.

Market Power and Hospital Prices: Evidence from New Hampshire

Teresa Rokos

Abstract

This thesis evaluates how the market power of insurers and hospitals in geographical sub-markets relates to the prices insurers and hospitals negotiate for hospital care. I examine to what extent the variation in prices is explained by variation in costs and quality versus variation in market power, which may play an important role in bilateral price negotiations for services. Using carrier-hospital specific prices for outpatient medical procedures from New Hampshire's NH HealthCost website, I compare the estimated prices for the same services across the state, both between hospitals and within hospitals. I find that there is no statistically significant relationship between measures of quality and price, but there are statistically significant differences in the prices paid by each major private insurer as well as statistically significant differences between hospitals in a monopoly versus duopoly.

Introduction

Motivation

The U.S.'s expenditure on health care has grown rapidly over the last few decades and has outpaced that of many peer countries without significant returns to quality (e.g. OECD 2017; Etehad and Kim 2017; Reinhardt et al., 2004). A substantial body of research has determined that the biggest driver behind the U.S. health care expenditure is not greater utilization or social spending but quite simply higher prices (e.g. Anderson et al., 2003; Papanicolas et al., 2018). Given that the $3.3 trillion spent on health care annually (17.9% of GDP) (Centers for Disease Control and Prevention 2017) erodes the budgets of families and individuals, as well as those of local, state, and federal government, understanding the sources of variation in these prices is of tremendous import.

This paper focuses on hospital prices because hospital care constitutes the largest share and one of the fastest growing components of U.S. health care spending at 32.4% ($1.0825 trillion) of national health expenditure (Centers for Disease Control and Prevention 2017) as shown in Figure 1. A vast body of research has identified wide variation in private insurance reimbursements to hospitals for the same services and/or diagnoses ***citations***. Cooper et al., 2015 finds that for the privately insured, only about half of the variation in expenditure is due to the quantity of care delivered while half is purely driven by price variation; as a comparison, 95% of the variation in expenditure for public programs like Medicare is explained by variation in the quantity of care delivered.

Figure 1: Health Care Spending in the U.S. over time
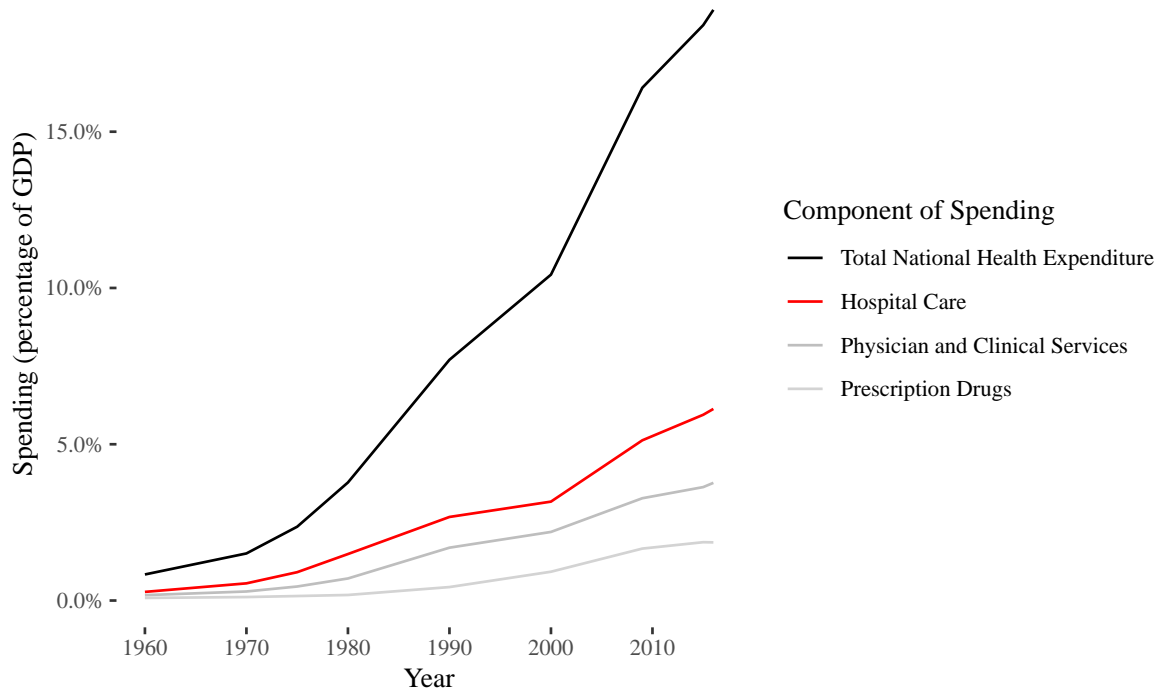
Source: Centers for Disease Control and Prevention 2017

Given that the largest portion of Americans (49%) receive health care coverage from their employer through private insurance plans rather than through Medicare and Medicaid (Kaiser Family Foundation 2017), this price variation between different private insurers/hospital contracts affects what many Americans pay in premiums and out of pocket for their healthcare. Moreover, prior research such as Cooper et al. 2015 finds that this variation persists even when costs and quality are arguably held constant.

This paper is most closely related to Cooper et al. 2015, but differs in several key respects: first, this analysis will focus a set of price data for hospital care in New Hampshire, while Cooper et al. 2015 relies on HCCI data which is a national cross-section sample and relies on claims data from Aetna, Humana, and United Health. While the HCCI data is a rich set of data that is perhaps nationally representative in a broad sense, none of these insurers are major players in the New Hampshire market; secondly, this paper will devote more attention to insurers' relative market power as well as the effects on the uninsured who have minimal market power; lastly, I also include an analysis of how the share of Medicare patients at a given hospital affects the prices that hospital negotiates with private insurers.

Theoretical Framework

In standard micro-economic theory, one learns that prices reflect supply and demand; in a perfectly competitive market, the supply curve is largely determined by each firm's costs of production and the demand curve determined by consumer preferences and

budget constraints. In this standard model, there are no profits as both producers and consumers are price takers. However, a more realistic model allows for the possibility of profits, therefore encouraging firm entry to the industry, by admitting firms may exercise some monopolist or market power.

Market power is largely a function of the number of other firms in the market, but a firm may also generate market power for itself through distiguishing it's product from others. When it's product differs from others in the market, a firm can act as a quasi-monopolist, price setter and extract a certain mark-up from consumers who have a preference for that difference and are price takers. As consumers often have a preference for quality or some aspect of quality, firms that can best distinguish their product as being of higher quality than others are more able to demand higher prices for their product(s).

The market for health services (often provided through hospitals) is unique in that there are two components of demand: individuals and payers. Even this is somewhat of an oversimplification in the US market because many individuals are privately insured through their employer which contracts with a private insurer. However, for the most part, it is insurer-provider price negotiations that determine the price of care; private insurers negotiate contracts with each provider (Medicare and Medicaid set their prices at a regional level) and also dictate how much the individual or family must pay in premiums and out of pocket for each episode of care. This gives private insurers some form of monopsony power in price negotiations as there are often only a few of private insurers present in each market and they can choose whether or not to include each provider in their network, affecting the prices individual/families face for care.

Thus, payers and providers engage in bilateral negotiations where both are price setters rather than price takers. I assume the following: both the provider and the payer want to maximize the number of patients they serve and their profit margins per patient, even if the provider is a non-profit (Horwitz 2005). Providers want to receive higher prices for their services but also to be included in payers' networks, as patients face lower out-of-pocket costs when going to providers in network. Payers want to pay lower prices for providers' services to minimize their costs but also want to attract enrollees by including convenient providers in their network, which is an important aspect of plan selection for individuals (Ho 2006). Thus, this is the bargaining environment in which bilateral hospital-insurer contracts are negotiated and the work below examines the impact on prices.

Structure

Section II of this paper provides background on the New Hampshire market for health services. Section III supplies explanation of the data sources being used, how they were obtained, and the relevant information contained therein. Section IV lays out the methodology of the analyses that are performed and Section V presents the results. The paper concludes with Section VI.

Background on the New Hampshire Market

Health Insurance Coverage

New Hampshire is a small state (8,953 sqaure miles) with a population of 1.343 million (90.5% white) and median household income of $68,485 (Census Bureau 2017). Figures 2 and 3 depict the insurance status of New Hampshire residents in 2017 and the market share of major private insurers respectively. According to the New Hampshire Insurance Department, a total of 543,900 members were enrolled in commercial market plans in 2017 in the state, and 81% received coverage through employer-sponsored insurance plans (11.0% Individual Market, 7.7% NH PAP, 12.6% Small Group, 19.8% Large Group Fully Insured, and 48.9% Large Group Self Insured).

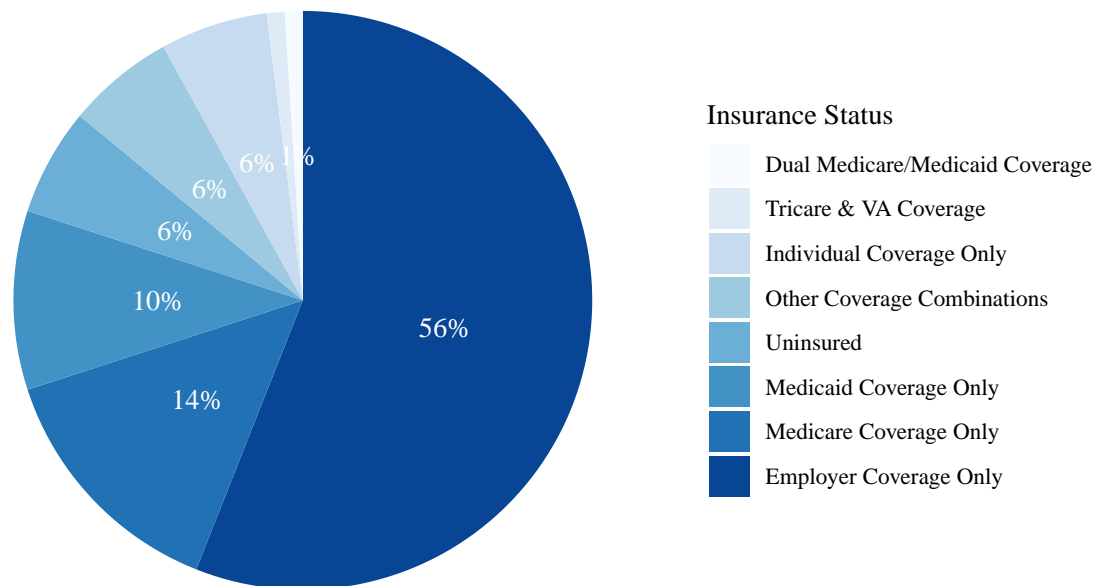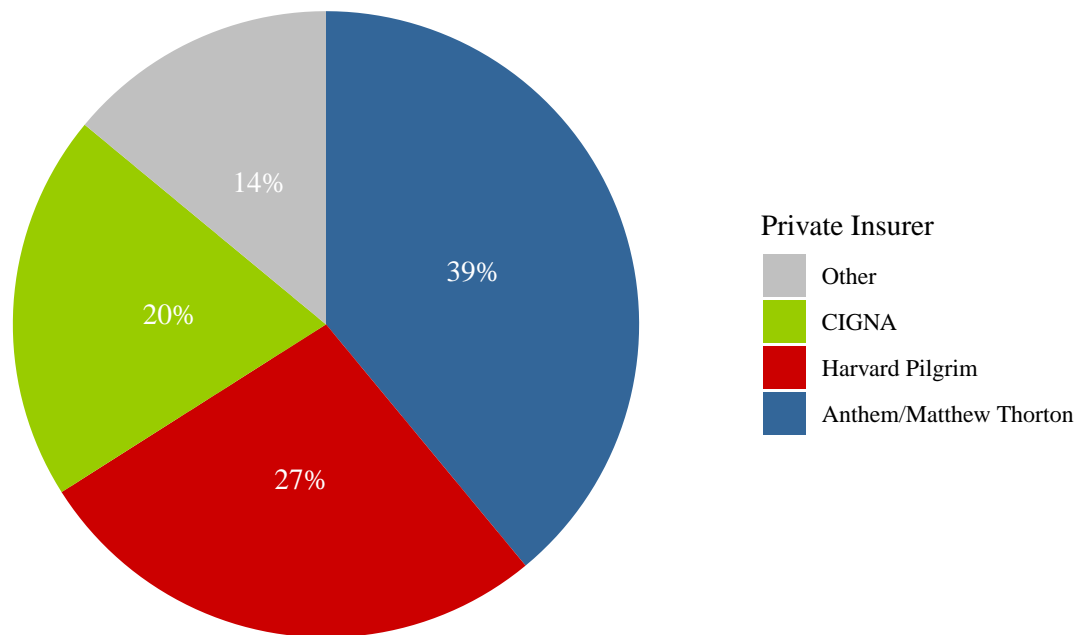Figure 2: New Hampshire Residents by Health Insurance Status in 2017

Figure 3: Distribution by Insurer for NH Commercial Market in 2017

New Hampshire Providers

New Hampshire has a total of 31 hospitals and 3,503 beds within the state (New Hampshire Hospital Association 2018). According to the New Hampshire Hospital Association, 13 of these hospitals with 2,704 beds total are Prospective Payment Systems (PPS) Hospitals, which take prospective payments from Medicare; 13 hospitals with 301 beds total are Critical Access Hospitals (CAH), which serve rural populations and therefore are eligible to receive certain benefits from Medicare such as cost-based reimbursement for Medicare services; 5 hospitals with 498 beds total are Specialty Hospitals, which provide a specialized category of services (such as children's hospitals, orthopedic hospitals, cancer hospitals, etc.) and are omitted from my analysis for lack of price information. While categorized by Medicare reimbursements, all of the hospitals included in my analysis serve privately insured individuals in addition to Medicare patients.

In addition to the 26 New Hampshire hospitals, there are 6 out-of-state hospitals included in my analysis which are located close to New Hampshire's borders: Anna Jaques Hospital, Lawrence General Hospital, and Lowell General Hospital (Massachusetts); Bridgton Hospital and York Hospital (Maine); and Northeastern Vermont Regional Hospital (Vermont). Furthermore, there are 99 non-hospital providers such as ambulatory surgical centers, clinics, and private phsycian groups that also provide some of the relevant outpatient procedures. Though the focus of the analysis will be on hospitals, I include these non-hospital providers in Figure 4 for context.

Figure 4: Location of New Hampshire Hospitals

Hospital Type

●   Acute Care Hospitals

●   Critical Access Hospitals

●   Non–Hospital Providers
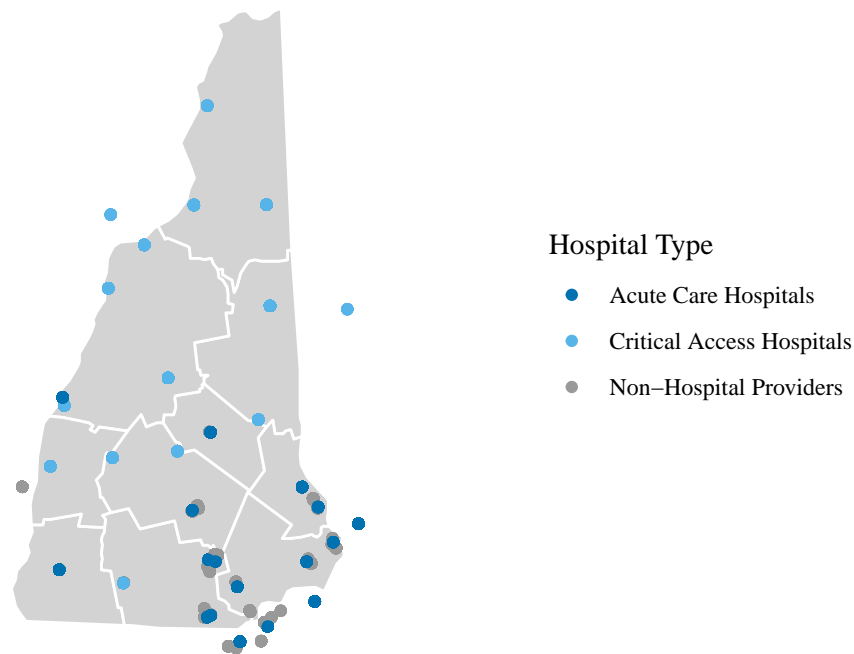
There has only been one hospital merger involving a hospital in New Hampshire: Massachusetts General Hospital (MGH)/Partners HealthCare from Massachusetts acquired Wentworth-Douglass on January 1, 2017. However, in May 2018 Partners HealthCare also made a bid to acquire Exeter Health Resources, and this merger is still pending approval.

Data

Raw data from NH HealthCost

The primary source of data on hospital prices comes from NH HealthCost which is a publicly available tool that provides insurer-hospital specific estimations of total costs (reimbursements) for a long list of outpatient services and procedures, each assigned a Current Procedural Terminology (CPT) code. New Hampshire is among a handful of states that make such information publicly available, hence why I use it as a case study for my analysis. All cost information is based on claims data collected in the New Hampshire Comprehensive Healthcare Information System, which unfortunately I was unable to access directly. On the NH HealthCost website, the average amount each insurer pays for a given service at a given hospital is available, and it is reasonable to assume that this is roughly equivalent to the price each hospital and insurerance carrier have negotiated for each service. This allowed me to construct a data set containing the estimated price for each procedure and each provider-insurer combination for which data was available.

CMS Data

The Center for Medicaid and Medicare Services (CMS) provides several useful data sets that aid my analysis. The first is the Physician Fee Schedule (PFS) 2018 Relative Value file which allows me to construct the Medicare reimbursement rates at each hospital for each service observed in the NH HealthCost data. I am able to calculate the 2018 Medicare Facility Pricing Amount for each CPT code (each procedure) at the locality level using the following formula:

$$2018 Facility Pricing Amount = [(Work RVU x Work GPCI) + (Facility PE RVU x PE GPCI) + (MF$$

Medicare treats all of New Hampshire as one locality, meaning that all hospitals in New Hampshire are reimbursed the same amount for outpatient services. ***this may not be true for Critical Access Hospitals (CAHs) of which New Hampshire has 13 so I need to figure out at what rate Medicare reimburses these hospitals*** This allows me to standardize the prices available through NH HealthCost and compare how much above this baseline rate private insurers or the uninsured pay by CPT code.

The New Hampshire Hospital Association provides a list of the 82 top outpatient CPT codes (out of several thousand) in 2016 at hospitals throughout the state. For presentation's sake, I further narrow this list down to 10 of the most expensive services for which I can obtain prices from NH HealthCost and present the resulting boxplot distributions. Figure 5.1 includes payments by the uninsured, private insurers, and Medicare, and Figure 5.2 only shows the payments made by private insurers. All price data presented reflect 2018 prices.

Figure 5.1: Price Variation for 10 Common Outpatient Procedures (NH)
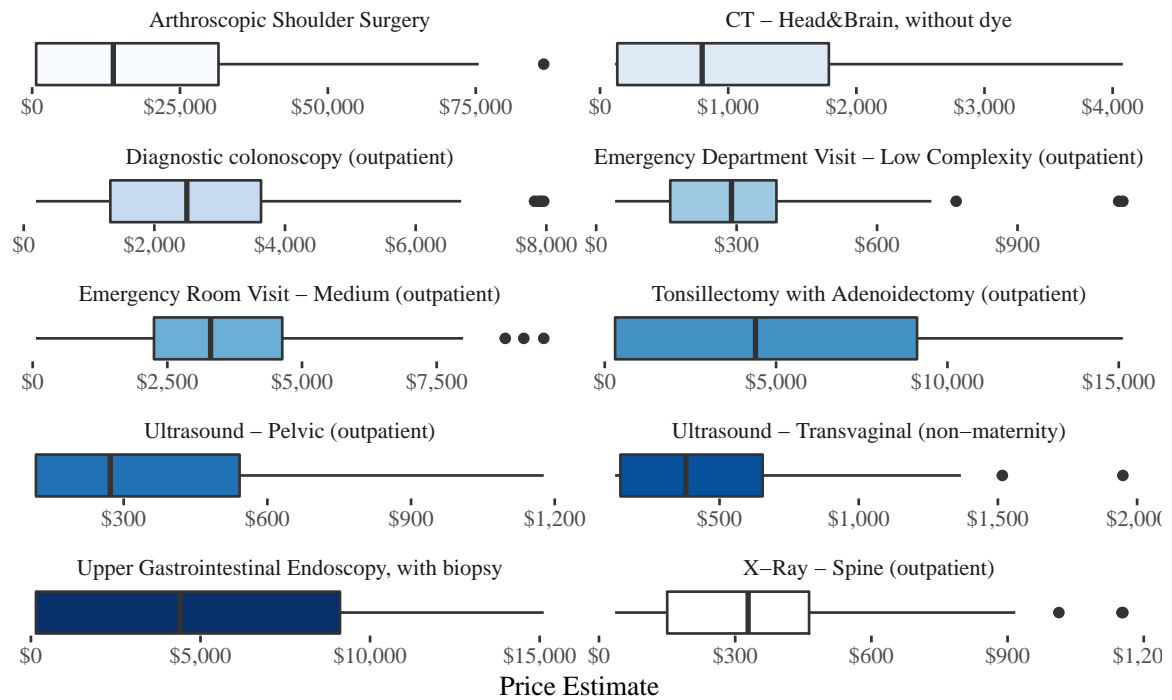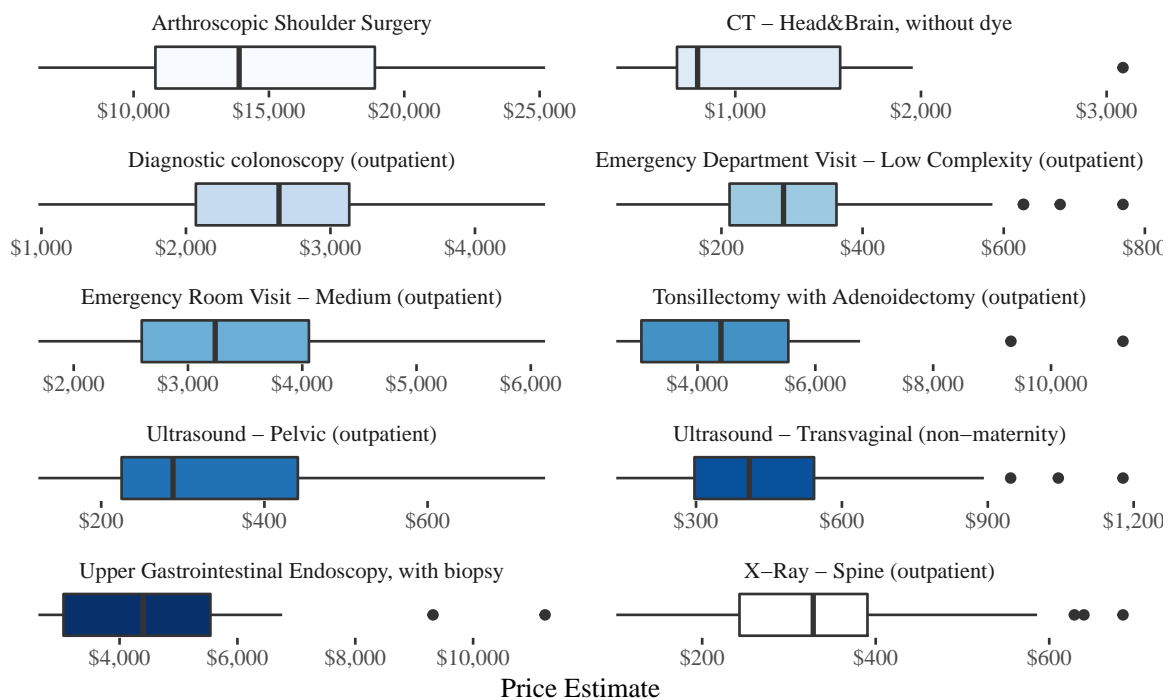Uninsured, Private Insurers, and Medicare

Figure 5.2: Price Variation for 10 Common Outpatient Procedures (NH)
For the Top Three Private Insurers (Anthem, CIGNA, & Harvard Pilgrim)

The second dataset provided by CMS is the Hospital Compare data which provides measures of quality.

Methodology

There are three large stages to my analysis. In all three I choose to restrict my investigation to radiology services as these types of services (CT scans, MRIs, X-rays, etc.) are among the most common outpatient service can reasonably be assumed to have constant costs and quality within the same hospital.

First Stage: Price Variation Patterns and Quality

I first want to motivate this paper by demonstrating that large price variation exists in the New Hampshire market for hospital care and that little of the variation is explained by costs and quality.

Clearly, significant variation exists, but I now want to examine how this variation relates to costs and quality. In my model, I find that, controlling for procedure, across hospital price variation accounts for 16.4% of the total variation in the model and *within* hospital price variation accounts for a further 17.0% of the total variation (using ANOVA). If prices truly reflected costs and quality, one may expect to see prices vary across hospitals which may have varying levels of quality, but within the same hospital, one would expect both price and quality to be constant for the same procedure across patients with different insurers.

I first compare prices across hospitals using measures for overall quality obtained through CMS Hospital Compare data. The hospital overall ratings show the quality of care a hospital may provide compared to other hospitals based on the quality measures reported on Hospital Compare, summarizing into a single rating more than 60 measures in seven measure groups: mortality, safety of care, readmission, patient experience, effectiveness of care, timeliness of care, and efficient use of medical imaging. I do not find any statistically significant nor visually apparent relationship between CMS's Overall Hospital Rating and the prices charged to private payers at that hospital; if anything, the relationship appears slightly negative.

Price Paid by Private Payers vs. CMS Overall Hospital Rating
For ten common procedures in NH
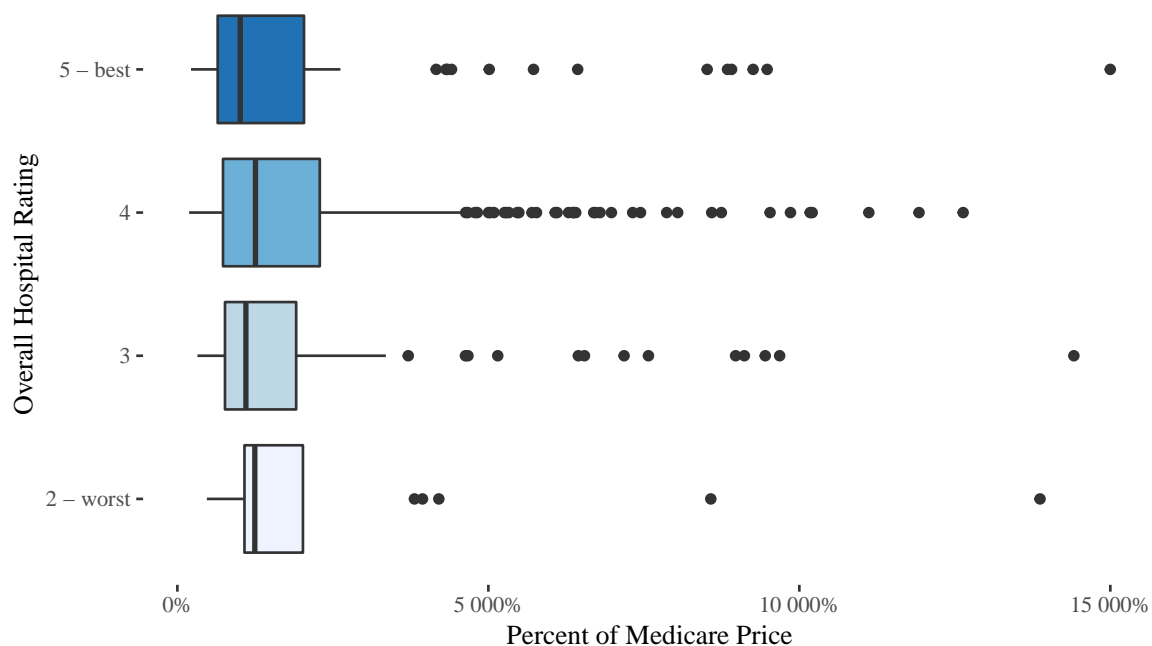
All NH hospitals receive the same Medicare reimbursement and were rated above a 2 by CMS.

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu % Date and time: Sat, Feb 09, 2019 - 18:56:04

Table 1: Hospital Quality Measures and Relative Price

	Dependent variable:
	Percent of Medicare Price
Overall Hospital Rating (Hospital Quality)	0.312
	(0.348)
Observations	3,652
R^2	0.536
Adjusted R^2	0.531
Residual Std. Error	15.704 (df = 3612)
F Statistic	106.845*** (df = 39; 3612)
Note:	*p<0.1; **p<0.05; ***p<0.01

However, I do find that for the exact same service, hospitals are able to charge different payers vastly different amounts. Below are two visual examples from the data that illustrate this variation between the three major private payers in New Hampshire (Anthem NH, CIGNA, and Harvard Pilgrim Health Care) for the same service at the same hospital.
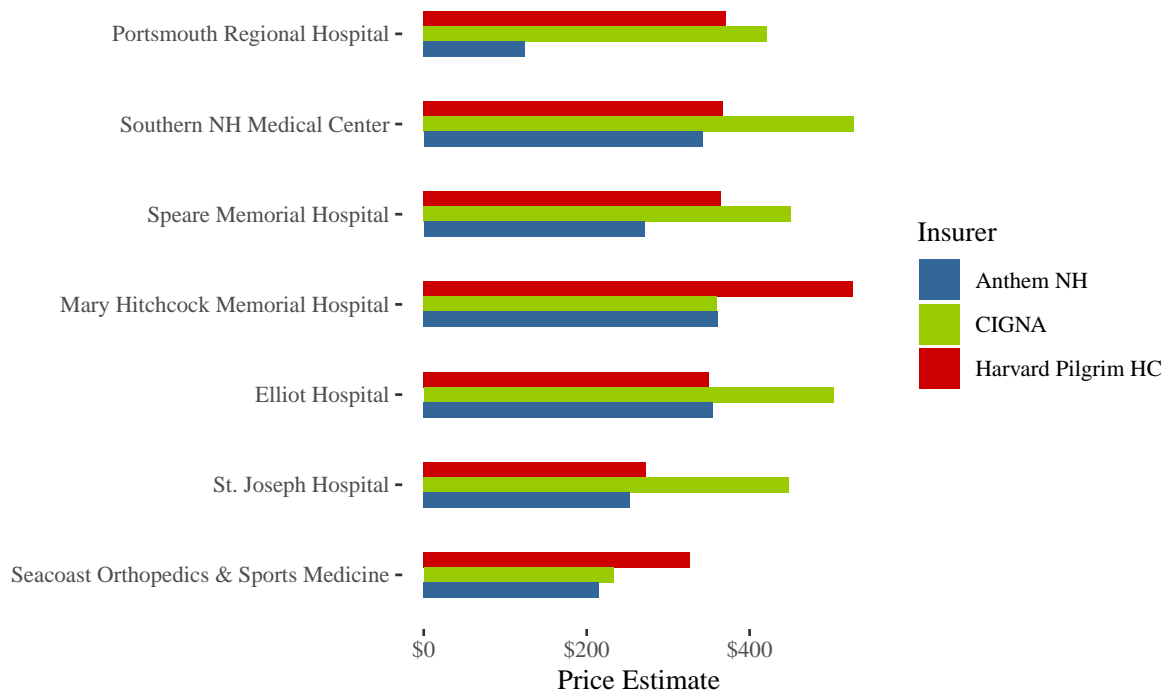
Prices Paid by Different Private Insurers
Procedure: Ultrasound – Transvaginal (non–maternity)
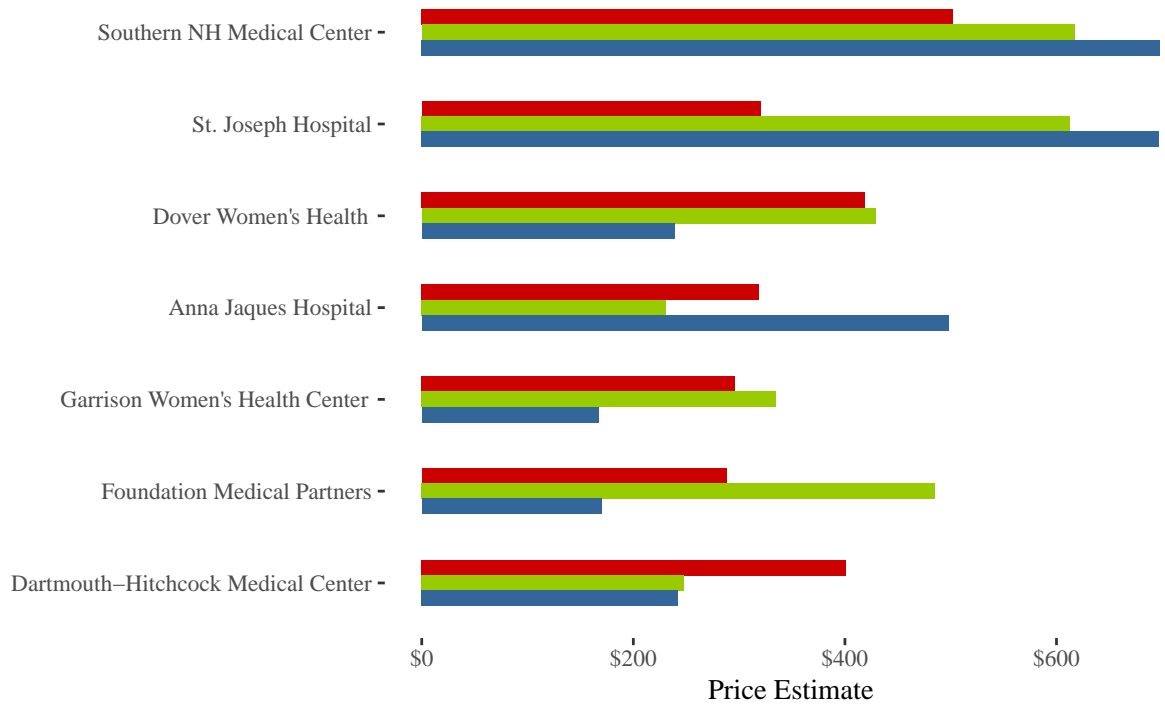
Prices Paid by Different Private Insurers
Procedure: X–Ray – Spine (outpatient)

These graphs present several examples of striking price variation for two common radiology services, Ultrasound - Tranvaginal (non-maternity) and X-Ray - Spine (outpatient). For all of the hospitals in the ultrasound graph, there is a difference of at least $150 in the price paid by the highest payer and that paid by the lowest payer. In three of these hospitals (St. Joseph Hospital, Anna Jaques Hospital, and Foundation Medical Partners), the highest payer is paying more than twice the amount the lowest payer is paying. For all of the hospitals in the x-ray graph, there is a difference of at least $100 between the highest and lowest payers. I make the assumption that it is unlikely that the cost of providing each of these services and the quality of each of these services within the same hospital should not vary with patients' insurance coverage. That is, it is reasonable to assume that it is no more costly from the hospital's point of view to perform a spine x-ray on a patient covered by CIGNA as opposed to a patient covered by Anthem, and hospitals do not provide higher quality spine x-rays to CIGNA covered patients that they do to Anthem patients.

Seeing that hospital price variation does not appear greatly correlated with costs or quality within hospitals, the analysis that follows will investigate how the market power of the insurer and the market power of the hospital relate to price.

Second Stage: Price Variation Patterns Across Major Private Insurers

The goal of this analysis is to determine whether there is a statistical difference between the prices hospitals charge Anthem, Harvard Pilgrim, and CIGNA in New Hampshire. That is, for the same service at the same hospital, is one insurer consistently paying a higher amount than the other two?

I create dummy variables for each of the insurers and Medicare and a new variable ("percent_medicare") which is the price as a percentage of what Medicare pays for the same procedure at the same hospital. The price Medicare pays for Blood Tests is $0 so I drop those observations from my data (from 6,329 to 6,002). With the remaining data, I regress the "percent_medicare" variable on each insurer dummy variable (with the Medicare dummy being excluded) and include procedure fixed effects and hospital fixed effects to isolate within-hospital variation of prices and therefore plausibly control for quality and costs.

The following boxplot depicts the various distributions of estimated prices for each payer-type across all 32 radiology services available on NH HealthCost.

Distribution of Cost Estimates Across Major Private Payers

Radiology services
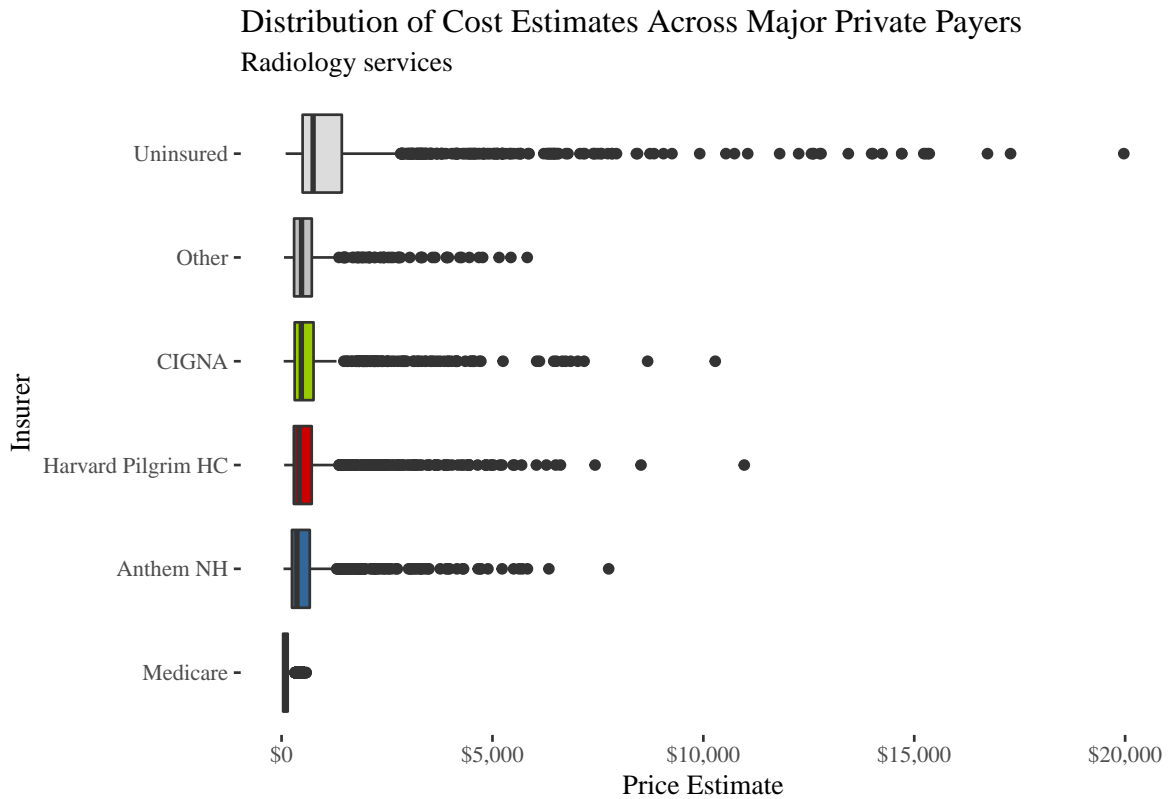
Third Stage: Price Variation Patterns and Hospital Concentration

For now, I restrict this second stage regression to only hospitals included in the Hospital Compare data set as these are hospitals that Medicare officially recognizes as Acute Care or Critical Access Hospitals. I then compare how the prices for each insurer varies with how many hospitals are within each hospital's market. I define a hospital's market as being within +/- 0.2 degrees of latitude and longitude of that hospital. I also include the median household income of the county obtained from 2017 US Census Data.

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu % Date and time: Sat, Feb 09, 2019 - 18:56:07

Robustness

Results

Price Variation Patterns Across Major Private Insurers

The results are listed below and show that Anthem pays on average 887% of Medicare prices, Harvard Pilgrim pays 920%, and CIGNA pays 1049%.

Table 2: Number of Hospitals in Market and Relative Price

	Dependent variable:
	Percent of Medicare Price
Number of Hospitals in Market	1.222***
	(0.370)
Median Household Income (county)	0.00000
	(0.00001)
Overall Hospital Rating - 3	2.791***
	(0.600)
Overall Hospital Rating - 4	2.213***
	(0.582)
Overall Hospital Rating - 5	−0.289
	(0.756)
Constant	157.592***
	(1.776)
Observations	1,443
R^2	0.904
Adjusted R^2	0.901
Residual Std. Error	4.912 (df = 1403)
F Statistic	337.663*** (df = 39; 1403)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 3: Insurance Carrier and Relative Prices

	Dependent variable:
	Percent of Medicare Price
Anthem NH	8.878***
	(0.434)
Harvard Pilgrim HC	9.200***
	(0.389)
CIGNA	10.469***
	(0.448)
Observations	3,814
R^2	0.565
Adjusted R^2	0.545
Residual Std. Error	9.265 (df = 3642)
F Statistic	27.717*** (df = 171; 3642)
Note:	*p<0.1; **p<0.05; ***p<0.01

Conclusions