Market.Competition.Index	0.054	0.076	0.125	0.074
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	1.892	1.438	3.053	1.860
Hospital	Medicaid.Days%	0.048	0.136	0.085	0.092
	Dummy.Emergency>10%.Net.Patient.Revenue	0.043	0.010	0.063	0.032
	Dummy.Network.5-20.hospitals	0.174	0.196	0.000	0.158
	Dummy.Network.20-50.hospitals	0.245	0.268	0.406	0.278
	Dummy.Network.> 50.hospitals	0.310	0.170	0.125	0.222
	N. obs.	184	194	64	442

The main four CBSAs have the highest share of small hospitals in terms of net patient revenue and while both the main four and comparison CBSAs have a few specialty hospitals, the counterfactual group has none.[40]

The variation in the means of the state-level variables between the three CBSA groups shows that the comparison and counterfactual CBSAs are similar but quite different to the main four CBSAs. The Dummy.Right.to.Work variable has a mean of 1 for the main four CBSA hospitals because all are in states with right to work laws in place in 2017 while only 24.2 percent of the comparison hospitals and 21.9 percent of the counterfactual hospitals were. The statewide Medicaid coverage variable has the lowest mean in the main four CBSAs, which makes sense because both Florida and Texas did not elect the Medicaid expansion under the Affordable Care Act and are much more restrictive than other states in the comparison and counterfactual CBSAs regarding Medicaid eligibility for persons under 200% FPL. Perhaps it is not surprising that the health outcome ranking indexes for the main four CBSAs are lower than the counterfactual CBSAs and comparison CBSAs too.

Our CBSA market competition index, which takes on a value between 0 and 1, with 0 indicating the highest amount of competition possible and 1 indicating no competition between hospitals in a CBSA, has the lowest average (most competitive) in the main four CBSAs. Notably, given that a value close to 0 indicates a high level of competition, the counterfactual hospitals, despite having the largest mean market competition index among the three groupings (0.125), are still located in very competitive markets, just not ones as competitive on average as those of the main four or comparison CBSAs. Having large competitive CBSAs in our sample is on purpose because we selected CBSAs to reflect features of the Dallas, Houston, San Antonio and Miami CBSAS: a large number of hospitals, a large portion of for-profit hospitals, a sizeable governmental hospital sector, and sizeable populations. The comparison CBSAs have each of these criteria and the counterfactual has all but for-profit hospitals.

On average, the zip code income disparity ratio is highest among the counterfactual CBSA hospitals at 3.053 and lowest among the comparison CBSA hospitals at 1.438, meaning that for every 1 person in a household with AGI less than $25,000 located in zip codes within these CBSAs, the counterfactual hospitals' zip codes have double the number of persons in households with AGI greater than $100,000. In other words, specific to our fourteen CBSA sample, the counterfactual hospitals tend to locate in the highest income areas and the comparison hospitals tend to locate in the lowest income ones.

At the hospital variable level, there are clear differences between the main four, comparison, and counterfactual CBSA groups. The mean of the Medicaid.Days% variable, which measures the share of a hospital's inpatient days attributable to Medicaid or CHIP patients, is lowest among the main four hospitals and highest among the comparison hospitals: on average, hospitals in the main four CBSAs have a Medicaid days share of 4.8% whereas the comparison and counterfactual CBSA hospitals have 13.6% and 8.5% shares, respectively. This means that, in our estimation sample, the comparison CBSA hospitals have approximately 2.8 times and the counterfactual CBSA hospitals just under 2 times as many Medicaid/CHIP inpatient days as the main four CBSA hospitals on average. This low share of Medicaid days among the main four CBSA hospitals is the result of Texas and Florida having some of the most restrictive Medicaid coverage policies nationwide as well as not expanding Medicaid under the

[40] The presence of specialty hospitals within a CBSA is positively correlated with the size of the presence of for-profit hospitals. We have not explored this relationship and its impact on hospital intermediate margins, but it is noteworthy that there are none in the counterfactual CBSAs: San Francisco, Seattle, and Des Moines.

Affordable Care Act. Both Texas and Florida, on the other hand, have the largest percentage of uninsured persons of any of the states in our sample. Overall and consistent across the CBSA groupings, very few hospitals have high shares of emergency department non-salary costs relative to their net patient revenues. This was the same result that we found in the 2021 report. The counterfactual CBSAs have the highest number and the main four CBSAs have the lowest number of hospitals with large emergency department costs. The concentration of high emergency department non-salary costs in a few hospitals in the main four CBSAs will turn out to be important for our findings.

Another CBSA contrast is with hospital network affiliation. Most hospitals in the fourteen CBSAs that belong to networks are affiliated with mid-size networks between 20 and 50 hospitals; this is true within both the comparison and the counterfactual CBSAs but within the main four CBSAs, most network-affiliated hospitals belong to large networks with more than 50 hospitals.

Model estimation of hospital intermediate sufficiency margin

For comparison, Table 12 provides estimates from three models. The first column shows our 2021 report hospital cost comparison model of hospital intermediate sufficiency margins on 4,072 hospitals nationwide which did not include governmental appropriations; the second column shows this same model estimated on the 442 hospitals in the fourteen CBSAs; and, the third column shows the same model estimated on the 442 hospitals in the fourteen CBSAs but with a redefined net patient revenue measure that includes governmental appropriations as part of net patient revenues in the dependent variable. The models in the second and third column use the 442 hospitals in the fourteen CBSAs for which we have complete data and do not include the Minnesota or Medicaid expansion dummy variables. The final model in column 3 of Table 12 shows our main results for the intermediate sufficiency margin with the dependent variable including governmental appropriations.

The Table 12 model in column 3 tells us that approximately 24 percent of the sufficiency of patient payments and governmental appropriations to cover the costs of hospital care in the fourteen CBSAs can be explained by forces outside of the hospital, highlighting the importance beyond each hospital patient's underlying health conditions and issues. In general, the model in column 3 is similar to our nationwide model shown in column 1. Both the nationwide model in column 1, which does not use governmental appropriations in net patient revenue, and the model in column 3 on the fourteen CBSAs, which uses government appropriations as a part of net patient revenue, explain the same amount of hospital intermediate sufficiency margin, roughly 24%.

However, excluding governmental appropriations as a part of net patient revenue for the fourteen CBSAs, as shown in column 2, the model explains roughly 30% of the intermediate margin rather than 24%. What drives this result? Many hospitals receive governmental appropriations as Table 3 shows. However, Table 3 also shows that the governmental appropriations to hospitals in the main four CBSAs are magnitudes greater in dollar terms than those to hospitals in the comparison or counterfactual CBSAs. For the hospitals that receive governmental appropriations in the main four CBSAs, most of the appropriation goes to governmental hospitals that have large negative margins. This can be seen by comparing the row for governmental hospitals in the main four CBSAs on Table 8 with, and without governmental appropriations. Even more striking is that while the governmental appropriations in the main four CBSAs are magnitudes larger than either the comparison or counterfactual CBSAs (Table 3), the number of hospitals receiving governmental appropriations in the main four CBSAs is only 5 percent of the 191 hospitals as compared with 16 percent of the 218 hospitals in the comparison CBSAs and with 30 percent of the 68 hospitals in the counterfactual CBSAs (Tables 2 and 3). So in the main four CBSAs, enormous government appropriations go to a handful of hospitals while in the counterfactual CBSAS

nearly one-third of hospitals receive much smaller governmental appropriations. The key insight here is that the reason these governmental hospitals in the Austin, Dallas, San Antonio, and Miami CBSAs have such large negative intermediate sufficiency margins is that a large proportion of their patients are uninsured, and uninsured patients are "piled up" in large governmental hospitals. The only way to keep these hospitals "above water" in an operating margin sense is to provide very large governmental appropriations. This will turn out to have a beneficial impact on the intermediate sufficiency margins of non-governmental hospitals in the main four CBSAs.

What are the big takeaways?

First, Medicaid matters. In general, the greater the share of Medicaid or CHIP inpatient days for a hospital, the lower its intermediate sufficiency margin. As Table 12 shows, this variable is negative and significant across all three models, and much more in the fourteen CBSA-based models than in the nationwide model.

However, when narrowing in on the 442 hospitals in the fourteen CBSAs, going from the column 1 nationwide Hospital Comparison Model to the column 3 Large CBSA Comparison Model with governmental appropriations included in the dependent variable, the state-level Medicaid coverage variable, which represents the proportion of a state's population under 200% of the federal poverty level covered under a state's Medicaid program, loses its significance.

Why might this be? The nationwide estimates using 4,072 hospitals in column 1 show that the dummy variable for Medicaid coverage is negative and significant. A greater portion of the state population covered under Medicaid reduces hospital intermediate margins. This intuitively makes sense because Medicaid payment rates are lower than Medicare or private insurance payments. For the column 3 model using the 442 hospitals in the fourteen CBSAs, this state-level dummy variable is no longer significant. If we note that the for-profit and non-profit hospital margins are nearly identical among the main four, comparison, and counterfactual CBSAs as Table 8 shows, then the fact that one group, the main four CBSAs, has many fewer low-income persons enrolled in Medicaid than the comparison or counterfactual group – again on Table 10 – tells us that Medicaid state-level coverage per se does not appear to drive hospital margins of for-profits and non-profits.

But why does Medicaid state-level coverage not matter when hospital-level Medicaid days do? The answer is complex. If a person is uninsured and not eligible for Medicaid, then hospitals that accept Medicare, and therefore Medicaid, are only obligated under Federal rules to stabilize the patient who comes "in the door" and move them to a facility that can care for them.[41] If this same patient was covered under Medicaid and if the hospital and its doctors accept Medicaid (about 75 percent of doctors that accept Medicare accept Medicaid), then the same hospital would need to provide a greater level of care. That is, the hospitals are not obligated to admit the uninsured as inpatients. States that restrict access to Medicaid have high uninsured rates. Texas and Florida, the two states in the main four CBSAs, have the highest percentages of uninsured persons in the U.S.[42] In states that provide Medicaid coverage broadly and that expanded Medicaid under the Affordable Care Act, hospitals are more likely to admit these patients. The effect of this can clearly be seen on Table 10 in the line for percent

[41] The Emergency Medical Treatment and Labor Act, EMTALA, requires public access to emergency medical care regardless of a patient's ability to pay, but it does not require a hospital to provide sustained care for indigent persons.

[42] See the Children's Health Coverage Report Card, created for each state by The Center for Children & Families in the Health Policy Institute at the McCourt School of Public Policy at Georgetown University. These state level Medicaid profiles are updated annually.

Medicaid days. Because Texas and Florida greatly restrict eligibility for Medicaid, they end up with the lowest frequency of Medicaid days, on average, in their hospitals. This is not because these are wealthy states with few people under 200% of the federal poverty level, but rather because these states restrict access to Medicaid.

For example, in both Texas and Florida, single adults without dependent children are ineligible for Medicaid regardless of income. In states with broader Medicaid access, single people with income below 100 percent of the Federal poverty level are typically Medicaid eligible.[43] In contrast, the comparison and counterfactual CBSA group hospitals have more than twice the frequency of Medicaid days. Despite hospitals in these CBSAs having higher frequencies of Medicaid days than hospitals in the main four CBSAs, both the for-profit and non-profit hospitals in the comparison and counterfactual groups have similar intermediate sufficiency margins to the same set of hospitals in the main four CBSAs (see Table 8). Same hospital types – for-profit and non-profit – same margins, but those in main four CBSAs have fewer Medicaid days. Thus, the main four hospitals have fewer of the lowest payment (Medicaid) patients and very few of the large uninsured population but the same margins as the comparison and counterfactual hospitals. Table 12 shows that higher frequencies of Medicaid days significantly reduce the intermediate margin of hospitals in the fourteen CBSAs. Therefore, states that limit access to Medicaid increase the intermediate sufficiency margins for for-profit and non-profit hospitals that accept Medicare. At the same time, however, restrictive Medicaid access creates a large class of patients that these hospitals do not need to provide services for. This class is the uninsured.

So where do the uninsured go for hospital care? In the main four CBSAs, they go to large governmental hospitals that receive very large governmental appropriations. These appropriations are raised through hospital districts in both states. Hospital districts are created under state law to provide revenue for hospital services for a geographic area – often a county. Hospital districts are created with a taxing power to raise revenues for this purpose.[44] In Texas, for example, hospital districts generally raise revenues through dedicated property tax programs. Table 11 shows hospital taxing district revenues raised in some Texas counties in 2017. Harris County Hospital District includes Houston CBSA; Dallas County Hospital District and Tarrant County Hospital District include the Dallas CBSA; and, University Health System includes the San Antonio CBSA. To put these amounts in perspective, the entire governmental appropriation for all hospitals in Washington state, with a population of 7.2 million persons in 2017, was $58,225,011.

[43] See Georgetown University Center for Children and Families and Kaiser Family Foundation's Annual 50-state survey entitled "Medicaid and CHIP Eligibility, Enrollment, and Cost Sharing Policies as of January 2020: Findings from a 50-state survey"

[44] See "Texas Hospital Districts: Past, Present, and Future", Ross Derek Mckinney, Master of Public Affairs thesis, University of Texas at Austin, August 2019.

Table 11. Texas Hospital District 2017 Tax Rates and Total Levies

District Name	2017 tax rate per $100 valuation	2017 Levy
Harris County Hospital District	0.1711	$735,217,465
Dallas County Hospital District	0.2794	$646,609,832
University Health System	0.2762	$433,665,650
Tarrant County Hospital District	0.2244	$392,545,531
Travis County Hospital District	0.1074	$184,236,987
R. E. Thomason General Hospital District	0.2519	$106,062,929
Nueces County Hospital District	0.1213	$35,005,279
Montgomery County Hospital District	0.0664	$33,895,890
Midland Memorial Hospital District	0.1225	$29,746,156
Lubbock County Hospital District	0.1098	$22,484,824

Source: Texas Comptroller of Public Accounts, Special District Rates and Levies 2017: comptroller.texas.gov/taxes/property-tax/rates/

Second, for-profit hospitals have much greater intermediate sufficiency margins than non-profit or governmental hospitals, a finding that is consistent in both the nationwide and fourteen CBSA-based models. For-profit hospitals locate much more frequently in right-to-work states, in neighborhoods with higher incomes, and are more likely to be specialty hospitals providing medical procedures that have high reimbursement rates such as knee and hip or orthopedic procedures. Being a specialized hospital also significantly improves a hospital's margin.

Results by level of aggregation of variables

The nationwide variables tell us that, relative to governmental hospitals, for-profit and non-profit hospitals in the fourteen CBSAs have larger sufficiency margins, with for-profits larger than non-profits. In the Hospital Cost Comparison model in column 1 of Table 12, small hospitals with net patient revenues less than $35 million have lower margins than hospitals with greater net patient revenues. This variable loses significance in column 3 of Table 12 as the nationwide sample is narrowed to the fourteen CBSAs. As expected, we consistently find that being a specialty hospital, such as a specialty knee and hip surgery hospital, significantly increases the intermediate sufficiency margin (columns 1, 2 and 3 of Table 12). However, we still find no evidence that transplant hospitals effect the margin. Both the specialized hospitals and the transplant hospitals are much more frequent in the fourteen CBSA sample than in the nationwide sample, as Table 9 shows.

None of the state-level variables including the dummy variable identifying if a state had right to work laws in place in 2017, the index of overall population health, and the proportion of a state's population under 200% of the federal poverty level covered under the state's Medicaid program are significant. Both the right to work dummy variable and the Medicaid coverage variable lose significance when modeling the hospitals in the fourteen CBSAs rather than the nationwide sample.

The variable measured at the CBSA level is a Hirschman-Herfindahl index of market competition based upon the variation in hospital net patient revenues across all hospitals in a CBSA. The market

competition index is not significant in the nationwide sample but just barely significant, and positive, in the fourteen CBSA sample. Less competition increases the intermediate sufficiency margin, as it should.

The 5-digit zip code income disparity variable, a measure we construct from individual income tax returns for tax year 2017 as the ratio of the number of persons in households with AGI greater than $100,000 to the number of persons in households with AGI less than $25,000, is positive and strongly significant across all of the models. This lends support to the idea that hospitals that locate among higher income neighborhoods have larger margins. We believe this measure is a good proxy for the proportion of the local population covered by private insurance which pays more for hospital services than either Medicare or Medicaid.

At the hospital level, the share of hospital days for Medicaid and CHIP inpatients is significant in each of the models and we find that as it increases, hospital intermediate margins decrease. This finding is strongest in the fourteen CBSA model in column 3 of Table 12. Had the hospitals in the main four CBSAs had the same average percentage of Medicaid inpatient days as hospitals in the comparison CBSAs (13.6 percent rather than 4.8 percent), the average intermediate sufficiency margin would have been 2.75 percentage points lower to 27.81 percent rather than 30.56 percent (see Table 8). In dollar terms, this would have reduced the $12.981 billion of intermediate margin for all hospitals in our estimation sample in the main four CBSAs by $1.169 billion to $11.812 billion.

For the dummy variable for hospitals with large non-salary emergency department costs, both the Hospital Cost Comparison model and the Large CBSA Comparison model without governmental appropriations are statistically significant and negative (compare columns 1 and 2 of Table 12).[45] When we include governmental appropriations as a part of hospital net patient revenue, the statistical significance goes away (column 3 of Table 12). This tells us that the governmental appropriations are resolving the large costs of emergency departments that had been driving the entire hospital intermediate sufficiency margin to be negative. We cannot determine conclusively that the large emergency department costs are being driven by large numbers of uninsured using the emergency departments as a point of contact for health care services from the CMS cost reports. However, the result is indicative of very large emergency department costs somehow being "covered" by the governmental appropriation and offsetting the lack of net patient revenue from Medicaid, Medicare, and other sources.

For the dummy variables of the size of hospital networks, whereas each was significant and positive when applied in the Hospital Cost Comparison paper to a nationwide sample (column 1 of Table 12), only one of the three dummy variables for affiliation with a hospital network is significant in our Large CBSA Comparison model that incorporates governmental appropriations: being part of a network consisting of between 20 and 50 hospitals has a positive effect on a hospital's margin relative to small hospital networks with fewer than 5 hospitals.

[45] The non-wage costs of emergency departments are mostly the commodity costs of providing care. As Tables 4 and 5 show, these commodity costs as medical, surgical, and pharmaceutical costs are remarkably stable as a share of net patient revenue across all hospital entity types, net patient revenue sizes, and CBSAs. We exploit this stability to infer that emergency departments with greater non-wage costs had greater patient volume.

Table 12. Estimation of intermediate sufficiency margin with and without governmental appropriations for short-term acute care hospitals in the fourteen CBSAs and accepting Medicare for FY 2017, with comparison to Hospital Cost Comparison model without including appropriations (1).

		Hospital Cost Comparison			Large CBSA Comparison			Large CBSA Comparison		
		DV: Intermediate Sufficiency Margin w/out Gov't Appropriations						DV: Intermediate Sufficiency Margin w/ Gov't Appropriations		
Data aggregation	Variable	Coefficient		"Robust" standard error calculated t-statistic	Coefficient		"Robust" standard error calculated t-statistic	Coefficient		"Robust" standard error calculated t-statistic
Nationwide	Intercept	0.2057	***	[7.8]	-0.0856		[-0.7]	0.0541		[0.5]
	Dummy.For-Profit	0.1365	***	[8.7]	0.3443	***	[5.6]	0.2512	***	[5.1]
	Dummy.Non-Profit.Church	0.0941	***	[5.8]	0.2385	***	[4.2]	0.1504	**	[3.2]
	Dummy.Non-Profit.Other	0.0732	***	[7.0]	0.2194	***	[3.9]	0.1378	**	[3.1]
	Dummy.Revenues<$35Mil	-0.0843	***	[-11.0]	0.0180		[0.4]	-0.0289		[-0.8]
	Dummy.Specialty.Hospital	0.0931	**	[3.1]	0.2647	***	[3.9]	0.2308	***	[4.0]
	Dummy.Transplant.Center	0.0065		[0.4]	-0.0140		[-0.3]	0.0154		[0.5]
rural/urban Medicaid expansion	Dummy.RuralxMedicaid.Expansion	0.0799	***	[8.4]						
	Dummy.UrbanxMedicaid.Expansion	0.0435	***	[4.9]						
State	Dummy.Right.to.Work	0.0176	*	[2.1]	-0.0483		[-1.2]	-0.0235		[-0.7]
	Health.Outcome.Ranking	0.0318		[1.4]	-0.0799		[-0.6]	0.0154		[0.1]
	Medicaid.Coverage	-0.1309	***	[-5.0]	0.1407		[1.2]	0.0571		[0.7]
	Dummy.Minnesota	0.0970	***	[7.9]						
CBSA	CBSA.Market.Competition.Index	0.0194		[1.6]	0.4357		[1.9]	0.3613		[1.9]
zip code	Zip.Code.Income.Disparity.Ratio	0.0152	***	[7.1]	0.0154	***	[3.9]	0.0140	***	[3.9]
Hospital	Medicaid.Days%	-0.0906	*	[-2.1]	-0.6421	**	[-3.0]	-0.3121	*	[-2.5]
	Dummy.Emergency>10%. Net.Patient.Revenue	-0.2672	***	[-7.1]	-0.2268	*	[-2.0]	-0.1129		[-1.6]
	Dummy.Network.5-20.hospitals	0.0609	***	[7.1]	0.1075	*	[2.5]	0.0606		[1.5]
	Dummy.Network.20-50.hospitals	0.0539	***	[4.8]	0.0957	**	[3.1]	0.0666	*	[2.4]
	Dummy.Network.> 50.hospitals	0.0612	***	[4.7]	0.0445		[1.2]	0.0091		[0.3]
	N. obs.	4,072			442			442		
	R squared	0.2354			0.3047			0.2425		
	F statistic	65.7			13.08			9.83		
	singular value decomposition condition number	30.3			59.60			59.60		

*** p < 0.001; ** p < 0.01; * p < 0.05.

Notes:

(1) The short-term acute care hospital intermediate sufficiency margin with governmental appropriations is defined as 1 - (costs for wages and salaries of employees, contractors, medical supplies, pharmaceutical supplies, surgical supplies, interest expense, IT expense, capital insurance expense, bad debt expense measured at cost, charitable care measured at cost, and maintenance and repairs expense)/(net patient revenues, governmental appropriations).

(2) The absence of heteroskedasticity was rejected for all models using White's test, provided in the R package "skedastic" with the white_lm() command. Robust standard errors (SE) were implemented using the "sandwich" package, adjusting the variance-covariance matrix by the "HC1" method which multiples the squared residuals of the model by (the number of observations)/(the number of observations – the number of coefficients).

Variables with greatest influence on intermediate sufficiency margins in the fourteen CBSAs

Coefficient estimates, which represent the predicted change in the dependent variable from a one unit change in the corresponding independent variable, are shown for each model in Table 12. However, our focus for this section, as we work to untangle the influence of each independent variable, is on the Large CBSA Comparison model with the intermediate margin incorporating governmental appropriations as its dependent variable (the model in column 3 of Table 12).

For a dummy variable with values of either 0 or 1, the estimated coefficient represents the predicted intermediate margin incorporating governmental appropriations for the average hospital in the group of hospitals which have that dummy variable equal to 1. For example, the estimated coefficient on the dummy for small hospitals in terms of net patient revenues (Dummy.Revenues<$35Mil) of -0.0289 means that the average small hospital has a margin that is 0.0289 points smaller than that of an average medium or large hospital in the fourteen CBSAs. The model also includes continuous variables measured as a percent such as Medicaid.Days%, which measures the share of a hospital's total inpatient days attributable to patients insured by Medicaid or CHIP. The coefficient of -0.3121 on Medicaid.Days% implies that a 1 percentage point increase in the share of Medicaid/CHIP impatient days leads to a decrease in a hospital's predicted intermediate margin of 0.3121 points.[46]

If each independent variable in our model was measured in the same units, we could make inferences about which variables have the largest impact on the predicted intermediate margin by directly comparing the magnitudes of the coefficients. As was the case in the 2021 report, we cannot make such inferences because we include discrete dummy variables, continuous variables measured as a percentage, and index variables that measure CBSA-level market competition and statewide health outcome ranking. To control for this and to discover how the model variables' contributions to the margin may differ within the three distinct CBSA groupings, we employ the same approach as that paper and calculate a measure of influence on the margin for each variable.

We first calculate the predicted margin for each individual hospital *i* by multiplying the estimated coefficients β times the independent variables for each hospital x_{ki} and then summing according to equation (1) below where *k* represents the number of variables in the model:

$$predicted.margin_i = \beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki} \quad (1)$$

Next, we compute the proportion of the predicted margin for hospital *i* attributable to independent variable x_k by multiplying the independent variable's value by the estimated model coefficient and dividing by the predicted margin. This is shown in equation (2). We calculate these proportions for each of our model variables for every hospital in our dataset. The calculated proportion of influence on the estimate of the intermediate sufficiency margin retains the sign of the coefficient. Some variables will have a negative influence on the margin while others will have a positive influence. The larger the estimated proportion, in absolute terms, the greater the contribution of that variable to a hospital's

[46] For the comparison between the percent of Medicaid and CHIP days for hospitals in the main four CBSAs of 0.048 and the same for hospitals in the comparison CBSAs of 0.136 on Table 10, 0.136 – 0.048 = 0.088. If we multiply 0.088 by the coefficient -0.3121 we get -0.0275 which would be the reduction in the intermediate sufficiency margin for hospitals in the main four CBSAs had they had the same proportion of Medicaid days as hospitals in the comparison CBSA. This would have reduced the intermediate sufficiency margin from 30.56 percent (Table 8) to 27.81 percent in the main four CBSAs. This would have placed the intermediate sufficiency margin almost exactly between the comparison CBSAs at 30.93 percent and the counterfactual CBSAs at 25.43 percent.

predicted margin. Additionally, by construction, the sum of the proportions for each of the independent variables across a hospital will total 1.

$$proportion_{ki} = \frac{\beta_k x_{ki}}{predicted.margin_i} \quad (2)$$

Table 13 contains the mean values of these proportions for each of the model's independent variables. Each number represents the proportion of the predicted intermediate sufficiency margin incorporating governmental appropriations that can be explained by that corresponding independent variable.[47] While the mean proportions are calculated across all hospitals in the fourteen CBSA sample, as shown in the rightmost column of Table 13, we also segment by CBSA grouping to evaluate how the variables' contributions may differ between hospitals in the main four, comparison, and counterfactual CBSAs. We also group the variables by the data aggregation levels – nationwide, state, CBSA, 5-digit zip code, and hospital – to show which types of variables have the greatest influence on the predicted margin overall.

Overall, hospital entity type as for-profit or non-profit, the extent to which a state provides for Medicaid coverage, the competition among hospitals within a CBSA, and the hospital-specific number of Medicaid or CHIP days are the most important factors. Most of the predicted intermediate sufficiency margin of the hospitals in the fourteen CBSAs can be explained by the set of dummy variables in the nationwide category for entity type with for-profit hospital presence contributing the most in the main four CBSAs followed by the comparison group, both of which have high proportions of for-profit hospitals. For non-profit (church-affiliated or non-church-affiliated) hospitals this pattern is reversed: non-profits in the counterfactual have the most influence on margin followed by the comparison group with non-profits in the main four CBSAs having the least impact on margin. The remaining three nationwide variables for small hospital revenue size, specialty hospital, and transplant hospital do not contribute much in terms of magnitude to the margin. Overall, the nationwide variables explain 73.8% of the *predicted* margin on average across all hospitals in the fourteen CBSAs. Among the three CBSA groups, these explain 73.1%, 76.1%, and 68.7% of the predicted margin for hospitals in the main four, comparison, and counterfactual CBSAs, respectively. These percentages of contribution to the explained variation in the hospital intermediate sufficiency margin are *smaller* than for the nationwide sample in the hospital cost comparison report (see Table 7 of the 2021 report) which we view as an improvement over the 2021 report model because less aggregate measures will contribute more to explaining the intermediate sufficiency margin.

However, the similarity between nationwide variables across the three CBSA groups ends once we examine the significant impacts at the state, CBSA, 5-digit zip code and hospital levels. For the main four CBSA hospitals, none of the variables at these levels of aggregation contribute much in terms of magnitude to the intermediate sufficiency margin once we include governmental appropriations into net patient revenue: neither state Medicaid coverage, CBSA market competition, income measured at the 5-digit zip code level, hospital Medicaid/CHIP days, hospital emergency department use, nor hospital network size.

For both the comparison and counterfactual groups, the variables at less than nationwide aggregation vary quite a bit and show much larger impacts on the intermediate margin than in the main four CBSAs. For example, neither Medicaid coverage (state-level variable) nor Medicaid days (hospital-level variable)

[47] In the hospital cost comparison paper, we removed hospitals with predicted intermediate sufficiency margins near 0 in calculating these proportions. Because each proportion is divided by the predicted margin, including the very small predicted margins led to proportions that approached infinity. However, we do not encounter the same issue in this paper and do not remove any hospitals from the sample the model was estimated on.

impact the margin for hospitals in the main four CBSAs. This might be because Texas and Florida restrict Medicaid enrollment which in turn depresses Medicaid days in their hospitals. Texas and Florida have large uninsured populations that can have their access to care restricted because they are not covered under Medicaid or Medicare. Most states in the comparison group and all three states in the counterfactual group have both greater Medicaid coverage and expanded Medicaid through the Affordable Care Act. In these states, greater Medicaid access results in smaller uninsured populations which in turn results in fewer persons that hospitals can choose not to admit.

This may be the reason that Medicaid coverage and Medicaid hospital days do not contribute much to the intermediate sufficiency margin in the main four CBSAs but contribute a great deal in the counterfactual group with greater state Medicaid coverage increasing the intermediate sufficiency margin and greater Medicaid inpatient hospital days decreasing the margin. We consistently find this result that broader Medicaid coverage at the state level improves margins, but greater hospital Medicaid inpatient days decreases margins.

For hospitals in the counterfactual group, a lack of market competition significantly improves the intermediate sufficiency margin but it does not for hospitals in either the main four CBSAs or the comparison CBSA group.

State-level variables lead to positive predicted proportions of intermediate sufficiency margin but, the contribution varies across the three CBSA groupings. The largest contribution is among the counterfactual CBSA hospitals with the state-level variables explaining on average 27.0% of their margins; in contrast, the explanatory share is 3.3% for the main four CBSA hospitals and 17.1% for the comparison CBSA hospitals. This divergence is largely driven by the state-wide Medicaid enrollment variable which positively impacts hospital margins in the counterfactual CBSAs, less so in the comparison CBSAs, and least in the main four. The dummy variable identifying if a hospital is in a right-to-work state consistently has a negative contribution (which is the wrong sign) to the predicted margin but is not significant statistically in the fourteen CBSA-based model. The health outcome ranking index variable has a positive though negligible contribution both overall and across the CBSA groupings.

We include one CBSA-level variable (CBSA market competition) and one zip code-level variable (the zip code income disparity variable). The CBSA market competition index is statistically significant and leads to positive predicted proportions of intermediate sufficiency with the largest positive influence among the counterfactual CBSA hospitals with a mean contribution proportion of 55.9% followed by a 12.2% contribution in the comparison CBSA group and only 7.0% contribution in the main four CBSA group. The less competition, the greater the margin in the counterfactual CBSAs. Similarly, the zip code income disparity ratio is also statistically significant and has the largest positive effect on the counterfactual CBSA group, which has the greatest proportion of high-income persons and the least effect on the main four CBSA group which has the smallest proportion. We consistently find, in both the 2021 report and this analysis, that location matters. Higher income areas improve hospital intermediate margins.

Our hospital-level variables have a negative predicted effect on the intermediate margin overall but the effect varies by CBSA grouping: across all hospitals, the average contribution is -11.5% but it is -12.2% for the comparison CBSAs and a whopping -67.6% for the counterfactual CBSAs while a positive 8.6% for the main four CBSA hospitals. This variation is almost entirely driven by a hospital's share of inpatient days for Medicaid and CHIP patients. Because the counterfactual CBSAs (San Francisco, Seattle, and Des Moines) each had broad Medicaid coverage and expanded Medicaid under the ACA, there are many more Medicaid inpatient days for these hospitals because there are many more Medicaid patients, and this is reflected at the hospital level as a reduction in the intermediate sufficiency margin. This result for

the 442-hospital sample is much stronger than the for the nationwide 4,072-hospital sample (compare size of estimated coefficients for Medicaid.Days% on Table 12).

As with the hospital cost comparison paper, a high share of emergency department non-salary costs relative to net patient revenues drives downward hospital margins, but once we include governmental appropriations as an additional revenue source in hospital net margin, this effect becomes small for hospitals in the main four and comparison CBSAs, while remaining large for hospitals in the counterfactual CBSAs. Given the magnitudes of governmental appropriations in the fourteen CBSAs, this finding makes sense (see Table 3) and supports a view that the role of large governmental appropriations in the main four CBSAs is to "hold harmless" the margins of hospitals that treat large numbers of uninsured persons. These large governmental appropriations in the main four CBSAs essentially eliminate volatility in the margins of governmental hospitals that are the result almost entirely of creating a large uninsured population by restricting access to Medicaid.[48]

Unlike the 2021 report that found positive and statistically significant effects to hospital margins for membership in networks of 5 or more hospitals, we find this effect in the fourteen CBSAs only for hospital networks with between 20 and 50 hospitals (see Table 12). As with the emergency department non-salary costs, this network size is most impactful to the intermediate margin in the counterfactual CBSAs but only half-as much so in the main four and comparison CBSAs. One explanation for this loss of statistical significance and impact on estimated margin results from the fact that many hospital networks traverse CBSAs not included in the fourteen that we analyze. As Appendix VI shows, this is especially true for the largest nationwide networks with over 50 hospitals. Of the largest hospital networks with a presence in the fourteen CBSAs, only HCA has a sizeable presence with 56 hospitals. Given that hospitals in networks span all revenue ranges, as Appendix V shows, it may be that the narrow geographic scope of this analysis to fourteen CBSAs is too restrictive to identify a broader network effect.

[48] We note that the large governmental appropriations to governmental hospitals in the main four CBSAs results in intermediate sufficiency margins near zero. That is, the governmental appropriation provides funding to pay for the funding shortfall for patient services – mostly from treating large uninsured populations. This is funding approach is similar to how Canadian hospitals are also funded. In most Canadian hospitals as reported on their financial statements, the net-income margin is near zero, or slightly positive. In Canada, hospitals receive upwards of 90% of patient revenues from Provincial government payments and because of the monopoly on payment for patient services that Provincial governments have under the Canada Health Act, the government has a strong incentive to maintain intermediate sufficiency margins that are adequate to provide services. Because payments for Canadian hospitals are a major component of Provincial government budgeting, and because the government is the main source of hospital revenue, we do not observe Canadian hospitals with net-income margins upwards of 20% to 40% as we do with U.S. hospitals. At the same time, most Canadian hospital capex is also funded through Provincial government budgets so that hospitals do not need to show profit support costly capital funding.

Table 13. Proportion of intermediate sufficiency margin including governmental appropriations explained by independent variables, overall and by CBSA grouping.

Data aggregation	Variable	Main Four	Comparison	Counterfactual	All
Nationwide	Intercept	0.199	0.221	0.428	0.242
	Dummy.For-Profit	0.389	0.286	0.015	0.289
	Dummy.Non-Profit.Church	0.022	0.059	0.080	0.046
	Dummy.Non-Profit.Other	0.122	0.169	0.192	0.153
	Dummy.Revenues<$35Mil	-0.021	0.014	-0.032	-0.007
	Dummy.Specialty.Hospital	0.015	0.005	0.000	0.009
	Dummy.Transplant.Center	0.005	0.007	0.004	0.006
	Total	0.731	0.761	0.687	0.738
State	Dummy.Right.to.Work	-0.087	-0.023	-0.111	-0.062
	Health.Outcome.Ranking	0.001	0.003	0.013	0.004
	Medicaid.Coverage	0.119	0.191	0.369	0.187
	Total	0.033	0.171	0.270	0.128
CBSA	CBSA.Market.Competition.Index	0.070	0.122	0.559	0.163
	Total	0.070	0.122	0.559	0.163
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	0.080	0.068	0.159	0.086
	Total	0.080	0.068	0.159	0.086
Hospital	Medicaid.Days%	-0.020	-0.215	-0.683	-0.201
	Dummy.Emergency>10%.Net.Patient.Revenue	0.017	-0.010	-0.089	-0.011
	Dummy.Network.5-20.hospitals	0.033	0.049	0.000	0.035
	Dummy.Network.20-50.hospitals	0.049	0.050	0.092	0.056
	Dummy.Network.> 50.hospitals	0.007	0.005	0.004	0.006
	Total	0.086	-0.122	-0.676	-0.115
	Total	1.000	1.000	1.000	1.000

Non-profit hospital networks and their executives

We now turn to the collection of short-term acute care hospitals in the fourteen CBSAs that are in hospital networks. Networks were initially identified using the CMS Cost Report filings' hospital identification worksheet, which asks for detail on if a facility is part of a chain organization.[49] To validate the Cost Report identification of a hospital network, we looked at health systems' annual reports and tax filings as well as articles documenting the purchases and sales of facilities to verify – to the best of our ability – if a hospital belonged to a particular network in FY 2017. For hospitals belonging to more than one network through a partnership or joint venture, we assigned them to their primary owner for our network-level analyses. We identify 26 non-profit hospital networks in the fourteen CBSAs.

Of the 477 short-term acute care hospitals in our fourteen CBSA sample, we identified 369 (77.4 percent) in a hospital network: 171 of the 203 for-profit hospitals (84 percent), 158 of the 184 non-profit hospitals (86 percent), and 40 of the 90 governmental hospitals (44 percent). This is shown in the first panel of Table 14 which details the counts and mean intermediate sufficiency margins with governmental appropriations of both the network-affiliated and network-unaffiliated hospitals,

[49] CMS Cost Reports Worksheet S-2, Part 1 lines 140-141, column 1. For Medicare purposes, "a chain organization consists of a group of two or more health care facilities or at least one health care facility and any other business or entity owned, leased, or, through any other device, controlled by one organization."

segmented by CBSA group, individual CBSA, and entity type. As also shown in Appendix V, our fourteen CBSA sample has 108 unaffiliated hospitals (22.6 percent) and governmental hospitals are by far the most likely entity type to belong to this group.

The first panel of Table 14 also shows that hospitals affiliate with networks at similar proportions in the three CBSA groupings: 79.6 percent of the hospitals in the main four CBSAs, 74.3 percent of the hospitals in the comparison CBSAs, and 80.9 percent of the hospitals in the counterfactual CBSAs were affiliated with a network in FY 2017. Among the individual CBSAs, the share of affiliated hospitals ranges from a low of 58.8 percent in the San Antonio CBSA to a high of 94.74 percent in the Denver CBSA. The second panel shows that the average intermediate sufficiency margin, not weighted by patient revenue, of unaffiliated hospitals, 22.4 percent, is less than that of affiliated ones, 32.2 percent. While this relationship generally holds between the margins of network-affiliated and unaffiliated hospitals, it is by no means the rule. In some CBSAs, such as Houston, Kansas, New Orleans, and Des Moines, network hospitals have lower average margins than unaffiliated hospitals.

We identified 60 hospital networks operating within the fourteen CBSAs. Using CMS Cost Report data on the individual hospitals, we calculated aggregate margin components – net patient revenues, labor costs, medical supply costs, charity care costs, etc. – for each network at CBSA level for the fourteen CBSAs in our data set as well as a nationwide level where applicable (meaning that a network also has hospitals outside of the fourteen CBSAs). By plugging these components into our intermediate sufficiency margin formula, we were able to calculate network-wide margin estimates. We find that the most profitable network is Larkin Community consisting of 2 for-profit hospitals in Miami and a network-wise margin of 71.35 percent. Neither hospital received government appropriations.

Only 4 of the 60 networks have negative network-wide margins, with Texas Medical Center having the lowest at -30.66%. Each of these negative margin networks is small, having 6 or fewer hospitals, and notably, 3 of the 4 completely reside within the main four CBSAs. The 4 networks are Adeptus Health (Houston and Dallas CBSAs, 2 for-profit hospitals), Texas Medical Center (Dallas CBSA, 1 governmental hospital), Memorial Healthcare System – South Florida (Miami CBSA, 4 governmental hospitals), and LA County Department of Health Services (Los Angeles CBSA, 4 governmental and 2 non-profit hospitals).

Governmental hospitals, when a part of a hospital network, tend to be a part of smaller networks. For example, Broward Health (Miami, Florida, all 4 governmental), UW Medicine (Seattle, Washington, 3 governmental and 1 non-profit), Regents of the University of California (San Francisco, 4 governmental, other CBSAs not in sample, 2 governmental), and Memorial Healthcare (Miami, 4 governmental). Two larger networks are also primarily governmental: Los Angeles County Department of Health Services has 4 governmental and 2 non-profit hospitals, and Unity Point Health (Des Moines, 6 governmental and 3 non-profits, but outside of our fourteen CBSAs, 6 additional governmental and 17 additional non-profits). At the same time, some of the largest hospital networks can also include governmental hospitals but much less frequently. For example, CHI Health has 1 governmental, 16 non-profits and 2 for-profits within our fourteen CBSAs but 2 governmental, 1 for-profit and 63 non-profits outside of our fourteen CBSAs, for a grand total of 85 hospitals. Neither HCA with 146 hospitals nor Community Health Systems with 120 hospitals include governmental hospitals in their networks during 2017.[50]

[50] This is not to imply that governmental hospitals are in some way "bad" for hospital intermediate margins or even executive compensation. As Table 8 shows with the highlighted cells in yellow, apart from the governmental

Appendix VI shows the footprint of the 15 largest hospital networks in the fourteen CBSAs we analyze. This appendix shows the total number of hospitals in these networks nationwide, and the total number of hospitals in these networks in the fourteen CBSAs. Some networks, such as HCA, Tenet Healthcare, Prime Healthcare, and Baylor Scott & White have large numbers of hospitals in the fourteen CBSAs, while other large networks such as Community Health Systems, LifePoint Health, Trinity Health and Quorum Health each have only one or two hospitals. The network-wide intermediate margins for these hospitals vary a great deal, ranging between 43.58% for HCA to 11.16% for LifePoint, although only 6 of the 15 network margins are below 30%.

hospitals in the main four CBSAs of Dallas, Houston, San Antonio and Miami, intermediate profit margins are positive and greater than 10%. Appendix VI shows that Unity Point Health in the Des Moines CBSA, part of our counterfactual CBSAs that include San Francisco and Seattle, has an intermediate margin of 28.81% while also being predominately governmental with 6 governmental and 3 non-profit hospitals in that CBSA. The unique feature of the counterfactual CBSAs is the absence of for-profit hospitals in those markets.

Table 14. Counts and average intermediate margins incorporating governmental appropriations of network-affiliated and unaffiliated short-term acute care hospitals in the fourteen CBSAs, by CBSA grouping and individual CBSA.

CBSA Grouping	for-profit		non-profit		governmental		Overall	
	In network	Not in network	In network	Not in network	In network	Not in network	In network	Not in network
Main Four CBSAs	**89**	**18**	**51**	**4**	**12**	**17**	**152**	**39**
Dallas-Fort Worth-Arlington, TX	39	4	26	-	2	6	67	10
San Antonio-New Braunfels, TX	9	3	1	-	-	4	10	7
Miami-Fort Lauderdale-Pompano Beach, FL	20	1	8	4	8	2	36	7
Houston-The Woodlands-Sugar Land, TX	21	10	16	-	2	5	39	15
Comparison CBSAs	**80**	**14**	**70**	**18**	**12**	**24**	**162**	**56**
Richmond, VA	4	-	4	-	-	2	8	2
Las Vegas-Henderson-Paradise, NV	10	1	3	1	-	1	13	3
Denver-Aurora-Lakewood, CO	6	-	11	-	1	1	18	1
Kansas City, MO-KS	12	3	9	1	-	7	21	11
Riverside-San Bernardino-Ontario, CA	13	-	6	5	1	6	20	11
Los Angeles-Long Beach-Anaheim, CA	32	7	32	11	7	3	71	21
New Orleans-Metairie, LA	3	3	5	-	3	4	11	7
Counterfactual CBSAs	**2**	**-**	**37**	**4**	**16**	**9**	**55**	**13**
San Francisco-Oakland-Berkeley, CA	2	-	16	3	6	3	24	6
Des Moines-West Des Moines, IA	-	-	5	-	6	3	11	3
Seattle-Tacoma-Bellevue, WA	-	-	16	1	4	3	20	4
Overall	**171**	**32**	**158**	**26**	**40**	**50**	**369**	**108**

CBSA Grouping	for-profit		non-profit		governmental		Overall	
	In network	Not in network	In network	Not in network	In network	Not in network	In network	Not in network
Main Four CBSAs	**38.5%**	**39.1%**	**30.9%**	**19.4%**	**9.1%**	**-2.9%**	**33.6%**	**18.8%**
Dallas-Fort Worth-Arlington, TX	45.0%	51.9%	32.7%	-	25.1%	-8.1%	39.6%	15.9%
San Antonio-New Braunfels, TX	37.4%	22.0%	24.4%	-	-	19.8%	36.1%	20.8%
Miami-Fort Lauderdale-Pompano Beach, FL	37.3%	-46.3%	33.1%	19.4%	10.9%	-2.6%	30.5%	3.7%
Houston-The Woodlands-Sugar Land, TX	27.9%	47.7%	27.2%	-	-14.5%	-15.0%	25.4%	26.8%
Comparison CBSAs	**37.9%**	**45.1%**	**32.2%**	**18.8%**	**0.9%**	**19.8%**	**32.7%**	**25.8%**
Richmond, VA	38.0%	-	44.6%	-	-	6.5%	41.3%	6.5%
Las Vegas-Henderson-Paradise, NV	37.0%	29.5%	12.6%	23.8%	-	17.4%	31.3%	23.6%
Denver-Aurora-Lakewood, CO	56.4%	-	41.1%	-	43.3%	-28.1%	46.3%	-28.1%
Kansas City, MO-KS	32.0%	57.4%	-	-4.8%	27.4%	27.5%	30.0%	32.7%
Riverside-San Bernardino-Ontario, CA	37.4%	-	32.3%	21.3%	32.3%	20.6%	35.6%	20.9%
Los Angeles-Long Beach-Anaheim, CA	36.3%	34.3%	32.0%	19.3%	-20.7%	20.6%	28.7%	24.5%
New Orleans-Metairie, LA	47.4%	63.0%	24.6%	-	26.7%	23.5%	31.4%	40.5%
Counterfactual CBSAs	**38.9%**	**-**	**29.7%**	**21.2%**	**19.1%**	**18.0%**	**26.9%**	**19.0%**
San Francisco-Oakland-Berkeley, CA	38.9%	-	29.0%	20.0%	16.4%	8.3%	26.7%	14.1%
Des Moines-West Des Moines, IA	-	-	25.4%	-	19.2%	27.5%	22.0%	27.5%
Seattle-Tacoma-Bellevue, WA	-	-	31.7%	24.9%	23.2%	18.3%	30.0%	20.0%
Overall	**38.2%**	**41.7%**	**31.2%**	**19.2%**	**10.6%**	**11.7%**	**32.2%**	**22.4%**

Executive compensation data

With hospital networks identified, we can now turn to executive compensation and ask what factors influence it. We focus specifically on the 26 non-profit networks operating in our fourteen CBSAs, capturing the compensation amounts of their individual officers, directors, trustees, and key employees from their Form 990 filings. Based on the executives' titles, we select and total the compensations of those most likely to be involved in their network's hospital management and operations as explained in the following section. We then apportion each network's total executive compensation to its individual hospitals based on each hospital's share of the network total net patient revenues plus governmental appropriations. The resulting amount is each hospital's pro-rate share of network-wide executive compensation.

Who is an executive?

We restrict our analysis to non-profit networks to exploit executive compensation data reported on Form 990 filings filed annually with the IRS as tax exempt organizations. We use GuideStar, a comprehensive data platform which both profiles every non-profit that is registered as tax exempt with the IRS and provides data on former non-profits, to access these Form 990 filings from FY 2017, focusing on Part VII, Section A of the return. That section lists an organization's current officers, directors, and trustees at the time of filing, regardless of the amount of compensation they received; it also lists the organization's key employees as well as their five highest compensated employees. [51] For all persons required to be listed, the organization must provide their name, title, average hours per week, position type, and amounts for both their reportable compensation and estimated other compensation from the filing and/or related organizations.

In constructing a person-level dataset, we begin with the name, title, and total compensation for each of the employees listed in Part VII, Section A of each non-profit network's Form 990 filing. For an individual employee's total compensation associated with a hospital network, we summed across each of the three reported types – reportable income from the filing organization, reportable income from any related organizations, and an estimation of any other compensation received. Additionally, we assigned each employee to a specific title or to an overarching group based on their position, essentially grouping those with like roles: for example, any employee listed as a Chief Financial Officer (CFO) was designated as a CFO whereas any employee with a title that included Senior Vice President (SVP) – such as SVP of Operations, SVP of Finance, or SVP of Resources Management – was assigned to a grouping of SVPs. By grouping the employees with similar positions in a network, we were able to distill the wide variation in executive titles into four categories - CEO/President, CFO/COO, VP, and CMO (Chief Medical

[51] A tax-exempt organization completing the Form 990 must list up to 20 current employees who satisfy the definition of a key employee at the time of filing. Key employees are persons with certain responsibilities or influence over the organization as a whole and reportable compensation greater than $150,000 from the organization and related organizations. The five current highest compensated employees must have reportable compensation of at least $100,000 from the organization and related organizations and they cannot be officers, directors, trustees, or key employees of the organization. Source : https://www.irs.gov/charities-non-profits/form-990-part-vii-and-schedule-j-reporting-executive-compensation-individuals-included#:~:text=The%20organization%20must%20also%20list,compensated%20employees%20with%20reportable%20compensation

Officer)/CNO (Chief Nursing Officer) – to calculate average, median, minimum, and maximum total compensation (Table 15).

After gathering person-level data gathering from Part VII, Section A for a hospital network's executives, we also looked at Schedule R of each network's Form 990 filings. Schedule R requires the name, state the primary activity of, and detail the direct controlling entity of any related organizations whether tax-exempt or taxable. Pairing this information with the organizations' mission statements we identified, to the best of our ability, affiliated entities on a network's main Form 990 that were involved in the management or operation of its hospitals.[52] We collected the person-level executive compensation data for each related entity that filed a Form 990 and combined these with the data with what we already had at from the network-level Form 990. For an example, Catholic Health Initiatives (CHI), has regional organizations that manage its hospital operations in particular states like CHI St. Vincent which oversees its hospitals in Arkansas as well as Mercy Health Network, a joint venture with Trinity Health Corporation, which operates its hospitals in Iowa. Regional entities such as these two would be listed as related organizations on a network's main Form 990. These regional systems and organizations have a substantial management role at the hospital level, so we include their executives' compensation in our dataset (for related hospitals). In contrast, we did not collect compensation data for any affiliated foundations because their executives' roles would consist of overseeing donations, managing endowments, and organizing fundraising campaigns rather than the operations of the hospitals.

This brings up an important distinction about the roles of hospital executives for this analysis. We limited the definition of hospital executives to capture those with the operational and managerial decision-making roles necessary to operate a hospital rather than those with fundraising or Board of Director roles. For example, we limited the pool of executives associated with a network, or a sub-system within a network, to those with titles of President, CEO, CFO, COO, EVP, SVP, VP, Assistant VP, CLO (Chief legal Officer), CLC (Chief Legal Counsel), CMO (Chief Medical Officer), CNO (Chief Nursing Officer), or any other Chief Executive Director/Officer. We did not include persons identified as members or officers of the Board unless they also happened to hold one of the listed positions above. In total, our data set includes 442 unique persons as executives distributed across 58 CEOs and Presidents, 59 CFOs and COOs, 275 VPs, and 17 CMOs and CNOs as well as 11 Chief Legal Officers and 22 other Chief Executives. For our analysis, we exclude these 33 executives because these roles were infrequent or data was incomplete, resulting in 409 executives in our data set of 26 non-profit hospital networks (Table 15).

Multiple roles

The complexity of the Form 990 executive compensation data does not end with multiple tiers of affiliated organizations. Many executives hold multiple positions within their respective networks. This was often the case even on a network's main Form 990 filing – for instance with one employee having dual roles as SVP of Finance and Treasurer (a Board position which we exclude). This issue also arose with related organizations where executives would often appear on both the network's main Form 990 as well as that of one of its affiliated entities.[53] When we found executives with multiple positions, we

[52] Some hospital networks had affiliated entities that owned and operated apartment buildings or commercial real estate, for example. These entities and their executives were not included in our executive analysis.

[53] In a case such as this, the executive would have the same amount of total compensation on both the network's main Form 990 and the affiliated entity's Form 990. Where the two would differ is in the columns dividing their

assigned them to each title or title grouping applicable but only assigned their total executive compensation to their most important (first-listed) position, ensuring that we would not double-count any executive's compensation despite them having multiple roles. Fortunately, the Form 990 requires organizations to segment an individual's compensation into the three components: reportable compensation from the filing organization, reportable compensation from affiliated organizations, and any other compensation received. By using the total compensation among all affiliated organizations and assigning only the highest title held among them we avoid double counting of persons and compensation. As an example, for 2017, Methodist Hospitals of Dallas had an employee who held multiple roles as CFO, EVP, Treasurer, and Assistant Secretary with a total compensation of $1,152,272 across all three positions. Our approach identifies them as a single CFO and not as an EVP. This person's two board roles as Assistant Secretary and Treasurer are excluded.

Another complication with the Form 990 data occurs in the case of an executive vacating their position during the reporting year. In this situation a network might list two people for the same role, both the person leaving and the person replacing them, just with distinct applicable time periods during FY 2017. In that instance, we kept both individuals in our dataset and assigned them to the same position title, with the underlying assumption being that their respective compensations would be commensurate with the time they spent splitting the role and therefore, jointly they would capture the total executive compensation attributable to that position when totaled. [54] For person-level tabulations this creates wider dispersion among reported compensation than a "full-year executive compensation amount" would and can lower both the average and the median compensation amounts for that type of executive shown in Figure 1 and Table 15. Moreover, as a hospital network becomes large in geographic reach, it is not uncommon to have nationwide and regional executives as well as executives of related organizations all included in the Form 990 data. Among the 26 non-profit hospital networks we observed the greatest number of executives as SVPs and directors in a network's filing, less so for Presidents or Chief Financial Officers (CFO) (unless say two employees were splitting the role at different times or if the filing organization was also listing its regional executives), and the least number of Chief Medical Officer or Chief Nursing Officer (CMO/CNO). Because we collected executive compensation amounts from related organizations as well, we may have two, three, or even four executives listed as a President or CFO at the network level in our dataset. We do not establish a hierarchy of employees within any title grouping, meaning that a President of a related organization is listed as having the same title as the President of the central network organization with their compensations being the only difference. As a result, the 26 non-profit hospital networks have 58 Presidents/ CEOs (see column 1 of Table 15).

Calculating executive compensation

For context, our dataset in Figure 1 shows the median total compensation of executives in these managerial and operational roles, grouped into four categories – CEO/President, CFO/COO, VP, and CMO/CNO – across the 26 non-profit networks. We combine like titles into these four categories for succinctness but to also address the low counts we find among some of the titles individually. For example, we combine 66 EVPs, 115 SVPs, 93 VPs, and 1 Assistant VP into an all-encompassing VP

compensation into income coming from the filing entity versus income coming from the affiliated entity. Essentially, the two entities would swap roles on their respective filings.

[54] For the median values of executive compensation shown in Figure 1, the "part-year" compensation amounts that can be shown on the Form 990

category. The scatterplot has the four executive type groups on the x-axis and median total compensation in dollars on the y-axis. We highlight the data points with different colors to distinguish between executives employed at different size networks: less than $1 billion (pink points), between $1 and $5 billion (green points), and greater than $5 billion (blue points) in terms of their total net patient revenue and governmental appropriations. Note that the largest networks have the highest median compensation in each group of executives and where we have data for all three size brackets, the smallest networks have the lowest. In terms of actual compensation, the median President/CEO is compensated 2.5 times as much in a network with greater than $5 billion in net patient revenues and governmental appropriations ($2,151,628) than in a network with less than $1 billion of the same measure ($860,634).

Figure 1 Median total executive compensation for 409 Persons by type across 26 non-profit networks encompassing 470 short-term acute care hospitals nationwide, 2017.

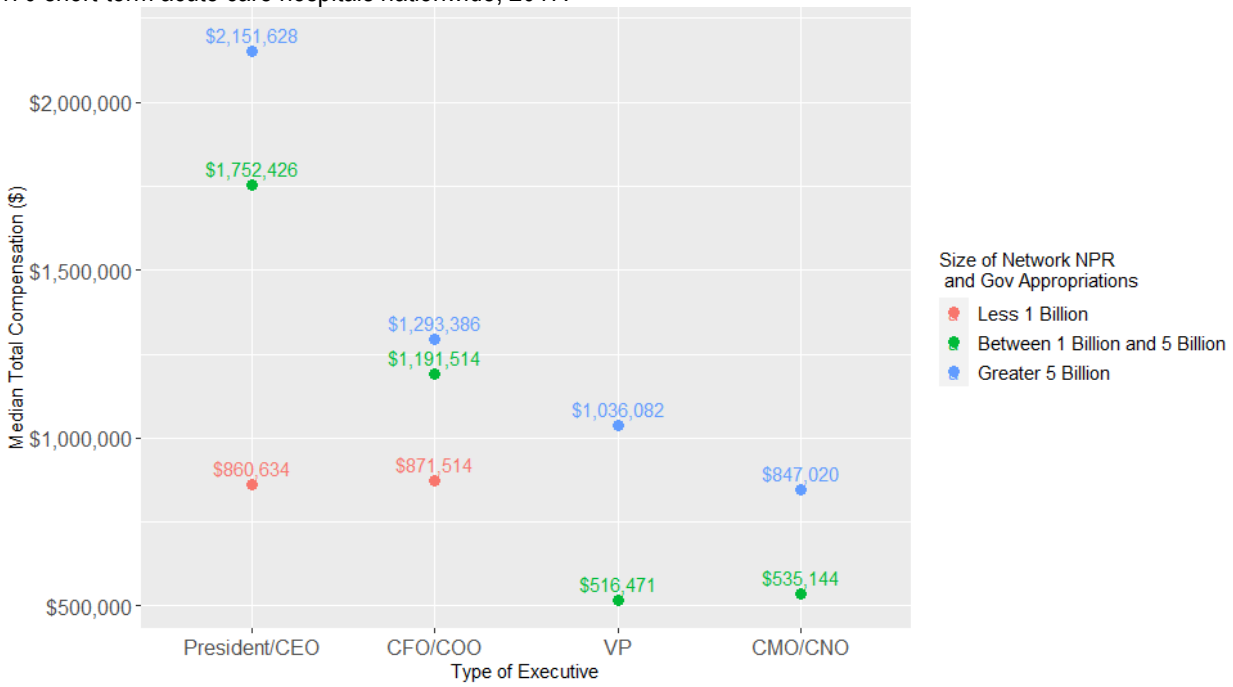


Table 15 further details the compensation of President/CEO, CFO/COO, VP, and CMO/CNO executives within the 26 non-profit hospital networks that we analyze. It shows the average, median (plotted in Figure 1), minimum, and maximum total compensation amounts within each grouping of executives, with further segmentation based on the size of the executives' networks in terms of net patient revenues and governmental appropriations. As is also shown in Figure 1, the median compensation of executives increases as the size of their network increases, and this is consistent across each of the four types. Additionally, there is wide variation in all positions, as shown by the minimum and maximum total compensation values in the last two columns of Table 15. For example, among the 27 CEOs/Presidents employed by networks having between $1 and $5 billion in total network net patient revenues and governmental appropriations, total compensation ranges from a low of $553,061 to a high of $18,957,123. It is worth noting that while not shown in Figure 1 or Table 15, we also looked at executives holding Chief Legal Officer or Legal Counsel roles within their networks: the range of their total compensation shows variation, as is the case with each of the other types of executives, but the average and median compensations are very similar across the different sizes of networks at $830,072 and $856,244 respectively.

Table 15. Summary statistics of total executive compensation for 409 persons by type across 26 non-profit networks encompassing 470 short-term acute care hospitals nationwide, 2017.

Type of Executive	Count	Size of Network Net Patient Revenues and Gov. Appropriations	Average Total Compensation	Median Total Compensation	Minimum Total Compensation	Maximum Total Compensation
CEO/President	3	Less than $1 Billion	$1,018,580	$860,634	$763,057	$1,432,050
	27	Between $1-$5 Billion	$2,907,899	$1,752,426	$553,061	$18,957,123
	28	Greater than $5 Billion	$3,008,455	$2,151,628	$663,952	$11,583,060
CFO/COO	1	Less than $1 Billion	$871,514	$871,514	$871,514	$871,514
	27	Between $1-$5 Billion	$1,574,584	$1,191,514	$426,092	$7,386,674
	31	Greater than $5 Billion	$1,329,203	$1,293,386	$365,398	$4,780,385
VP (EVP, SVP, VP, AVP)	-	Less than $1 Billion	-	-	-	-
	141	Between $1-$5 Billion	$657,270	$516,471	$101,670	$2,616,542
	134	Greater than $5 Billion	$1,178,326	$1,036,082	$113,080	$4,141,097
CMO/CNO	-	Less than $1 Billion	-	-	-	-
	8	Between $1-$5 Billion	$624,448	$535,144	$241,441	$980,471
	9	Greater than $5 Billion	$1,031,904	$847,020	$250	$2,506,407

Notes:

(1) Where an executive holds more than one role their total compensation is assigned to their highest title. For example, an executive may be both a CFO and a VP at different levels within a network but their compensation will be designated only as that of a CFO. Therefore, this table could overestimate or underestimate compensation for the types of executives detailed because it reflects assigning all of an executive's compensation to their highest title.

(2) This table does not distinguish executives that held a position for part of a fiscal year from those that held a position for a complete fiscal year.

Allocating total executive compensation

We pivot our focus from individual executives and their compensation to the compensation of executive management teams at a hospital, rather than individual level. What can we say about an executive management team, their compensation, and hospital performance? Specifically, can the model of hospital intermediate margin in table 12 also explain the compensation of the executive team for each hospital? To answer this we allocate the compensation of the 409 network executives from Table 15 to each hospital in a non-profit network that was also in our fourteen CBSAs, specifically focusing on those directly involved in the hospitals' management or operations.[55] We then used each network's hierarchy of hospital groups and executives associated with those groups to apportion the compensation for each of these roles to each hospital based upon net patient revenue. For example, if a hospital network was entirely located within one of the CBSAs, then the total compensation of the set of executives would be allocated to each hospital in that network based upon each hospital's net patient revenue (plus government appropriation).[56]

For multi-state hospital networks there often would be multiple sets of executives filling these positions, some with state-specific roles and others with nationwide roles. For example, CHI, a multi-state hospital network, employed many CEOs and Presidents in FY 2017, both at (1) the overall network level with

[55] We did not include the Chief Legal Officer among this group as few networks had that position.

[56] In this process, we excluded the organizations' highest paid employees who were not these executives, the trustees and directors serving on their governing bodies, as well as any of their employees with a Chair, Vice Chair, Treasurer, or Secretary title, unless they also happened to hold one of the included titles listed above.

Kevin Lofton as CEO, Michael Rowan as President of Health System Delivery, and Dean Swindle as President of Enterprise Business Lines – and (2) within specific systems or locations. Among the latter group of executives were Michael Covert and Michael McBride, the CEO and Market President respectively of CHI's St. Luke's Health System located in Houston, Texas, as well as Robert Ritz and David Vellinga, the President and CEO respectively of CHI's Iowa operations.[57]These region-specific executives only have responsibilities for the hospitals under their jurisdiction and not across the entire CHI network. At the same time, the CHI network executives have responsibilities for the entire hospital network.

We separated a network's "universal" executives from its region-specific executives where applicable and calculated separate total compensation amounts. We then allocated portions of these two network-level totals to individual hospitals to get our hospital-level measure of executive compensation in the following manner.

- First, we created an estimate for each hospital's portion of its network's universal executive compensation, apportioned by its share of its network's total net patient revenues and governmental appropriations. [58]
    - As an example, from Appendix VI, the CHI network includes 85 hospitals but only 19 within our fourteen CBSAs. The universal executives would have their total compensation allocated across 85 hospitals by net patient revenue. However, for the contribution to total executive compensation at the hospital level for our analysis, only the amounts associated with the 19 hospitals in our fourteen CBSAs would be used.[59]

- Second, for the hospitals in our fourteen CBSAs belonging to networks with location- or region-specific employees, we allocated any location-based executive compensation to the relevant hospitals with the same method of apportioning but only among that set of relevant hospitals.

[57] See the FY 2017 Form 990 filings for Catholic Health Initiatives (now Commonspirit Health), Catholic Health Initiatives-Iowa Corp, and St Luke's Health System Corporation for detail on these executives and their roles. This example is not exhaustive of CHI's location-specific executives; we only looked at those pertaining to hospitals located in our fourteen CBSAs (including the Denver and Seattle CHI hospitals) with this example serving to highlight only the Presidents and CEOs specific to CHI's hospitals in the Houston, Texas and Des Moines, Iowa CBSAs plus the network-wide executives identified on the network's Form 990. We did not include CHI affiliate executives of sub-networks without hospitals in our fourteen CBSAs.

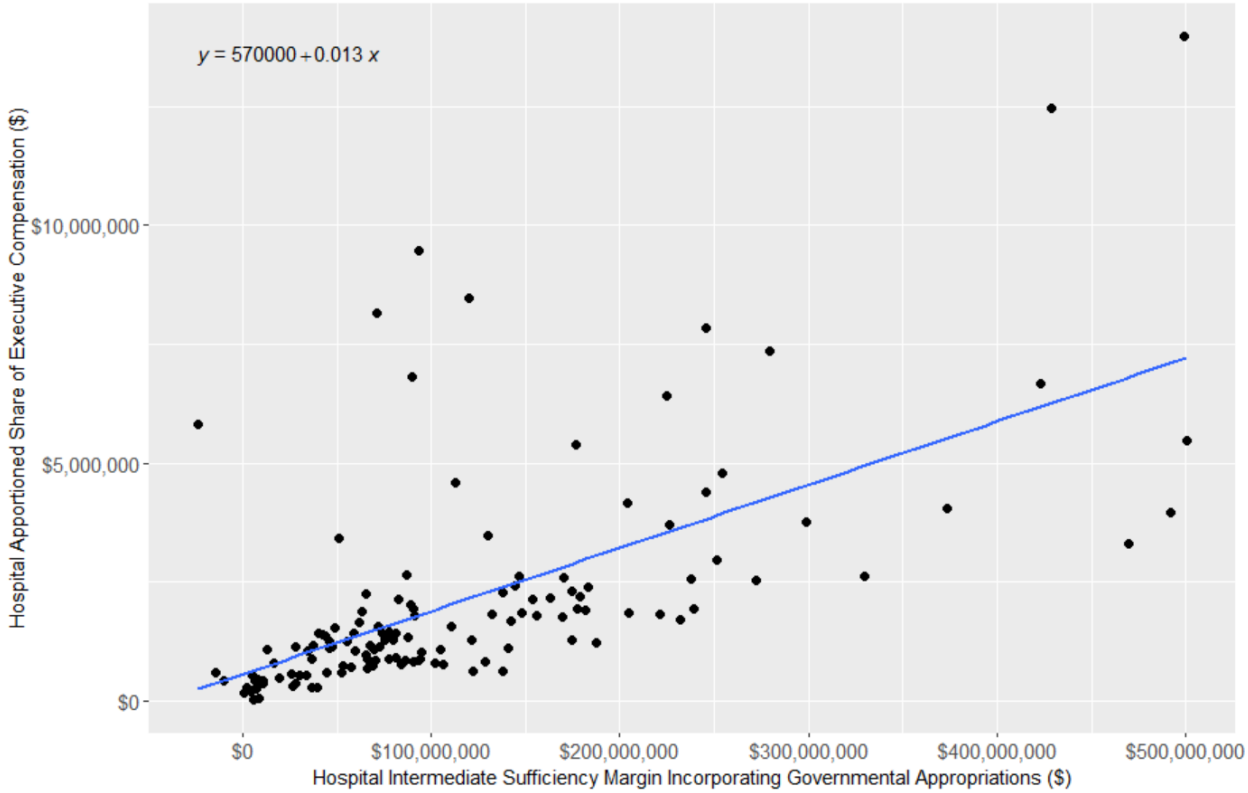
[58] It is important to note that in calculating each network's total net patient revenues and governmental appropriations, we summed over the net patient revenues and governmental appropriations of each of their affiliated hospitals, not just those located inside of our fourteen CBSAs and not only the non-profit hospitals within the network.

[59] It is not uncommon for a non-profit hospital network to include for-profit or governmental hospitals in our dataset – a feature often attributable to strategic partnerships or joint ventures between the different types of entities. Because the CMS cost reports provide net patient revenue and governmental appropriations (where applicable) for each hospital regardless of for-profit, non-profit, or governmental status, we can allocate executive compensation across each hospital. However, the Form 990 data only reveals the executives of the non-profit networks and so, we cannot capture the compensation of the for-profit or government executives associated with the for-profit or government hospitals we find to be affiliated with the non-profit networks. As a result, we focus solely on the networks' non-profit hospitals.

- Where a hospital has an allocated portion of regional compensation in our dataset, total executive compensation is equal to the sum of the hospital apportioned shares of its network's universal and region-specific executive compensation totals.

In Figure 2 we compare this measure of hospital-level executive compensation for all non-profit hospitals belonging to the 26 non-profit networks in our fourteen CBSAs with the hospital-level intermediate sufficiency margin in dollars. The two measures are highly correlated at 0.532, and a regression line shows that each additional dollar of hospital intermediate margin results in approximately 1.3 cents more compensation to its executive team (comprised of Presidents and CEOs, CFOs and COOs, VPs, CMOs and CNOs, Legal Officers, and other Chief Executives).[60]

Figure 2. Hospital apportioned share of network total executive compensation in dollars by intermediate sufficiency margin incorporating governmental appropriations in dollars for the 136 non-profit hospitals in non-profit networks in the fourteen CBSAs, 2017.



Note: Two outlier observations were removed from this (x,y) plot: Cedars-Sinai Medical Center ($1,334,728,866, $8,537,470) and Long Beach Memorial Medical Center ($222,403,104, $20,220,253), both located in the Los Angeles CBSA.

Model estimation of hospital-level network executive compensation

As Figure 2 shows, the hospital-level intermediate margin of non-profit hospitals in non-profit networks is highly correlated with the total compensation of the executive team of the hospital network. But what other factors might explain the amount of hospital-level executive compensation among non-profit hospitals? Our measure of hospital-level executive compensation has a very wide range across non-

[60] Also as expected, the correlation between hospital bad debt as a share of net patient revenues plus governmental appropriations and hospital-level executive compensation is negative at -0.110.

profit hospitals with a median value of $188,120 for small hospitals with revenue less than $35 million to $5,139,718, or 27 times larger, for large hospitals with revenue greater than $600 million (Table 17). To what extent do the same forces that explain hospital intermediate sufficiency margin - smaller hospitals and greater Medicaid days reducing margin and hospital zip-code income distribution, CBSA market competition, and networks with between 20 and 50 hospitals increasing margin (Table 12) - also explain executive compensation?

To explore these questions Table 18 shows our model of hospital-level executive compensation as a function of the same variables that we use to explain hospital -level intermediate margin. Because this model is estimated on 1) non-profit hospitals in 2) non-profit hospital networks that 3) file the tax form 990, the total number of hospitals in the fourteen CBSAs drops from 442 to 136 for estimation. The penalty for such a large reduction in observations is, necessarily, a reduction in the number of independent variables used for estimation.

Table 18 also shows the model of hospital-level intermediate sufficiency margin incorporating governmental appropriations from Table 12. Because we limit the executive compensation analysis to non-profit hospitals, we remove the dummy variables for-profit, church-affiliated non-profit, or a non-church-affiliated non-profit. We also dropped dummy variables for specialty hospitals and hospitals with a high share of non-salary emergency department costs relative to net patient revenues because each has a single observation. Finally, we removed the dummy variable identifying hospitals in right to work states due to collinearity with the statewide Medicaid coverage variable.[61]

Executive compensation estimation sample in comparison to intermediate margin estimation sample

Among this 136-hospital sample, the comparison CBSA group – Los Angeles, Riverside CA, Denver, New Orleans, Richmond VA, Las Vegas, and Kansas City - has 58 non-profit hospitals in non-profit networks (42.6 percent), the main four – Dallas, Houston, San Antonio, and Miami – has 45 (33.1 percent) and the counterfactual CBSA group – Seattle, Des Moines, and San Francisco - has 33 (24.3 percent). These non-profit hospitals in non-profit networks comprise more than one-half of all hospitals in the counterfactual CBSA group, less than one-third in the comparison group, and less than one-quarter in the main four. Partly this is by construction as the counterfactual group was designed to exclude for-profit hospitals, but partly it also reflects the very large proportion of governmental hospitals in the Seattle, San Francisco, and Des Moines CBSAs affiliated with large, state university hospital networks: the University of Washington and the University of California. In addition, non-profit hospital networks avoid small hospitals with revenues less than $35 million as can be seen by comparing these proportions on Table 10 with Table 16 and more generally non-profit hospitals are the least likely to be small in the full set of 442 hospitals.[62] Comparing Tables 10 and 16 also shows that the non-profit hospitals in these networks

[61] We can measure how highly correlated the two variables are by comparing variance inflation factors. When Dummy.Right.to.Work is included, its VIF is 6.065, which is already higher than the ideal threshold of 5, and the VIF of Medicaid.Coverage is 4.690; when Dummy.Right.to.Work is removed, the VIF of Medicaid.Coverage drops to 1.810. Lastly, we removed the CBSA market competition index because its inclusion made the data matrix ill-conditioned, increasing the singular value decomposition condition number from 48.16 to 75.44.

[62] We find it a bit surprising that even in the full sample of 442 hospitals in fourteen CBSAs, none of which are rural, that government hospitals are the most likely to have revenues less than $35 million. Government hospitals appear to be of two different types: those that are small because they serve rural areas, and those that tend to be large because they are affiliated with state university medical schools and health care systems. It is this latter group that represent governmental hospitals in both the 442 hospital and 136 hospital samples we analyze.

tend to locate in higher income areas and are more likely to be transplant centers compared with the full set of 442 hospitals.

For the state level variables, the 442-hospitals of all types (Table 10, right column) and 136-hospital non-profit only (Table 16, right column) samples have very similar means and characteristics. In both, the counterfactual CBSAs have the highest average health outcome ranking and the highest average state Medicaid coverage for persons under 200% FPL and the main four CBSAs consistently have the lowest state Medicaid coverage. Neither Texas nor Florida adopted the Medicaid expansion under the Affordable Care Act and are among the most restrictive states in terms of eligibility under the regular Medicaid program.

Among the hospital-level variables, Medicaid.Days% has the most consistent means across the estimation samples of the 136 hospitals belonging to non-profit hospital networks and the 442 hospitals in the fourteen CBSAs. Regardless of the sample being analyzed, both show that 9.2 percent (Table 10, right column) to 9.3 percent (Table 16, right column) of an average hospital's inpatient days are attributable to Medicaid or CHIP patients. It is worth noting that for both samples, hospitals in the main four CBSAs have the lowest average Medicaid.Days%.

However, there are substantial differences between the two samples for hospital network size. Partly this is due to excluding hospitals that do not belong to a network from the 136-hospital non-profit sample but even controlling for this, many more non-profit hospitals are in networks of 20 to 50 hospitals (48.5 percent, Table 16) than in the larger 442-hospital sample (27.8 percent, Table 10). For the largest networks with more than 50 hospitals, non-profits are less represented than for-profit hospitals. In the 442-hospital data set, 22.2 percent of for-profit hospitals are in these largest networks, while for the 136-hospital non-profit networks only 12.5 percent are. The for-profit hospitals comprise four of the five largest hospital networks in our 442-hospital sample (see Appendix VI for a list of these networks).[63]

Table 16. Means of independent variables used in DEG's executive compensation model for the estimation sample consisting of non-profit hospitals in non-profit networks in the fourteen CBSAs, overall and by CBSA grouping.

Data aggregation	Variable	Main Four	Comparison	Counterfactual	All
Nationwide	Intercept	1.000	1.000	1.000	1.000
	Dummy.Revenues<$35Mil	0.044	0.017	0.091	0.044
	Dummy.Transplant.Center	0.156	0.086	0.121	0.118
State	Health.Outcome.Ranking	0.010	0.060	0.120	0.058
	Medicaid.Coverage	0.544	0.827	0.923	0.757
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	2.410	2.121	3.043	2.440
Hospital	Medicaid.Days%	0.052	0.134	0.078	0.093
	Dummy.Network.5-20.hospitals	0.378	0.224	0.000	0.221
	Dummy.Network.20-50.hospitals	0.489	0.414	0.606	0.485
	Dummy.Network.> 50.hospitals	0.133	0.052	0.242	0.125
	N. obs.	45	58	33	136

[63] Note that while each of the 136 hospitals belongs to a non-profit hospital network, the mean values of the three network sizes do not add up to 1 because the omitted case is for hospitals belonging to networks with less than 5 hospitals (Table 16).

Table 16 details the mean values of the independent variables included in our 136-hosptial executive compensation model and Table 17 shows the mean values for the dependent variable, hospital-level executive compensation, as well as the medians, minimums, and maximums arranged by net patient revenue. As Table 17 shows, the mean, median, and range of a hospital's apportioned network executive compensation amounts increase with hospital net patient revenue. Across the 136 non-profit hospitals in non-profit networks, the average hospital-level apportioned amount is $2,303,842. The smallest hospitals, with net patient revenue less than $35 million, have a mean of $174,369 while the largest hospitals have a mean of $6,451,001, or 37 times greater than the smallest hospitals.

Table 17. Mean, median, minimum, and maximum of hospital allocated executive team compensation for 136 non-profit hospitals in non-profit networks in the fourteen CBSAs, by size of hospital net patient revenues in 2017.

Net Patient Revenues	Hospital Apportioned Share of Network Executive Compensation ($)				N
	Mean	Median	Min	Max	
< $35 Million	$174,369	$188,120	$26,964	$296,892	6
$35 - $600 Million	$1,577,354	$1,256,584	$267,048	$9,475,320	108
> $600 million	$6,451,001	$5,139,718	$2,530,755	$20,220,253	22
All	$2,303,842	$1,384,722	$26,964	$20,220,253	136

How do these hospital-level executive team compensation amounts compare with other hospital-level measures that we use? By dividing the mean hospital executive compensation (Column 2 of Table 17) by the mean value of hospital net patient revenues plus governmental appropriations for each size bracket of net patient revenues, we find that for hospitals with <$35 million, executive compensation is approximately 0.70%, for hospitals with net patient revenues between $35 million and $600 million approximately 0.57%, and for hospitals with greater than $600 million approximately 0.64%. We can also relate the mean hospital-level executive compensation shares shown in Table 17 to average direct labor costs for this group of 136 hospitals. We find that, as a share of hospital-level labor costs in dollars, executive compensation is about 1.40% on average for the smallest hospitals, 1.43% for the medium size hospitals, and 1.62% for the largest hospitals. Thus, as a first impression, the compensation of the executive team allocated to each hospital is declining in proportion to hospital net patient revenues but increasing in proportion to hospital labor costs.

Results

Because the dependent variable is hospital level executive team compensation, we estimate the model as a labor supply model using a log transformation of these amounts as well as the independent variables. The 136-hospital model estimated in Table 18 for hospital-level executive compensation has the best goodness-of-fit of any of the hospital models we have estimated with an r-square of 0.43.[64] The dummy variable identifying if a hospital is small in terms of net patient revenues is strongly significant and results in lower log values of network executive compensation at the hospital level. The coefficient of -2.2325 on the variable Dummy.Revenues<$35Mil means that the log value of a hospital's portion of network executive compensation will be 2.2325 lower for hospitals with net patient revenues less than $35 million in comparison to hospitals with net patient revenues greater than that threshold. To interpret this effect on the dependent variable, we would multiply it by $e^{-2.2325}$ or 0.1073,

[64] While we show the results based upon apportioning by a hospital's share of its network's net patient revenue (including governmental appropriations), we also tested this model by apportioning the same executive compensation to each hospital by the number of beds and the results were similar.

corresponding to an approximately 89 percent decrease (1 - 0.1073 = 0.8927) in total executive compensation. Contextualizing this, if a hospital with net patient revenues of $75 million had an apportioned executive compensation share of $1,900,00, then a hospital with $25 million in net patient revenues would have an expected apportioned executive compensation share of $200,000. This does not mean that a single executive's compensation would be 89 percent smaller, but that the total executive compensation among its CEOs and Presidents, CFOs and COOs, VPs, CMOs and CNOs, Legal Counsel/Officers, and other Chief Executives allocated to this hospital would decline by 89 percent. This large decline in executive compensation at small hospitals may be the result of both smaller executive teams at small hospitals (fewer VPs and no CMO or CNO for example) and lower executive compensation. However, we observe that non-profit hospital networks tend to avoid smaller hospitals: 4.4 percent of hospitals in non-profit networks have net patient revenues less than $35 million versus 11.4 percent for the larger 442-hospital sample and this result might indicate one reason why. If executive compensation is increasing with the dollar amount of a hospital's intermediate margin as Figure 2 shows, then small revenue hospitals in networks are not good for executive compensation. [65]

One very strong result for the executive compensation model is the presence of a transplant center. The 136-hospital data set has a larger share of transplant hospitals compared with the 442-hospital data set for the fourteen CBSAs (Table 10 at 9.3 percent versus with Table 16 at 11.8 percent). The presence of transplant hospitals within a network increases executive team compensation, an effect we did not find with the larger 442-hospital estimation of hospital intermediate sufficiency margin (Table 18).

Medicaid inpatient days is significant and negative for both the hospital intermediate margin and executive compensation models on Table 18. This is one of the most consistent findings across both the 136 and 442 hospital data sets. At the same time, we find evidence in both models that wider access to Medicaid at the state level increases hospital intermediate margins and non-profit executive compensation, but this finding is not statistically significant.

The Table 18 136-hospital model of executive compensation among non-profit hospitals in hospital networks does not include standalone non-profit hospitals. How do executives in standalone hospitals fair on compensation? Just focusing on the President/CEO title of standalone hospitals, we find that individual Presidents and CEOs managing a standalone non-profit hospital have lower average and median amounts of total compensation than those individuals managing two or more non-profit hospitals in a network. Within the 26 non-profit networks we analyze – comprised of 136 hospitals with an average net patient revenue plus governmental appropriations of $384.47 million – a CEO or President has an average (median) total compensation of $2,858,720 ($1,819,773). In contrast, among the 25 independent non-profit hospitals in our fourteen CBSAs, which have an average net patient revenue plus governmental appropriations of $311.77 million among them, a CEO or President has an average (median) total compensation of $1,221,529 ($996,016).[66] While the network-affiliated and

[65] Additionally, we might expect this result because each hospital a share of its network's total executive compensation is apportioned by its share net patient revenues and governmental appropriations for the entire network. However, this example shows that while $25 million in net patient revenue is 1/3 of $75 million in net patient revenue, total executive compensation at the hospital-level falls by much more than 1/3, but by almost 90 percent. This small hospital effect is, however, limited to hospitals with net patient revenues less than $35 million, of which there are only 6 in the 136 non-profit hospital sample.

[66] If we restrict the 26 non-profit hospital networks in our fourteen CBSAs to only hospitals with net patient revenues and governmental appropriations no larger than those of the largest standalone non-profit hospital for which we have executive compensation data, which has $735.78 million, this would remove 12 of the 136 network hospitals. The largest hospital removed had net patient revenue of $3,140.74 million (Cedars-Sinai Medical Center

unaffiliated hospitals are notably similar in terms of their average net patient revenue plus governmental appropriations, a President or CEO employed within a non-profit network has an average (median) total compensation that is 134 percent (83 percent) greater than the average (median) total compensation of a CEO or President employed by a single, independent non-profit hospital in our fourteen CBSAs.[67]

Of the 136 non-profit hospitals in the estimation sample, 16 identify as transplant centers. The dummy variable identifying if a hospital is a transplant center is strongly significant and results in higher hospital shares of network executive compensation. The coefficient of 1.1906 on Dummy.Transplant.Center means that, the value of a hospital's executive compensation portion will be approximately 229 percent greater in transplant centers. Transplant procedures are strong revenue sources for hospitals, and significantly increase net patient revenues relative to hospitals that do not perform them.[68] This will result in higher hospital portions of executive compensation in our calculations because our measure is apportioned by a hospital's share of its network's total net patient revenue (including governmental appropriations).

For the network size dummy variables the omitted size is networks consisting of less than 5 hospitals. The coefficients on each of the dummies should be interpreted as increasing or reducing the hospital portion of network executive compensation compared to that of hospitals in networks with less than 5 hospitals. Each of the network dummies have negative coefficients but only networks with between 20 to 50 hospitals is significant. Relative to networks with fewer than 5 hospitals, or between 5 and 20 hospitals, or with greater than 50 hospitals, total executive compensation is less in the 20 to 50 hospital networks. These results reflect the observation that executive team compensation as a share of hospital revenues is a decreasing share, even if individual executive compensation is clearly increasing with hospital network size as Figure 1 shows.

The state-level health outcome ranking and Medicaid coverage variables are insignificant as are the variables reflecting a hospital's zip code income disparity ratio. A hospital's share of inpatient days attributable to patients insured by Medicaid or CHIP is significant and negative at the 10% level. Medicaid and CHIP patients hurt executive compensation in non-profit networks.

in the Los Angeles CBSA). For the remaining 124 network hospitals, the average net patient revenue was $295.07 million, which is closer to the average net patient revenue for the standalone hospitals, at $311.77 million. However, we cannot untangle the CEO pay for these networks based upon a subset of the 136 hospitals.

[67] We were able to collect Form 990 compensation data for 25 independent non-profit hospitals in our fourteen CBSAs to calculate these mean and median President/CEO total compensation amounts.

[68] Of the 41 transplant hospitals in the 442-hospital data set, average hospital net patient revenue was $920.5 million with the largest at $3,140.7 million.

Table 18. Estimation of a hospital's portion of its network's total executive compensation for the short-term acute care non-profit hospitals in non-profit networks in the fourteen CBSAs and accepting Medicare during FY 2017.

		Large CBSA Comparison					
		DV: Intermediate Sufficiency Margin w/ Gov't Appropriations			DV: Log Hospital Assigned Executive Compensation		
Data aggregation	Variable	Coefficient		"Robust" standard error calculated t-statistic	Coefficient		t-statistic
Nationwide	Intercept	0.0541		[0.5]	14.0829	***	[35.8]
	Dummy.For-Profit	0.2512	***	[5.1]			
	Dummy.Non-Profit.Church	0.1504	**	[3.2]			
	Dummy.Non-Profit.Other	0.1378	**	[3.1]			
	Dummy.Revenues<$35Mil	-0.0289		[-0.8]	-2.2325	***	[-6.8]
	Dummy.Specialty.Hospital	0.2308	***	[4.0]			
	Dummy.Transplant.Center	0.0154		[0.5]	1.1906	***	[5.7]
rural/urban Medicaid expansion	Dummy.RuralxMedicaid.Expansion						
	Dummy.UrbanxMedicaid.Expansion						
State	Dummy.Right.to.Work	-0.0235		[-0.7]			
	Health.Outcome.Ranking	0.0154		[0.1]	0.3740		[0.5]
	Medicaid.Coverage	0.0571		[0.7]	0.6840		[1.5]
	Dummy.Minnesota						
CBSA	CBSA.Market.Competition.Index	0.3613		[1.9]			
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	0.0140	***	[3.9]	-0.0033		[-0.1]
Hospital	Medicaid.Days%	-0.3121	*	[-2.5]	-1.5142		[-1.9]
	Dummy.Emergency>10%.Net.Patient.Revenue	-0.1129		[-1.6]			
	Dummy.Network.5-20.hospitals	0.0606		[1.5]	-0.0926		[-0.4]
	Dummy.Network.20-50.hospitals	0.0666	*	[2.4]	-0.6343	**	[-3.3]
	Dummy.Network.> 50.hospitals	0.0091		[0.3]	-0.2107		[-0.8]
	N. obs.	442			136		
	R squared	0.2425			0.4296		
	F statistic	9.83			12.30		
	singular value decomposition condition number	59.60			48.16		

*** p < 0.001; ** p < 0.01; * p < 0.05.

(1) Note the change in the dependent variable between the two models as well as the change in the number of observations. The model with hospital assigned executive compensation, apportioned to hospitals by share of their network's total net patient revenue, as the dependent variable is run only on non-profit hospitals for which we have network executive compensation. The change in sample also affects the independent variables included in that model as discussed in the paper's text.

(2) The absence of heteroskedasticity was rejected for the first model, which has the new intermediate sufficiency margin as the dependent variable, using White's test, provided in the R package "skedastic" with the white_lm() command. Robust standard errors (SE) were implemented using the "sandwich" package, adjusting the variance-covariance matrix by the "HC1" method which multiples the squared residuals of the model by (the number of observations)/(the number of observations – the number of coefficients). White's test was also run on the second model but with a p-value of 0.181, the absence of heteroskedasticity was not rejected and therefore, robust standard errors were not implemented.

Variables with greatest influence on a hospital's portion of its network's total executive compensation

In the "Variables with greatest influence on intermediate sufficiency margins in the fourteen CBSAs" section, we estimated the influence of each of the independent variables on the predicted intermediate margin for the 442-hospital sample in table 13. Table 19 shows this same analysis for the 136-hospital non-profit hospitals in networks. Each number in Table 19 represents the average proportion of a hospital's (logged) share of its network's total executive compensation that can be explained by the corresponding independent variable. In addition to calculating the mean proportion across the non-profit hospitals belonging to non-profit networks in our fourteen CBSAs as seen in the rightmost column of Table 19, we also segment by CBSA grouping to understand how the variables' contributions differ between the main four, comparison, and counterfactual CBSAs. The variables are grouped and their mean contributing proportions are totaled by the data aggregation levels shown in the leftmost column.

As with the 442-hospital analysis of variables with the greatest influence on the predicted intermediate sufficiency margin of hospitals in the fourteen CBSAs shown on Table 13, the nationwide variables shown on Table 19 contribute the most to a non-profit hospital's predicted share of its network's total executive compensation. This is predominantly attributable to the intercept; the dummy variables for being a small hospital in terms of net patient revenue and for a being a transplant center consistently, while statistically significant, have very little influence on allocated executive compensation at the hospital-level. For example, Dummy.Revenues<$35Mil explains -0.8% of the predicted measure across all of the non-profit hospitals in non-profit networks in the fourteen CBSAs, and it explains -0.9%, -0.3%, and -1.7% of it on average for those hospitals when located in the main four, comparison, and counterfactual CBSAs, respectively.

Both state level variables positively influence a hospital's weighted share of network executive compensation. On average, the Medicaid.Coverage variable reflecting the proportion of a state's population with income under 200% FPL covered under its Medicaid program contributes 3.7% overall, 2.6% within the main four CBSAs, 4.0% within the comparison CBSAs, and 4.5% within the counterfactual CBSAs. State level Medicaid coverage improves hospital margins among the 442-hospital data set for the fourteen CBSAs, and executive compensation for 136-non-profit hospitals in this data set, but in our 4,072-hospital nationwide estimates reduces hospital margins (compare Tables 12 and 18).

The health outcome ranking variable's influence is insignificant, contributing between 0.0% and 0.3% overall and across the three CBSA groupings as is the zip code level variable reflecting the income disparity in a hospital's local area income distribution.

The hospital-level variables – most notably Medicaid.Days% and Dummy.Network.20-50.hospitals - consistently have a negative effect in estimating a hospital's weighted share of its network's executive compensation, contributing 3.5% on average. Although statistically significant, these variables have much less influence on the executive compensation model than on the intermediate sufficiency margin model using the larger 442-hospital sample. These same variables account for 11.5% of hospital predicted margin (Table 13) versus 3.5% on the executive compensation model for non-profit hospitals in non-profit networks.

Table 19. Proportion of the log of a hospital's weighted share of its network's total executive compensation explained by independent variables, overall and by CBSA grouping.

Data aggregation	Variable	Main Four	Comparison	Counterfactual	All
Nationwide	Intercept	1.003	0.991	1.000	0.997
	Dummy.Revenues<$35Mil	-0.009	-0.003	-0.017	-0.008
	Dummy.Transplant.Center	0.012	0.007	0.010	0.009
	Total	1.007	0.994	0.993	0.998
State	Health.Outcome.Ranking	0.000	0.002	0.003	0.002
	Medicaid.Coverage	0.026	0.040	0.045	0.037
	Total	0.027	0.041	0.048	0.038
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	-0.001	-0.000	-0.001	-0.001
	Total	-0.001	-0.000	-0.001	-0.001
Hospital	Medicaid.Days%	-0.006	-0.014	-0.008	-0.010
	Dummy.Network.5-20.hospitals	-0.002	-0.001	0.000	-0.001
	Dummy.Network.20-50.hospitals	-0.023	-0.019	-0.028	-0.022
	Dummy.Network.> 50.hospitals	-0.002	-0.001	-0.004	-0.002
	Total	-0.033	-0.035	-0.040	-0.035
	Total	1.000	1.000	1.000	1.000

Note: Proportions may not sum exactly to gray rows in the data aggregation panels due to rounding.

Appendix

Appendix I. Summary of hospitals removed from analysis due to lack of sufficient data.

CBSA Grouping	Count of Removed Hospitals	
	In Network	Not in Network
Main Four	**1**	**1**
Dallas-Fort Worth-Arlington, TX Metro Area	0	0
San Antonio-New Braunfels, TX Metro Area	0	0
Miami-Fort Lauderdale-Pompano Beach, FL Metro Area	0	1
Houston-The Woodlands-Sugar Land, TX Metro Area	1	0
Comparison	**11**	**2**
Richmond, VA Metro Area	0	1
Las Vegas-Henderson-Paradise, NV Metro Area	0	1
Denver-Aurora-Lakewood, CO Metro Area	0	0
Kansas City, MO-KS Metro Area	0	0
Riverside-San Bernardino-Ontario, CA Metro Area	3	0
Los Angeles-Long Beach-Anaheim, CA Metro Area	8	0
New Orleans-Metairie, LA Metro Area	0	0
Counterfactual	**10**	**0**
San Francisco-Oakland-Berkeley, CA Metro Area,	9	0
Des Moines-West Des Moines, IA Metro Area,	0	0
Seattle-Tacoma-Bellevue, WA Metro Area	1	0
Total	**22**	**3**

Note: All of the 22 removed network-affiliated hospitals are non-profits (21 of the 22 are affiliated with Kaiser Foundation Health). Within the unaffiliated hospitals, the Las Vegas and Richmond CBSA hospitals are for-profit while the Miami CBSA hospital is non-profit.

Appendix II. Averages of intermediate sufficiency margins calculated without and with governmental appropriations included in the denominator by CBSA and CBSA grouping.

CBSA Grouping	Average Intermediate Sufficiency Margin	
	NPR w/out Gov't Appropriations	NPR w/ Gov't Appropriations
Main Four	**27.63%**	**30.56%**
Dallas-Fort Worth-Arlington, TX Metro Area	35.39%	36.53%
San Antonio-New Braunfels, TX Metro Area	24.66%	29.78%
Miami-Fort Lauderdale-Pompano Beach, FL Metro Area	25.09%	26.14%
Houston-The Woodlands-Sugar Land, TX Metro Area	19.54%	25.82%
Comparison	**27.65%**	**30.93%**
Richmond, VA Metro Area	-4.10%	34.33%
Las Vegas-Henderson-Paradise, NV Metro Area	29.65%	29.90%
Denver-Aurora-Lakewood, CO Metro Area	40.50%	42.40%
Kansas City, MO-KS Metro Area	30.41%	30.95%
Riverside-San Bernardino-Ontario, CA Metro Area	26.43%	30.40%
Los Angeles-Long Beach-Anaheim, CA Metro Area	26.33%	27.77%
New Orleans-Metairie, LA Metro Area	33.96%	34.91%
Counterfactual	**23.03%**	**25.43%**
San Francisco-Oakland-Berkeley, CA Metro Area,	21.90%	24.17%
Des Moines-West Des Moines, IA Metro Area,	17.55%	23.19%
Seattle-Tacoma-Bellevue, WA Metro Area	27.64%	28.30%

Appendix III. Average tax return income measures and payor mix for inpatient services by hospital days for all hospitals in the fourteen CBSAs of interest by hospital type with breakout by hospital network affiliation, 2017.

Hospital Category	Average Tax Return Income in Hospital Zip Code (1)	Average Ratio of Exemptions with AGI >100K to Exemptions with AGI < 25K	Average Bed Utilization	Average Medicaid/ CHIP Days as Share of Total Hospital Days	Average Medicare Days as Share of Total Hospital Days	Average Non-Medicaid and Non-Medicare Days as Share of Total Hospital Days
For-profits	$85,217	1.60	48.69%	8.22%	29.17%	62.62%
Non-profits	$107,847	2.43	58.59%	9.45%	31.42%	59.13%
Governmental	$70,685	1.25	50.71%	11.40%	33.42%	55.17%
All	$91,599	1.86	52.88%	9.30%	30.84%	59.86%

Appendix III - Part A. Network-affiliated hospitals

Hospital Category	Average Tax Return Income in Hospital Zip Code (1)	Average Ratio of Exemptions with AGI >100K to Exemptions with AGI < 25K	Average Bed Utilization	Average Medicaid/ CHIP Days as Share of Total Hospital Days	Average Medicare Days as Share of Total Hospital Days	Average Non-Medicaid and Non-Medicare Days as Share of Total Hospital Days
For-profits	$85,677	1.62	52.79%	8.42%	28.19%	63.39%
Non-profits	$105,133	2.49	59.26%	9.36%	30.95%	59.69%
Governmental	$80,163	1.20	56.61%	12.62%	31.65%	55.73%
All	$93,592	1.96	55.97%	9.28%	29.75%	60.97%

Appendix III - Part B. Unaffiliated hospitals

Hospital Category	Average Tax Return Income in Hospital Zip Code (1)	Average Ratio of Exemptions with AGI >100K to Exemptions with AGI < 25K	Average Bed Utilization	Average Medicaid/ CHIP Days as Share of Total Hospital Days	Average Medicare Days as Share of Total Hospital Days	Average Non-Medicaid and Non-Medicare Days as Share of Total Hospital Days
For-profits	$82,759	1.47	26.80%	7.15%	34.34%	58.51%
Non-profits	$124,338	2.06	54.35%	10.06%	34.34%	55.60%
Governmental	$63,473	1.29	45.98%	10.43%	34.84%	54.73%
All	$84,624	1.54	42.20%	9.36%	34.58%	56.06%

(1) This measure is the average household income across hospitals based on their zip code. It is calculated at the individual hospital level by weighting the average income in its zip-code's AGI groupings by their share of total zip code returns filing income. SOI data obtained from https://www.irs.gov/statistics/soi-tax-stats-individual-income-tax-statistics-2017-zip-code-data-soi.

Appendix IV. Main Large CBSA Comparison Model estimation with and without rural/urban Medicaid expansion dummy variables as well as the predictor variables' associated variance inflation factors.

`	Variable	Large CBSA Comparison Model DV: Intermediate Sufficiency Margin w/ Gov't Appropriations					
		With Urban/Rural Medicaid Expansion Dummy Variables			Without Urban/Rural Medicaid Expansion Dummy Variables		
		Coefficient		VIF	Coefficient		VIF
Nationwide	Intercept	0.2163			0.0541		
	Dummy.For-Profit	0.2636	***	3.036	0.2512	***	2.902
	Dummy.Non-Profit.Church	0.1622	***	1.798	0.1504	**	1.705
	Dummy.Non-Profit.Other	0.1468	**	2.462	0.1378	**	2.412
	Dummy.Revenues<$35Mil	-0.0540		1.532	-0.0289		1.397
	Dummy.Specialty.Hospital	0.2289	***	1.054	0.2308	***	1.052
	Dummy.Transplant.Center	0.0142		1.073	0.0154		1.073
rural/urban Medicaid expansion	Dummy.RuralxMedicaid.Expansion	0.1930	**	3.097			
	Dummy.UrbanxMedicaid.Expansion	0.0664		10.402			
State	Dummy.Right.to.Work	-0.0482		4.386	-0.0235		4.004
	Health.Outcome.Ranking	0.0207		1.972	0.0154		1.808
	Medicaid.Coverage	-0.1737		17.150	0.0571		4.391
CBSA	CBSA.Market.Competition.Index	0.0870		2.079	0.3613		1.243
zip code, 5 digit	Zip.Code.Income.Disparity.Ratio	0.0142	***	1.165	0.0140	***	1.165
Hospital	Medicaid.Days%	-0.3262	**	1.396	-0.3121	*	1.363
	Dummy.Emergency>10%.Net.Patient.Revenue	-0.1112		1.185	-0.1129		1.185
	Dummy.Network.5-20.hospitals	0.0556		1.405	0.0606		1.396
	Dummy.Network.20-50.hospitals	0.0518		1.741	0.0666	*	1.657
	Dummy.Network.> 50.hospitals	0.0036		1.877	0.0091		1.868
	N. obs.	442			442		
	R squared	0.2509			0.2425		
	F statistic	9.21			9.83		
	singular value decomposition condition number	98.16			59.60		

For the model that includes the two Medicaid variables, two VIF values stick out: 10.402 on the urban Medicaid expansion dummy and 17.150 on the Medicaid coverage variable reflecting the share of a state's population below 200% FPL covered by the state's Medicaid program. These VIFs tells us, for example, that the variance of the estimated coefficient of the urban Medicaid expansion dummy is inflated by a factor of 17.150 because it is highly correlated with at least one of the other predictors in the model – specifically, the Medicaid coverage variable. To address this serious multicollinearity, we remove the urban and Medicaid expansion dummies because we have a preference for the Medicaid variable and recognize the lack of rural hospitals in our dataset due to selecting large metro areas for our analysis. After doing so, each of the model's VIFs measure below 5, indicating that collinearity is no longer an issue in the model. In terms of the adjusted R-squared values of the models with and without the two Medicaid expansion dummies, we did not lose much explanatory power by dropping the two predictors: it decreased from 25.09% to 24.25%.

Appendix V. Counts and average intermediate sufficiency margins with governmental appropriations for individual hospitals affiliated and unaffiliated with hospital networks, by hospital entity type and net patient revenues size.

Hospital Type	Net Patient Revenues and Network Affiliation						Overall	
	< $35 million		$35-$600 million		> $600 million			
	In Network	Not in Network	In Network	Not in Network	In Network	Not in Network	In Network	Not in Network
For-profit	18	15	147	17	6	0	171	32
Non-Profit	7	3	126	19	25	4	158	26
Governmental	6	18	23	26	11	6	40	50
Total	31	36	296	62	42	10	369	108

Hospital Type	Net Patient Revenues and Network Affiliation						Overall	
	< $35 million		$35-$600 million		> $600 million			
	In Network	Not in Network	In Network	Not in Network	In Network	Not in Network	In Network	Not in Network
For-profit	36.3%	38.9%	38.1%	44.2%	47.3%	-	38.2%	41.7%
Non-Profit	24.1%	-10.9%	31.1%	21.8%	33.7%	29.8%	31.2%	19.2%
Governmental	15.1%	12.9%	8.3%	11.0%	13.1%	11.5%	10.6%	11.7%
Total	29.5%	21.8%	32.8%	23.4%	30.3%	18.8%	32.2%	22.4%

Appendix VI. Payor mix for inpatient services by hospital days for the largest networks located in the fourteen CBSAs with aggregation up to network level for hospitals only within the CBSAs, 2017.

	Overall		Aggregation of Network Hospitals in Fourteen CBSAs						
Largest Networks Nationwide	Count of Hospitals	Type (1)	Count of Hospitals	Average Hospital Zip Code Income	Intermediate Sufficiency Margin w/ Gov't App.	Bed Utilization	Medicaid and CHIP Days Share	Medicare Days Share	Non-Medicare/ Medicaid Days Share
HCA	146	For-profit	56	$86,687	43.58%	69.47%	7.91%	25.92%	66.17%
Community Health Systems	120	For-profit	2	$56,501	24.45%	57.41%	3.30%	42.95%	53.75%
CHI Health	85	Non-profit	19	$96,717	27.19%	68.79%	8.26%	30.87%	60.88%
LifePoint Health	64	For-profit	1	$50,360	11.16%	9.79%	1.12%	51.32%	47.57%
Tenet Healthcare Corp.	58	For-profit	19	$87,143	33.46%	53.23%	9.90%	24.57%	65.52%
Trinity Health	52	Non-profit	1	$175,580	27.53%	59.38%	3.43%	37.56%	59.01%
Prime Healthcare Inc.	42	For-profit	19	$87,439	39.01%	45.22%	9.99%	35.95%	54.06%
Providence St. Joseph	40	Non-profit	15	$93,553	33.21%	62.98%	7.33%	28.28%	64.39%
Dignity Health	34	Non-profit	12	$109,086	27.90%	54.49%	13.91%	24.17%	61.92%
UnityPoint Health	32	Non-profit	9	$59,531	28.81%	62.60%	25.13%	38.64%	36.22%
AdventHealth	32	Non-profit	5	$101,908	35.26%	60.65%	12.49%	28.68%	58.83%
Baylor Scott & White	31	Non-profit	23	$95,515	40.12%	65.40%	4.47%	30.66%	64.87%
Quorum Health Corp.	29	For-profit	2	$55,031	41.23%	51.21%	16.66%	34.11%	49.22%
Universal Health Services	27	For-profit	11	$77,314	37.60%	69.34%	11.94%	23.78%	64.28%
Sutter Health	25	Non-profit	10	$190,563	36.21%	53.21%	10.01%	33.12%	56.87%

(1) Some networks are comprised of more than one type of hospital. The predominant type of hospital nationwide for a network is detailed in this column. For example, CHS/Community Health Systems Inc is filed for 118 for-profits and 2 non-profits in the CMS data and so, it is listed as for-profit in this table.