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The Determinants and Variation of Nursing Home Private-Pay Prices: Organizational and Market Structure

Sean Shenghsiu Huang[1], Jane Banaszak-Holl[2], Stephanie Yuan[1], and Richard A. Hirth[3]

Abstract

Nursing home (NH) care is arguably the most significant financial risk faced by the elderly without long-term care insurance or Medicaid coverage. Annual out-of-pocket expenditures for NH care can easily exceed $70,000. However, our understanding of private-pay prices is limited by data availability. Utilizing a unique data set on NH prices from 2005 through 2010 across eight states, we find that NH price growth has consistently outpaced growth in consumer and medical care prices. After adjusting for geographical and facility differences, for-profit chains charge the lowest prices, independently operated for-profit and nonprofit NHs have similar prices, and nonprofit chains charge the highest prices. Adjusted prices are also likely to be higher when NHs have higher occupancy rates and markets are more concentrated. The significant differences in price across organizational and market structures suggest private-pay prices can be an important factor when evaluating and comparing the value of NH care.

Keywords

nursing home, price, medical expenditure, organizational structure, price variation, market structure

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[1]Georgetown University, Washington, DC, USA
[2]Monash University, Melbourne, Victoria, Australia
[3]University of Michigan, Ann Arbor, MI, USA

Corresponding Author:
Sean Shenghsiu Huang, Department of Health Systems Administration, Georgetown University, 3700 Reservoir Road Northwest, St. Mary's Hall, Washington, DC 20057, USA.
Email: sean.huang@georgetown.edu

Introduction

Institutional long-stay nursing home (NH) care is expensive. For instance, in the state of New York, the annual average price in 2010 was $121,764.[1] Since most Americans do not purchase long-term care insurance to cover these expenses (Lin & Prince, 2013), out-of-pocket NH expenditures represent a substantial financial burden for elderly who are not eligible for Medicaid (Kopecky & Koreshkova, 2014). Out-of-pocket payments are estimated to account for 33% of formal long-term care spending among the elderly, whereas private insurance only accounts for 4% of NH expenditure (Catlin, Cowan, Stephen, & Washington, 2007; Congressional Budget Office, 2004). NH private-pay prices have been increasing and price growth hinders the affordability of NH care (Stewart, Grabowski, & Lakdawalla, 2009). For example, in California between 2002 and 2011, the nominal median private-pay price for NH care increased by 56.7%.[2] Seniors whose resources are depleted by paying escalating prices must subsequently resort to Medicaid. This also increases the financial burden to public funding sources.

Despite the significance to the elderly, our understanding of what drives NH private-pay prices is limited. Existing studies on NH pricing have relied mostly on data from Medicaid cost reports within a single state. For instance, Nyman (1994) used Wisconsin data for 1988 to show that higher market concentration of NHs leads to higher prices. Mukamel and Spector (2002) utilized a sample of for-profit (FP) NHs in New York State in 1991 to calculate private-pay markups above marginal costs and above Medicaid rates. Bowblis (2014) used Ohio data to determine whether the expansion of assisted living facilities affected NH prices. Utilizing survey data for multiple states, Stewart et al. (2009) examined the evolution of average private-pay prices (from 1977 to 2004) but did not explore the facility or market variation in prices. Several recent studies also examined whether public reporting of NH quality has an impact on pricing (Clement, Bazzoli, & Zhao, 2012; Huang & Hirth, 2016).

This article contributes to the literature by utilizing a multistate and multiyear data set to study the level and growth of NH prices. It also studies the heterogeneity of the relationships between prices and organizational as well as market structures. In particular, we focus on price differentials across NHs by FP status and chain membership because differences in profit motives, tax status, quality of care, and access to corporate resources can potentially contribute to price variations among NHs. Furthermore, we examine whether prices are associated with market concentration and capacity constraints.

New Contributions

This article makes several significant contributions. First, to the best of our knowledge, this study utilizes the largest NH price data set collected from eight states and across 6 years, thus enhancing the generalizability of results relative to prior studies. Our results indicate that NH price growth has consistently outpaced growth in

consumer and medical care prices. Second, this study extensively compares price differentials among NHs by FP status, chain membership, occupancy rates, and market concentration. Our findings provide valuable insights for assessing the value of NH care and how it varies by organizational and market characteristics.

Data and Method

Data

For these analyses, we combine (a) price data extracted from state-administered NH cost reports, (b) information on NH characteristics obtained from both the Long-term Care Focus (LTC Focus) database maintained by Brown University and hand-coded identifications of chain membership, and (c) local area information obtained from the Area Health Resource Files as well as the Quarterly Census of Employment and Wages from the Bureau of Labor Statistics. Price data are extracted on a state-by-state basis from the NH cost reports, which we obtained from health agencies in eight states for the period from 2005 through 2010 (California, Florida, Georgia, New York, Ohio, Oregon, Texas, and Vermont). Health agencies in these states collect Medicaid cost reports with detailed and reliable information on NH revenues and resident payer mix, which are used to calculate price measures. We merge the price information with LTC Focus data on key NH characteristics, including FP status, number of beds, occupancy rates, and nurse-staffing levels. County-level socioeconomic characteristics are obtained from the Area Health Resource Files and Quarterly Census of Employment and Wages data. We also use the zip code of a NH to identify whether it is urban or rural based on rural–urban commuting area codes. Finally, the data are merged with unique chain identifiers based on prior work (Hirth et al., 2019). We exclude hospital-based and government NHs because they serve unique populations and focus on different financing sources (Rahman, Norton, & Grabowski, 2016; Stearns, Dalton, Holmes, & Seagrave, 2006). The analytical sample includes more than 3,900 NHs per year, representing approximately 27% of U.S. freestanding facilities.

Definition of Private-Pay Price

We use the state cost reports to calculate price measures. The richness of the information in the cost reports allows us to calculate daily average private-pay prices for NH care. NH prices in California, Florida, Ohio, and Oregon include only routine care and specifically, exclude any ancillary care. NH prices in Vermont include only room and board expense. NH prices in Georgia, New York, and Texas include all revenues from private-pay sources. We provide a detailed description for the calculation of NH prices in Supplemental Appendix A (available online). Since the cost reporting forms from each state have slightly different classification methods, direct comparison across states should be taken with caution.[3] To account for potential errors in reporting, we exclude observations with the highest and lowest 1% of private-pay prices and percentage price changes.

Analytical Methods

We first compare prices and price growth across states and by FP status as well as chain ownership. This comparison is not adjusted for geographical distribution, NH characteristics, or quality differences across NHs. Then, we use a multivariate regression model to control for the comprehensive set of NH and market characteristics. These factors are likely to influence the prices set by NHs because they are associated with quality-adjusted costs and whether NHs can raise prices above costs. These factors include market concentration, market supply and demand, proxies for clinical quality, quantity of inputs, and input prices. Our models use the ordinary least squares regression. The baseline model includes state fixed effects and the alternative specification includes additional county fixed effects. For completeness, we present results from both models.[4] We also include year fixed effects in the price models but not in the price growth models. The baseline specification is as follows:

$$P_{i,t} = FP_{i,t}\,\beta_1 + Chain_{i,t}\,\beta_2 + FPXChain_{i,t}\,\beta_3 + NH_{i,t}\,\Phi + M_{m,t}\,\delta + R_{i,t}\,\sigma + S_s + T_t + \varepsilon_{i,t}$$

Where *i, m, s*, and *t* refer to NH, market (county), state, and year, respectively. Depending on the specification, $P_{i,t}$ represents the average NH private-pay price (per day) or the annual price growth for a NH *i* in year *t*. $FP_{i,t}$ and $Chain_{i,t}$ indicate whether a NH is FP and chain-affiliated, respectively. $FPXChain_{i,t}$ equals to one if a NH belongs to a FP chain. $NH_{i,t}$ is a set of NH-level variables, $M_{m,t}$ is a set of county characteristics, and $R_{i,t}$ represents resident characteristics that are aggregated to the facility. S_s and T_t are the state and year fixed effects, respectively. Standard errors are clustered at the NH level in all regressions. For each outcome, we run three different regression models. The first specification uses the full sample and controls for state fixed effects. The second model restricts the sample to NHs with at least 5 full-year equivalent private-pay residents (1,825 private-pay days per year). The third regression uses the restricted sample and adds county fixed effects. We also perform the same regression analyses on samples stratified by market concentration and by market-averaged occupancy rates. We utilize the county boundary[5] to define markets and the number of beds to calculate the Herfindahl–Hirschman index (HHI) adjusted for common ownership within chains (Hirth et al., 2019). We also conduct two subsample analyses. First, following the Horizontal Merger Guidelines, we identify moderately and highly concentrated markets (hereafter concentrated markets) by whether the HHI is above 0.15.[6] Second, we also stratify the markets based on whether the market-level occupancy rate is above or below the median value (86.1%).

Independent Variables

Key independent variables include the FP status, chain membership, FP and chain interaction (the reference group is *independent nonprofits* [*Independent NFPs*]), occupancy rates, and HHI. We also control for facility characteristics, including nurse staffing ratios, resident payer-mix and case-mix, and the number of deficiencies. Payer-mix

is measured by the percentage of residents supported by either Medicare or Medicaid. The number of deficiencies[7] is used to control for differences in clinical quality across facilities. The resident case-mix is measured at the facility level by the age, race, gender, and an Acuity index (Acuindex).[8] We also include variables indicating whether the facility has an Alzheimer's or other special care unit. At the county level, we also include socioeconomic status for the county in which a facility is located and an indicator for whether the county is rural or urban. Urban status is defined as either (a) metropolitan urban, (b) micropolitan urban, (c) small rural town, or (d) isolated small rural town.[9] Our model also controls for the median household income, local unemployment rate, percentage of population 65 years of age or older, and the average weekly wage rate for a typical NH worker.

Results

Summary Statistics

Summary statistics are presented in Table 1 for the six organizational types of NHs, including FP chain (column 2), independent FP (column 3), all FP (column 4), NFP chain (column 5), independent NFP (column 6), and all NFP (column 7). FP and NFP NHs represent 81% and 19% of our sample, respectively. About 57% of FP and 38% of NFP NHs are chain members. Across all facilities, the unadjusted average price per day and annual price growth are $188.80 and 6.51 percentage points. Comparing the price and price growth across organizational types, NFP NHs have higher average prices than FP NHs and independent NHs have higher prices on average than chain-owned NHs. FP chains have the lowest average price ($171.81), whereas independent NFPs have the highest average price ($228.60). Independent FPs have the fastest annual price growth (7.0%) and NFP chains have the slowest price growth (6.1%). Overall, before adjusting for geographical, facility, and quality differences, NFP NHs have higher prices but slightly slower price growth than FP NHs. In terms of payer-mix, FP NHs have higher percentages of revenues from Medicaid-pay residents and Medicare-pay patients, while NFP NHs are more dependent on private-pay residents. NFP chains on average receive 30.4% of their revenues from private-pay residents. Only 19.4% of revenues in independent FPs come from private-pay residents. FP and NFP chains are located in markets that on average have an HHI of 0.17 and 0.18, while independent FPs and NFPs are located in markets that on average have an HHI of 0.13 and 0.12. Both FP and NFP chains tend to be located in areas with lower median household income. Independent FPs and NFPs are disproportionately more likely to be located in California (30%) and New York (34%), respectively. NHs in New York are disproportionately less likely to be chain members.

Table 2 provides a more detailed look at the distribution and time trends in unadjusted prices. We also provide a graphical illustration of the distribution of prices and price trends in Supplemental Appendices B, C, and D (available online). We find substantial price variation across states. NHs in New York have the highest average price ($302.30), while Texas has the lowest average NH price ($121.90). We also find that

Table 1. Summary Statistics on the Sample of Nursing Homes in Eight States (2005-2010).

		For-profit (FP)			Nonprofit (NFP)		
	All	Chain	Independent	All FP	Chain	Independent	All NFP
Observations (nursing home-year)	23,813	10,974	8,429	19,403	1,669	2,741	4,410
Outcome variables							
Private price	188.80 (83.42)	171.81 (59.95)	196.46 (98.20)	182.52 (79.81)	196.47 (73.10)	228.60 (101.1)	216.44 (92.81)
Annual percentage change in private price	6.51 (22.99)	6.25 (20.67)	6.97 (26.17)	6.56 (23.21)	6.06 (20.69)	6.42 (22.70)	6.29 (21.96)
Facility controls							
For-profit	0.81	1.00	1.00	1.00	0.00	0.00	0.00
Chain affiliation	0.53	1.00	0.00	0.57	1.00	0.00	0.38
Occupancy rate	0.85 (0.14)	0.83 (0.15)	0.86 (0.14)	0.84 (0.15)	0.86 (0.12)	0.90 (0.11)	0.89 (0.12)
Number of beds	115.69 (62.68)	109.92 (43.10)	116.52 (63.35)	112.79 (52.96)	105.75 (55.26)	142.26 (107.70)	128.44 (93.14)
Medicaid-pay share (%)	64.89 (19.08)	65.59 (17.27)	67.29 (18.93)	66.33 (18.03)	56.55 (23.25)	59.77 (21.23)	58.55 (22.07)
Medicare-pay share (%)	13.93 (10.61)	14.90 (10.27)	13.36 (11.02)	14.23 (10.63)	13.07 (9.63)	12.26 (10.86)	12.57 (10.42)
Registered nurse (HPRD)	0.29 (0.52)	0.27 (0.52)	0.29 (0.60)	0.28 (0.55)	0.27 (0.30)	0.33 (0.26)	0.31 (0.28)
Licensed practical nurse (HPRD)	0.88 (0.75)	0.87 (0.83)	0.87 (0.77)	0.87 (0.80)	0.91 (0.51)	0.88 (0.39)	0.89 (0.44)
Certified nurse aide (HPRD)	2.28 (0.97)	2.18 (0.92)	2.32 (0.98)	2.24 (0.94)	2.46 (1.05)	2.45 (1.08)	2.45 (1.06)
Number of deficiencies	6.22 (6.27)	6.40 (6.38)	6.53 (6.53)	6.46 (6.44)	5.84 (5.72)	4.79 (5.06)	5.18 (5.35)
Any nurse practitioner/physician assistant	0.35	0.38	0.31	0.35	0.33	0.35	0.34
Alzheimer's care unit	0.14	0.12	0.11	0.12	0.22	0.22	0.22
Other special unit	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Resident controls							
With hypertension (%)	57.57 (11.90)	57.97 (11.57)	57.74 (12.06)	57.87 (11.79)	56.20 (12.51)	56.27 (12.16)	56.24 (12.29)
Female (%)	69.97 (11.58)	68.76 (10.86)	68.59 (12.24)	68.68 (11.48)	74.77 (10.62)	76.15 (9.98)	75.62 (10.25)
White (%)	78.17 (21.96)	77.64 (21.21)	75.50 (23.13)	76.72 (22.09)	82.78 (20.14)	85.70 (20.17)	84.57 (20.20)
Average age	79.85 (6.25)	78.88 (5.59)	79.24 (6.55)	79.04 (6.03)	82.78 (5.65)	83.80 (6.09)	83.41 (5.95)
Acuindex	11.55 (1.35)	11.53 (1.29)	11.62 (1.44)	11.57 (1.36)	11.43 (1.23)	11.48 (1.36)	11.46 (1.31)

(continued)

Table 1. (continued)

	All	For-profit (FP)			Nonprofit (NFP)		
		Chain	Independent	All FP	Chain	Independent	All NFP
County controls							
Herfindahl–Hirschman index	0.15 (0.20)	0.17 (0.20)	0.13 (0.18)	0.15 (0.20)	0.18 (0.23)	0.12 (0.15)	0.14 (0.19)
Median household income (in $1,000s)	49.33 (12.03)	48.36 (10.94)	50.73 (13.15)	49.39 (12.01)	48.15 (11.67)	49.64 (12.33)	49.08 (12.10)
Medicare managed care penetration rate (%)	23.62 (14.07)	22.26 (13.90)	25.24 (14.16)	23.55 (14.09)	23.17 (13.67)	24.37 (14.15)	23.92 (13.98)
Percentage of population aged 65+ years (%)	13.39 (4.04)	13.25 (4.09)	13.42 (4.07)	13.32 (4.08)	13.78 (4.00)	13.68 (3.75)	13.72 (3.85)
Percentage of population female (%)	50.98 (2.06)	50.91 (2.08)	50.94 (2.08)	50.93 (2.08)	51.18 (2.15)	51.24 (1.85)	51.22 (1.97)
Unemployment rate (%)	6.93 (2.88)	6.99 (2.88)	6.93 (2.94)	6.97 (2.90)	6.84 (2.84)	6.68 (2.71)	6.74 (2.76)
Weekly wage of nursing home workers ($)	482.72 (180.70)	457.86 (174.30)	504.51 (183.40)	478.13 (179.80)	462.91 (184.20)	527.35 (178.30)	502.94 (183.20)
Metropolitan	0.75	0.72	0.78	0.75	0.78	0.79	0.79
Micropolitican	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Small town	0.04	0.05	0.04	0.05	0.03	0.03	0.03
Rural	0.04	0.03	0.04	0.04	0.03	0.04	0.03
California	0.26	0.26	0.30	0.28	0.18	0.15	0.16
Florida	0.13	0.12	0.13	0.12	0.20	0.15	0.17
Georgia	0.04	0.06	0.02	0.04	0.10	0.02	0.05
New York	0.11	0.02	0.16	0.08	0.09	0.34	0.24
Ohio	0.21	0.24	0.17	0.21	0.26	0.19	0.22
Oregon	0.02	0.03	0.01	0.02	0.01	0.01	0.01
Texas	0.21	0.26	0.19	0.23	0.16	0.11	0.13
Vermont	0.01	0.01	0.01	0.01	0.00	0.02	0.01

Note. HPRD = hours per resident day. The summary statistics include nursing homes in eight states from 2005 through 2010. Georgia prices are not available in 2005 and 2010, while Oregon prices are not available in 2010. The mean and standard deviation (in brackets) are reported for all, for-profit and chain, for-profit and nonchain (independent), all for-profit, nonprofit and chain, nonprofit and nonchain (independent), and all nonprofit nursing homes. Year indicators are not shown. Annual price change variable has one fewer year of observations. For several resident, facility, and county variables, 0.01% to 4.56% of the observations have missing values. To include as many observations as possible, we created indicators for missing values. These indicators are not shown for brevity. Because Medicare managed care penetration rate is not available for year 2006 and 2007, we used 2005 values for 2006 and 2008 values for 2007. The percentage of population who are female is only available for year 2005 and 2009, so we used 2005 values for 2006 and 2007, as well as 2009 values for 2008 and 2010. FP and NFP represent for for-profit and nonprofit nursing homes, respectively.

Table 2. Average Prices by Year and State (Unadjusted Prices).

Year	CA	FL	GA	NY	OH	OR	TX	VT	Medical CPI	General CPI
2005	166.92 (46.76)	168.42 (50.58)		273.80 (100.04)	175.42 (60.32)	172.35 (57.41)	114.03 (52.36)	177.12 (51.83)	323.23	195.30
2006	176.37 (46.05)	175.02 (51.73)	137.96 (23.99)	276.61 (94.98)	181.00 (55.08)	194.43 (69.94)	112.52 (36.67)	187.79 (52.80)	336.18	201.60
2007	185.96 (49.08)	188.49 (56.11)	146.21 (20.81)	295.62 (100.50)	189.05 (57.58)	202.76 (48.98)	120.39 (45.20)	199.62 (43.71)	351.05	307.34
2008	197.75 (51.14)	200.89 (54.73)	152.60 (19.74)	297.23 (98.01)	200.07 (64.12)	213.17 (63.72)	120.89 (32.52)	216.16 (60.97)	364.07	215.30
2009	210.08 (60.13)	215.49 (69.15)	157.63 (20.94)	337.99 (168.10)	210.67 (80.64)	227.24 (65.85)	131.00 (47.80)	218.54 (58.08)	375.61	214.54
2010	217.29 (59.61)	218.17 (65.05)		333.60 (148.30)	215.03 (67.56)		131.34 (45.16)	228.73 (57.65)	388.44	218.05
Average price ($): All years	192.32 (55.34)	194.72 (61.33)	148.79 (22.62)	302.30 (124.30)	195.38 (66.46)	202.40 (64.07)	121.90 (44.36)	204.57 (56.80)		
Cumulative price growth (2005-2010), %	30.18	29.54		21.84	22.58		15.18	29.14	20.17	11.65
Number of observations	6,123	3,133	1,052	2,629	5,084	504	5,081	207		

Note. CPI = consumer price index; CA = California; FL = Florida; GA = Georgia; NY = New York; OH = Ohio; OR = Oregon; TX = Texas; VT = Vermont. Numbers in brackets are standard deviation. The prices are not adjusted for facility and geographical differences.

NH prices grow at a faster pace than medical care and general consumer prices across states. Across the study period, the cumulative inflation in medical care and general consumer prices were 20.2% and 11.7%, respectively. NH prices in California and Florida increased by 30.2% and 29.5%. On the other hand, NHs in Texas had the lowest cumulative growth rate (15.2%), which was slower than the growth in medical care prices but still faster than inflation in general consumer prices.

Main Regression Results

Table 3 reports the results of the multivariate regression analyses. In all regression models, the reference group is independent NFPs. After controlling for a host of factors, we find that independent FPs and independent NFPs do not charge statistically different prices. However, among the four types of organizational structures, NFP chains charge the highest prices and FP chains have the lowest prices. Based on models including county fixed effects, NFP chains charge $9.81 more and FP chains charge $1.58 less than independent NFPs. The price differences across NHs are mostly driven by FP and NFP chains. The price difference between FP and NFP chains is $11.40, equal to 6.2% of the average price of FP NHs. This translates into a meaningful $4,161 annual price difference. We do not find a statistically significant association between organizational structure and price growth.

We also find that prices are positively associated with occupancy rates and market concentration. For example, a 1 standard deviation increase in HHI (0.20) is associated with a $2.65 to $3.03 increase in price. On the other hand, we find that prices are negatively associated with the number of deficiencies, suggesting a positive correlation between prices and quality.

Subsample Analysis

Table 4 shows the results of subsample analyses by market concentration. When we include all NHs, the findings are qualitatively similar for NHs in concentrated and unconcentrated markets. However, when the regressions are run on the restricted samples with at least five private-pay residents (columns 3 and 6), the coefficients have larger magnitudes and are more often statistically significant in unconcentrated markets. Table 5 shows the results of regression analyses for subsamples of facilities in markets with high and low occupancy rates. The results based on the restricted samples show greater price variation across organizational types in markets with higher occupancy rates. The results of subsample analyses for price growth models are mixed and mostly statistically insignificant. These results are not reported for brevity.

Discussion

During the study period, the growth of NH prices has consistently outpaced inflation in both general consumer and medical care price indices. The continuing growth of

Table 3. Main Regression Results for Adjusted Prices.

	Private price ($)			% Change in private price		
	All	At least five private residents		All	At least five private residents	
For-profit	−3.1110 (3.2869)	1.7919 (3.4419)	2.2924 (3.5139)	−0.2110 (0.5017)	−0.0480 (0.5214)	0.1283 (0.5971)
Chain	4.4125 (3.7768)	7.8013** (3.8405)	9.8131*** (3.6868)	−0.5086 (0.6054)	−0.0374 (0.6256)	−0.095 (0.7254)
For-profit × Chain	−7.7605* (3.9743)	−11.3687*** (4.1793)	−11.3975*** (4.0960)	−0.2441 (0.6742)	−0.3039 (0.7104)	−0.1040 (0.8277)
Occupancy rates	8.5896 (5.4472)	20.6093*** (6.0845)	23.0142*** (5.8742)	−2.9330* (1.5321)	1.8356 (1.6132)	1.8612 (1.7810)
Herfindahl–Hirschman index	15.1559*** (4.7433)	13.2427*** (5.0692)	6.9039 (8.7778)	0.1381 (1.0166)	0.876 (1.1222)	−3.6789 (7.1042)
Number of deficiencies	−0.2713*** (0.0747)	−0.2898*** (0.0867)	−0.1412* (0.0845)	0.0181 (0.0257)	0.0281 (0.0283)	0.0407 (0.0314)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects			Yes			Yes
Number of observations	23,813	17,163	17,163	19,374	13,894	13,894

Note. All regressions include all facility, resident, and market control variables as listed in Table 1. These variables are not shown for brevity. The price regressions (columns 1, 2, and 3) also control for year fixed effects. Indicators for missing values are not shown. Standard errors are clustered at nursing homes. Columns 1 and 4 show the results from all nursing homes. Columns 2, 3, 5, and 6 show the results from the samples restricted to nursing homes with at least five private-pay residents.
*$p < .10$. **$p < .05$. ***$p < .001$.

Table 4. Analysis of Adjusted Prices by Market Concentration.

	All nursing homes		Nursing homes with at least five private residents			
	HHI < 0.15	HHI ≥ 0.15	HHI < 0.15	HHI ≥ 0.15	HHI < 0.15	HHI ≥ 0.15
For-profit	−0.4546 (3.7945)	−9.1228 (5.5937)	5.6159 (4.0667)	−7.1034 (5.5493)	5.3638 (4.0723)	−7.5154 (6.2960)
Chain	5.9734 (4.3093)	2.9820 (6.9176)	11.3465** (4.5334)	1.5119 (6.4782)	11.3833*** (4.3845)	3.2478 (6.0541)
For-profit × Chain	−8.7734* (4.6690)	−3.2631 (6.7730)	−13.7124*** (5.0558)	−1.2387 (6.5501)	−13.6176*** (4.9253)	−3.2923 (6.6405)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects					Yes	Yes
Number of observations	16,604	7,209	11,564	5,599	11,564	5,599

Note. HHI = Herfindahl–Hirschman index. All regressions include all facility, resident, and market control variables as listed in Table 1 (except for HHI measures). These variables are not shown for brevity. The regressions also control for year fixed effects. Indicators for missing values are not shown. Columns 1 and 2 show the results based on all nursing homes. Columns 3, 4, 5, and 6 show results based on samples restricted to nursing homes with at least five private-pay residents.
*$p < .10$. **$p < .05$. ***$p < .001$.

Table 5. Analysis of Adjusted Prices by Market Occupancy Rates.

	All nursing homes		Nursing homes with at least five private residents			
	Market occupancy rate		Market occupancy rate		Market occupancy rate	
	<Median	≥Median	<Median	≥Median	<Median	≥Median
For-profit	−19.4601*** (4.0017)	5.9022 (4.2384)	−14.6323*** (3.6165)	10.1989** (4.6983)	−13.6717*** (3.3368)	12.1125** (4.8347)
Chain	−1.4458 (4.9695)	6.7715 (4.7857)	0.5770 (4.3634)	12.1644** (5.0715)	−0.3204 (3.9589)	15.8607*** (5.0772)
For-profit × Chain	1.083 (5.0727)	−10.9889** (5.2739)	−1.1784 (4.5382)	−15.3647*** (5.8002)	0.3320 (4.1855)	−17.9973*** (5.8637)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects					Yes	Yes
Number of observations	11,914	11,899	8,324	8,839	8,324	8,839

Note. All regressions include all facility, resident, and market control variables as listed in Table 1 (except for individual nursing homes' occupancy rates). These variables are not shown for brevity. The regressions also control for year fixed effects. Indicators for missing values are not shown. Columns 1 and 2 show the results based on all nursing homes. Columns 3, 4, 5, and 6 show results based on samples restricted to nursing homes with at least five private-pay residents. The median market occupancy rate is 0.86.
*$p < .10$. **$p < .05$. ***$p < .001$.

NH prices creates challenges to the affordability of NH care. We also find significant price variations across organizational types. Before adjusting for differences in geographical and facility characteristics, NFP NHs charge $33.92 in higher prices than FP NHs. The price difference is equivalent to 18.6% of the average FP price, an annual difference of $12,380. Furthermore, both independent FPs and NFPs, respectively, charge an additional $24.65 and $32.13 compared with their chain counterparts. While the difference is substantial, NHs have different organizational structures tend to locate in different states, have different staffing levels, and provide different levels of quality. For example, independent NFPs are disproportionately more likely located in New York, the state with the highest average price ($302.30). NFP NHs have fewer deficiencies than FP NHs have, which can also contribute to higher unadjusted prices. Perhaps most important, how price is defined varies by state, so to the extent that facility or market characteristics also vary by state, the descriptive results may mask the true differences. Therefore, we prefer to focus on the regression-adjusted results, which account for facility- and market-level differences as well as state or county fixed effects.

The adjusted price differences from the regression results show a more complex relationship between prices and organizational structures. In the regression model that adjusts for facility and market factors, we find that NFP chains charge statistically significant higher prices. One explanation is that consumers with imperfect quality information view NFP chain status as a signal for better quality and are willing to pay higher prices (Hirth, 1999). Since NFP chains can and do attract disproportionately more private-pay residents and also charge higher prices, it is unclear whether NFP chains are providing substantially higher quality or other community benefits to justify their tax-exempt status. The significantly lower prices at FP chains also provide a different perspective. Although FP chains often have lower quality, private-pay residents who by definition are spending their own or their family's money, may be willing to accept a tradeoff between price and quality. In addition, the fact that adjusted price differences related to the FP status only existed among chains but not independent NHs is somewhat puzzling. Previous studies comparing the differences between FP and NFP NHs mostly overlook the role of NFP chains. Our finding regarding the distinct pricing of FP and NFP chains suggests a more nuanced relationship between NH price and organizational types.

Our regression analysis also finds several interesting relationships. First, the negative relationship between prices and deficiencies indicates that NH prices are correlated with clinical quality. Since quality is thought to be a common good within an NH, higher private prices may have positive spillovers for all residents with different payer sources (Grabowski, Gruber, & Angelelli, 2008; Konetzka & Werner, 2009). Second, we find that higher occupancy rates are associated with higher prices. Although Certificate-of-Need laws have been considered less binding in recent years (Grabowski, 2008), other forms of capacity regulations, both formal and informal, may lead to excess demand for NH beds in selected markets. Increasing the supply of NH beds in markets with high occupancy rates might help contain prices. A recent cap-and-trade experiment of NH beds across markets could be an

interesting alternative (Mehdizadeh, Yamashita, & Applebaum, 2010). Finally, NHs in more concentrated markets as measured by HHI charge higher prices than facilities in less concentrated markets, but have similar price growth.

Although this article provides valuable evidence about the growth of NH prices and the heterogenous relationships between prices and organizational and market structures, our analyses have several limitations. First, we do not take into consideration the provision of amenities (e.g., nicer rooms, more social activities) in our analyses. Differences in facility provision of amenities may help explain the price differences between FP and NFP chains. Second, even though we control for resident characteristics, there may be unobservable resident selection into NHs with different organizational structures, which can bias our results. Future research could use resident-level data and an instrumental variables approach to mimic randomization in the likelihood that residents are admitted to a particular type of NH. For instance, previous research has used the differential distance from prior community residence to the closest NFP and FP NH as a predictor of the probability of choosing an NFP NH.[10] Third, although we control for staffing levels and health deficiencies, there can be other clinical quality differences among NHs that are not reflected in our models. Future research should consider structural modeling techniques that can simultaneously account for price and quality choices made by NHs. Fourth, a more comprehensive price data set would include more markets and years to provide more variations in market characteristics over time.[11]

Conclusion

We show that NH price growth has consistently outpaced the growth in both consumer and medical care prices. While this price growth may partly reflect more comprehensive services provided in NHs, it still increases the financial burden faced by private-pay residents. After controlling for a host of variables, we find that FP and NFP chains charge significantly different prices. NH prices are also positively associated with occupancy rates and market concentration. Overall, our results suggest that when evaluating the value of NH care (quality relative to price), the private price is an important factor to consider.

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Notes

1. Based on authors' calculation.
2. Based on authors' calculation.
3. Report forms are consistent within states during our study period. The detailed report form of each state will be provided by the authors on request.
4. We do not utilize an NH fixed effect model because our main variables of interest (e.g., FP ownership) do not change frequently.
5. We acknowledge that there are different views regarding the appropriate geographical market definitions, which can be measured at the county level, using a fixed radius around a NH, or based on a geographical range of resident flows. We use the county to identify markets because the literature finds that NH residents rarely choose NHs across county lines (Grabowski, 2008; Nyman, 1994) and federal block grants to NHs are allocated by county (Banaszak-Holl, Zinn, & Mor, 1996). Prior studies have shown that the results generally are not sensitive to either using the county or alternative market definitions (Grabowski & Town, 2011; Hirth et al., 2019). This market definition is also consistent with measuring control variables at the county level.
6. Based on the Horizontal Merger Guidelines (U.S. Department of Justice & Federal Trade Commission, 2010), we use 0.15 as the cutoff value which includes moderately (0.15-0.25) and highly (>0.25) concentrated markets (https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c).
7. We extract deficiencies data from the Nursing Home Compare data archive.
8. The Acuindex is extracted from the LTC Focus database. The index reflects the residents' need for activities of daily living assistance and special treatment.
9. We identify the urban–rural status by using Categorization A provided by the Washington, Wyoming, Alaska, Montana, and Idaho Rural Health Research Center.
10. For instance, Grabowski, Feng, Hirth, Rahman, and Mor (2013).
11. Because this study is based on Medicaid cost reports, some NHs not certified by Medicaid are excluded from our sample. These NHs may charge higher prices.

Supplemental Material

Supplemental material for this article is available online.

ORCID iDs

Sean Shenghsiu Huang https://orcid.org/0000-0001-8156-6177
Richard A. Hirth https://orcid.org/0000-0002-0654-3220

References

Banaszak-Holl, J., Zinn, J., & Mor, V. (1996). The impact of market and organizational characteristics on nursing care facility services innovation: A resource dependency perspective. *Health Services Research*, *31*, 97-117.

Bowblis, J. R. (2014). Nursing home prices and market structure: The effect of assisted living industry expansion. *Health Economics, Policy and Law*, *9*, 95-112.

Catlin, A., Cowan, C., Stephen, H., & Washington, B. (2007). National health spending in 2005: The slowdown continues. *Health Affairs*, *26*, 142-153.

Clement, J., Bazzoli, G., & Zhao, M. (2012). Nursing home price and quality responses to publicly reported quality information. *Health Services Research*, *47*, 86-105.

Congressional Budget Office. (2004). *Financing long-term care for the elderly*. Washington, DC: Author.

Grabowski, D. C. (2008). The market for long-term care services. *Inquiry*, *45*, 58-74.

Grabowski, D. C., Feng, Z., Hirth, R., Rahman, M., & Mor, V. (2013). Effect of nursing home ownership on the quality of post-acute care: An instrumental variables approach. *Journal of Health Economics*, *32*, 12-21.

Grabowski, D. C., Gruber, J., & Angelelli, J. (2008). Nursing home quality as a common good. *Review of Economics and Statistics*, *90*, 754-764.

Grabowski, D. C., & Town, R. J. (2011). Does information matter? Competition, quality, and the impact of nursing home report cards. *Health Services Research*, *46*(6 Pt 1), 1698-1719.

Hirth, R. (1999). Consumer information and competition between nonprofit and for-profit nursing homes. *Journal of Health Economics*, *18*, 219-240.

Hirth, R., Zheng, Q., Grabowski, D., Stevenson, D., Intrator, O., & Banaszak-Holl, J. (2019). The effect of chains on the measurement of competition in the nursing home industry. *Medical Care Research and Review*, *76*, 315-336.

Huang, S. S., & Hirth, R. (2016). Quality rating and private-prices: Evidence from the nursing home industry. *Journal of Health Economics*, *50*, 59-70.

Konetzka, R. T., & Werner, R. (2009). Review: Disparities in long-term care: Building equity into market-based reforms. *Medical Care Research and Review*, *66*, 491-521.

Kopecky, K., & Koreshkova, T. (2014). The impact of medical and nursing home expenses on savings. *American Economic Journal: Macroeconomics*, *6*, 29-72.

Lin, H., & Prince, J. (2013). The impact of the partnership long-term care insurance program on private coverage. *Journal of Health Economics*, *32*, 1205-1213.

Mehdizadeh, S., Yamashita, T., & Applebaum, R. (2010). *A review of Ohio's nursing home certificate of need program: Implications for practice and policy* (Brief Report). Retrieved from https://drive.google.com/file/d/0B4wanN4JghN3QTBvak85VEdVM0U/view

Mukamel, D., & Spector, W. (2002). The competitive nature of the nursing home industry: Price mark ups and demand elasticities. *Applied Economics*, *34*, 413-420.

Nyman, J. (1994). The effect of market concentration and excess demand on the price of nursing home care. *Journal of Industrial Economics*, *42*, 193-204.

Rahman, M., Norton, E., & Grabowski, D. (2016). Do hospital-owned skilled nursing facilities provide better post-acute care quality? *Journal of Health Economics*, *50*, 36-46.

Stearns, C., Dalton, K., Holmes, G., & Seagrave, S. (2006). Using propensity stratification to compare patient outcomes in hospital-based versus freestanding skilled-nursing facilities. *Medical Care Research and Review*, *63*, 599-622.

Stewart, K., Grabowski, D., & Lakdawalla, D. (2009). Annual expenditures for nursing home care: Private and public payer price growth, 1977 to 2004. *Medical Care*, *47*, 295-301.

U.S. Department of Justice & Federal Trade Commission. (2010). *Horizontal merger guidelines*. Retrieved from https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf