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Market Power and Hospital Prices: Evidence from New Hampshire

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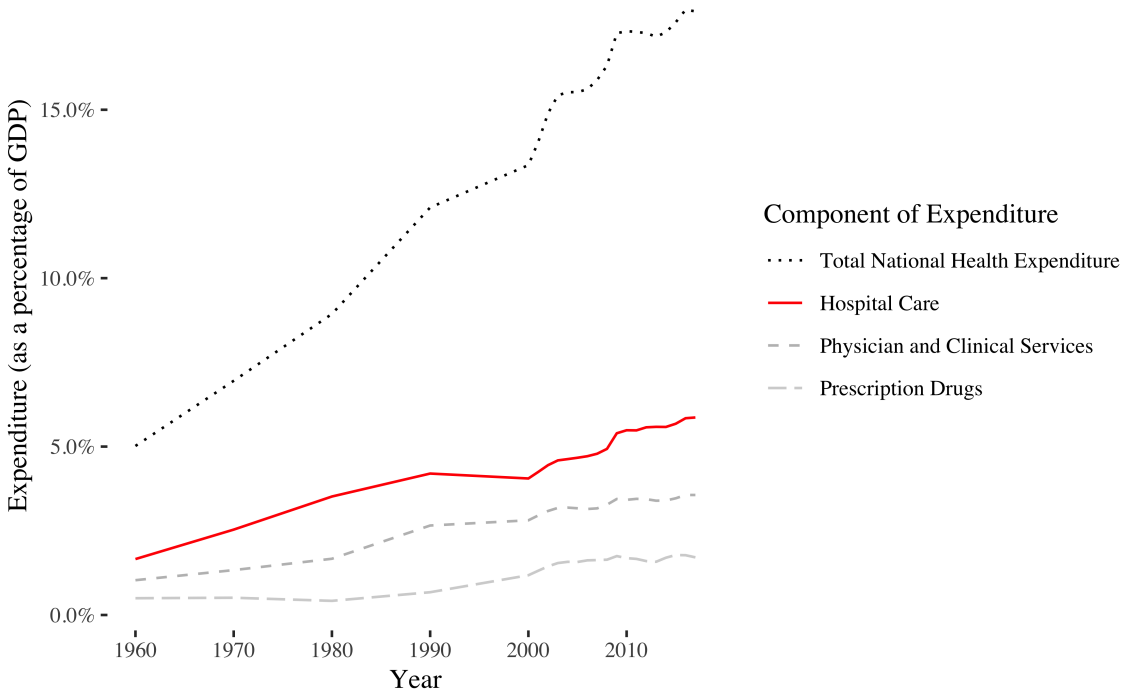
Abstract

This thesis evaluates how insurers and hospitals are able to exert market power in negotiating prices for hospital care, providing a more holistic picture of hospital price negotiations through synthesizing what currently exists as separate in the literature. Using estimates of insurer-hospital-procedure level prices for outpatient radiology services from New Hampshire's HealthCost website, I compare the estimated prices for the same service first across insurers and then across hospitals to evaluate how this relates to the insurer or hospital's market share. I find that the private insurer with the largest market share in New Hampshire's commercial market, Anthem/Matthew Thorton, pays on average 12-31% less than the other two major private insurers with smaller market shares with statistical significance. I also estimate that hospitals with one fewer competitor in their market are able to charge 3-9% higher prices for each procedure after controlling for the insurer, quality, typical patient complexity, and socioeconomic/demographic characteristics. However, the effects of hospital competition on negotiated prices vary heterogenously across different insurers, with Harvard Pilgrim prices being the most sensitive to hospital competition. These results are consistent with the hypothesis that hospital prices are inefficiently influenced by the market power of the negotiating parties, and that policy solutions that can decrease the relative market power of each hospital and increase the market power of insurers may help to reduce prices.

I Introduction

The United States' expenditure on health care has grown rapidly since World War II 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). From 1960-2017, the growth rate of this spending has surpassed that of GDP, averaging 6.3% annually, and although this rate recently slowed to only 3.9% in 2017 (Center for Medicare and Medicaid Services 2018), it remains positive and continues to outpace the annual growth rate of real GDP at 2.2% in 2017 (Burea of Economic Advisors 2019). Given that the $3.5 trillion spent on health care (17.9% of GDP) in 2017 (CMS 2018) erodes the personal budgets and funds for government social services, exploring the sources of spending has generated a large body of relevant research in health economics. Hospital care, physician services, and pharmaceutical drugs are the largest sources of spending, with hospital care constituting the largest share at 32.7% ($1.1 trillion) of total national health expenditure in 2017 (CMS 2018) as shown in Figure 1. Hospital care expenditures are also one of the faster growing components of total health care spending, growing on average over the last decade at 5.8% annually, while spending of physician services and perscription drugs over the same period grew on average at 4.8% and 4.1%, respectively (CMS 2018). While the prevalence of third party payers and certain unhealthy behaviors of American lifestyle may encourage higher utilization of medical care, the biggest driver behind the U.S.'s spending on hospital care and total health expenditure is not greater utilization or social spending but simply higher prices (e.g. Anderson et al., 2003; Papanicolas et al., 2018).

Due to the size and relevance of hospital care spending, an important health economics literature deals with investigating the sources of hospital price variation. However, the process of determing and defining hospital prices has long been a challenging element of this research as the list prices hospitals put on their "chargemasters" have



Notes: All dollar amounts are nominal. National Health Expenditue data up to 2017 comes from CMS 2018 NHE Estimates; GDP data from Bureau of Economic Advisors 2019.

Figure 1: Health Care Expenditure in the U.S. over time

little systematic relation to what payers actually pay (Reinhardt 2006) and the actual hospital transaction prices for private payers have largely been considered commercially sensitive until relatively recently. What has been discovered as this price data has become more available is that these prices vary dramatically for different payers. Public payers such as Medicare and Medicaid set their prices at the federal or state level, which may vary somewhat across regions to reflect costs but usually do not vary within region. Private payers, on the other hand, negotiate price contracts separately with each hospital and often pay between an additional 50-200% of the Medicare price (Selden et al. 2015; Cooper et al. 2018; Bai and Anderson 2018), and this gap has only been growing in recent decades (Selden et al. 2015). In addition to the public-private gap, a few studies (e.g. Cutler et al., 2000; Bai and Anderson, 2018; Cooper et al. 2018) have also identified price gaps between different private payers and private payer types, such that for the same care at the same hospital, different insurers

are paying significantly different prices. Considering the fact that 49% of Americans receive health care coverage from their employer through private insurance plans rather than through Medicare (21%) and Medicaid (14%) (Kaiser Family Foundation 2017), this price variation in different private insurer-hospital contracts affects what many Americans pay out of pocket and in premiums for their healthcare. Moreover, Cooper et al. (2015) finds some evidence that this variation persists even when costs and quality are arguably held constant.

The literature has largely evaluated the potential impacts of market power on price negotiations by studying hospital competition or insurer competition separately. The growth in hospital consolidation in the past three decades has fueled significant research as to the price effects of mergers and the formation of large hospital systems (e.g. Capps and Dranove 2004; Dafny 2009; Bai and Anderson 2015; Melnick and Fonkych 2016), but relatively little work hs been done to examine the heterogeneity of these effects between different insurers. Hospital price negotiations with commercial insurers have been modeled in several papers.

In this paper, I examine how prices for outpatient radiology services in New Hampshire vary with the market share of the insurer and the market share of the hospital, including an analysis of whether the effects of hospital market share are heterogeneous across insurers, using multivariate linear regression. New Hampshire has been a pioneer of price transparency in health care among the U.S. states and therefore provides the opportunity to more closely evaluate the forces shaping hospital prices. I use publicly available data from NH HealthCost to construct price estimates at the insurer-provider-procedure level, information from the New Hampshire Insurance Department to obtain state-level health insurance information, and geographical data from Dartmouth Atlas and HealthCost to construct various measures of hospital market shares. While much of the previous literature analyzes inpatient care or

physician practices (Clemens and Gottlieb 2016), I choose to focus my analysis to hospitals' outpatient radiology services because outpatient services have expanded in recent decades (Fuchs 2012) and radiology services can plausibly be assumed to have constant quality and costs (after controlling for service type and wages) across hospitals and particularly within hospitals. Furthermore, radiology services often constitute the largest source of outpatient profit for many hospitals at roughly 35% (Becker's Hospital Review 2015). I find statistically significant differences between the prices different insurers face across the state as well as statistically significant effects of hospital market share on prices, although this effect varies somewhat across insurers.

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 although a formal analysis of insurer market power is not possible; lastly, I also examine whether the effect of hospital competition is different across different private insurers.

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 conceptual framework motivating the empirical methodology laid out in Section V and Section VI presents the results. A discussion of the results takes place in Section VII and the paper concludes with Section VIII.

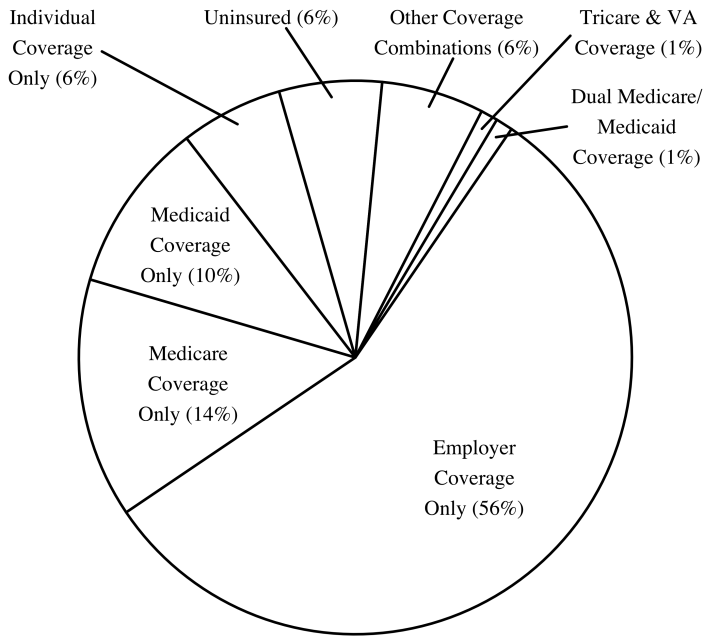
II Background on the New Hampshire Market

The state of New Hampshire has been a pioneer of price transparency through the creation of the Comprehensive Health Care Information System (CHIS), and in the same legislation enacted statutes that mandated that health insurance carriers submit their encrypted health care claims data and Health Employer Data and Information Set (HEDIS) data to the state. This has led to a rich set of health claims data that has allowed for the creation of an online public tool "NH HealthCost," which allows individuals to find estimates for what the total price for certain services will be at each hospital given their insurance carrier.

II.I Health Insurance Coverage

New Hampshire is a small state (8,953 square miles) with a population of 1.3 million (90.5% white) and median household income of $71,305 (Census Bureau 2017). Additionally, 17.6% of the population is over the age of 65, which is slightly higher than the national average of 15.6% (Census Bureau 2017). Figures 2 and 3 show the insurance status of New Hampshire residents in 2017 and the market share of major private insurers, respectively. In 2017, 62% of residents (approximately 820,000 individuals) received health insurance through the private insurance market, 56% through employer-sponsored insurance and 6% through individual private insurance, and this translates to 543,900 enrolled members.[1] Of the privately insured, 81% received coverage through employer-sponsored insurance plans (12.6% Small Group, 19.8% Large Group Fully Insured, and 48.9% Large Group Self Insured) and the remainder either purchase their coverage individually (11.0%) or received subsidies for private coverage through New Hampshire's Premium Assistance Program (7.7%).

[1] A plan member can be a household or an individual; these estimates exclude individuals covered by the Federal Employees Health Benefits Program (FEHBP)

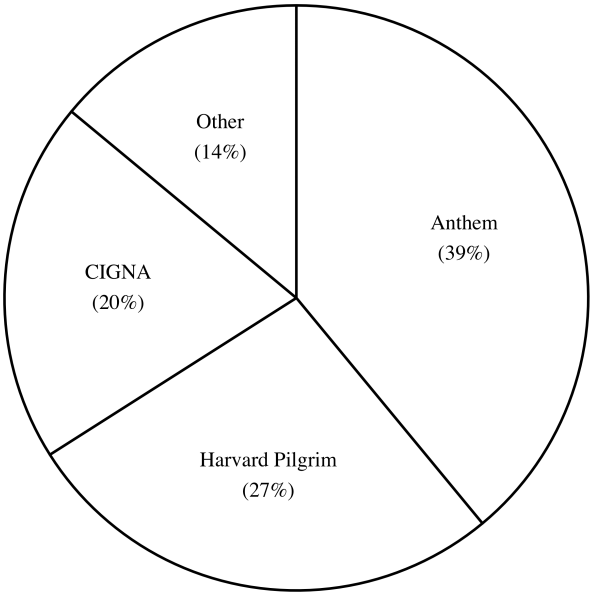


Source: New Hampshire Health Insurance Department, Nov. 2018

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

The three major private insurers are Anthem/Matthew Thorton (39%), Harvard Pilgrim Healthcare (27%), and CIGNA (20%). Other insurers include Ambetter (3.5%), Minuteman Health (3.4%), Tufts (3.0%), Community Health Options (2.1%), United (1.2%), and Aetna (0.2%). The HealthCost website often does not provide prices for these insurers as they each constitute less than 5% of the market and when it does, it does not specify between them so I am unable to include them in the analysis. Of the three major insurers, both Anthem and CIGNA have a significant national presence, Anthem being the larger of the two with 40.2 million members compared to CIGNA's 15.9 million members Becker's Hospital Review 2019. The Anthem plans are underwritten by Matthew Thorton Health Plan, Inc., which is a fully owned subsidiary of Anthem, and is referred to as "Anthem" for the remainder of the paper. Harvard Pilgrim Health Care is a non-profit private company that primarily operates in the north eastern United States Crunchbase 2019, so while it is the second largest insurer

in New Hampshire, it is a relatively small national player.



Source: New Hampshire Health Insurance Department, Nov. 2018

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

II.II New Hampshire Providers

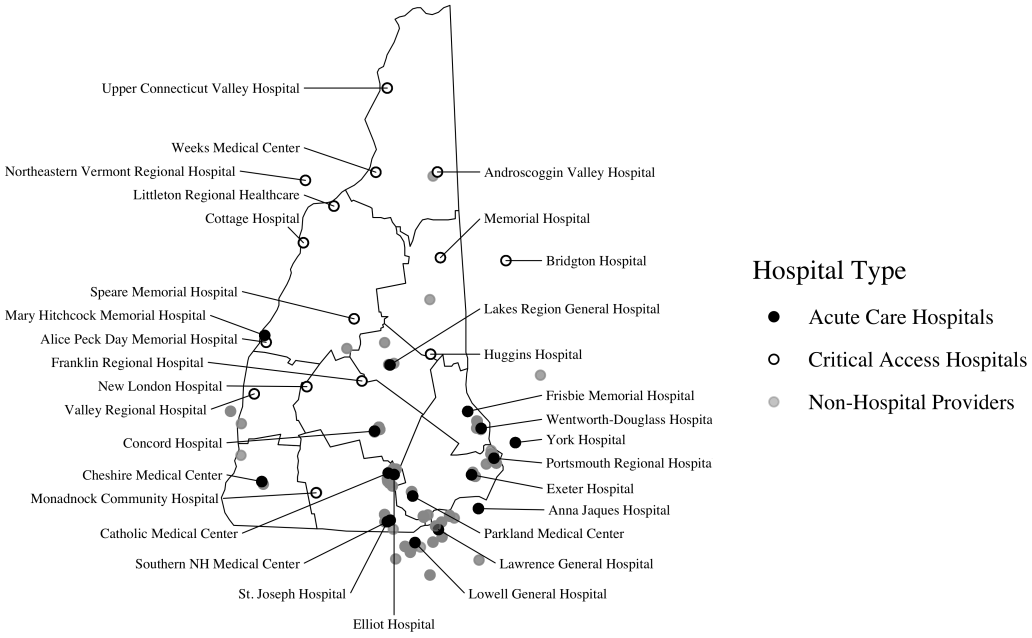
New Hampshire has a total of 31 hospitals and 3,503 beds within the state (New Hampshire Hospital Association 2018). According to the New Hampshire Hospital Association, 13 of these hospitals with 2,704 beds total are Prospective Payment Systems (PPS) Hospitals; 13 hospitals with 301 beds total are Critical Access Hospitals (CAH); and 5 hospitals with 498 beds total are Specialty Hospitals. PPS hospitals are normal acute-care hospitals that are reimbursed by Medicare through prospective payments[2] for inpatient stays. CAHs are hospitals that serve rural populations and

[2]Medicare prospective payments are predetermined, fixed amounts based on the classification system of the care received. For example, acute-care hospitals are reimbursed for inpatient stays according to the patient's diagnosis, corresponding to a diagnosis-related group (DRG), rather than according to the services provided to that patient.

are therefore eligible to receive cost-based reimbursements from Medicare for inpatient stays. Specialty hospitals are any 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 the way these hospitals are reimbursed for inpatient hospital stays by Medicare may differ, these distinctions are largely irrelevant in the outpatient setting where physician and clinical services are reimbursed on a service level basis through Medicare Part B and do not affect how these hospitals are reimbursed by private insurers.

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 physician groups that also provide some of the relevant outpatient procedures. Though the focus of the analysis is on hospitals, I include these non-hospital providers in Figure 4 for context. Non-hospital providers are often highly concentrated in certain areas and some even exist on the same campus as other non-hospital providers, clinics, or hospitals.

There has only been one official hospital merger involving a hospital in New Hampshire: Massachusetts General Hospital (MGH)/Partners HealthCare from Massachusetts acquired Wentworth-Douglass on January 1, 2017. However, if two pending quasi-mergers go through, "22 out of New Hampshire's 26 acute-care hospitals will have established some kind of organizational connection with other institutions, often mergers in all but name" (Concord Monitor Jan 26, 2019). In May 2018 Partners HealthCare also made a bid to acquire Exeter Health Resources, and this merger is still pending approval.



Note: Location of hospitals and non-hospital providers provided by NH HealthCost. County divisions are shown.

Figure 4: Location of New Hampshire Hospitals

II.III Price variation in the New Hampshire Market

Large price variation exists in New Hampshire, and I present in Table 1 the estimated prices for Medicare, the three major private insurers, and the uninsured for ten common outpatient procedures in New Hampshire. I identify these procedures using 2016 data from the New Hampshire Hospital Association and further narrow their list of 82 (out of thousands) down to 10 with some of the highest average prices and for which I have price estimates for private insurers. All price data presented reflect 2018 prices, and the price estimates for private payers have been adjusted to match the non-bundled prices.[3] Significant variation exists in the prices paid for the same

[3]As outlined in more detail in the Section III, the prices for private payers are taken from the HealthCost website and, unadjusted, reflect "bundled" payments, which include additional payments commonly provided with the primary service. Medicare prices on the other hand are highly specific to the service provided. In order to make more reasonable comparisons between Medicare and private prices, I multiply the private prices for each procedure by a factor that leads the median price for that procedure for the three major private insurers is 200% of the Medicare price. Prior literature

procedure or service, even when only considering the privately insured. This variation may be efficient if costs and quality vary across hospitals for complex procedures such as Arthroscopic Shoulder Surgery, but may be inefficient for services where cost and quality are plausibly constant.

Table 1: Median Price for 10 Common Outpatient Procedures by Payer

Procedure	All	Medicare	Anthem	HP	CIGNA	Uninsured
Arthroscopic Shoulder Surgery	1,777	677	1,606	1,793	1,981	3,559
CT - Head/Brain, without dye	302	122	240	209	487	666
Diagnostic colonoscopy	437	198	475	400	465	774
Emergency Room Visit - Low Level	85	42	84	88	83	115
Emergency Room Visit - Medium Level	131	63	132	139	124	166
Tonsillectomy with Adenoidectomy	617	302	537	1,281		1,749
Ultrasound - Pelvic	389	117	472	332	362	772
Ultrasound - Transvaginal	324	130	338	322	325	601
Upper GI Endoscopy, with biopsy	314	148	373	278	310	545
X-Ray - Spine	82	37	71	81	89	144

However, this variation persists even when costs and quality are reasonably assumed to be fixed within the same hospital. Controlling for procedure, across hospital price variation accounts for 16.4% of the total variation but *within* hospital price variation accounts for a further 17.0% of the total variation in my data. For the same service at the same hospital, different payers are charged vastly different amounts. Figure 5 shows the different prices paid by the three major private payers in New Hampshire (Anthem, Harvard Pilgrim, and CIGNA) at the same hospital for spine x-rays (a common outpatient procedure). For all of the hospitals in Figure 5, there is a difference of at least $100 between what the highest and lowest payers pay.

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 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 that hospitals do not provide higher quality spine x-rays to CIGNA covered patients than they do to Anthem patients. Thus my analysis explores

suggests this is reasonable to assume for the services being considered (Congressional Budget Office 2018).

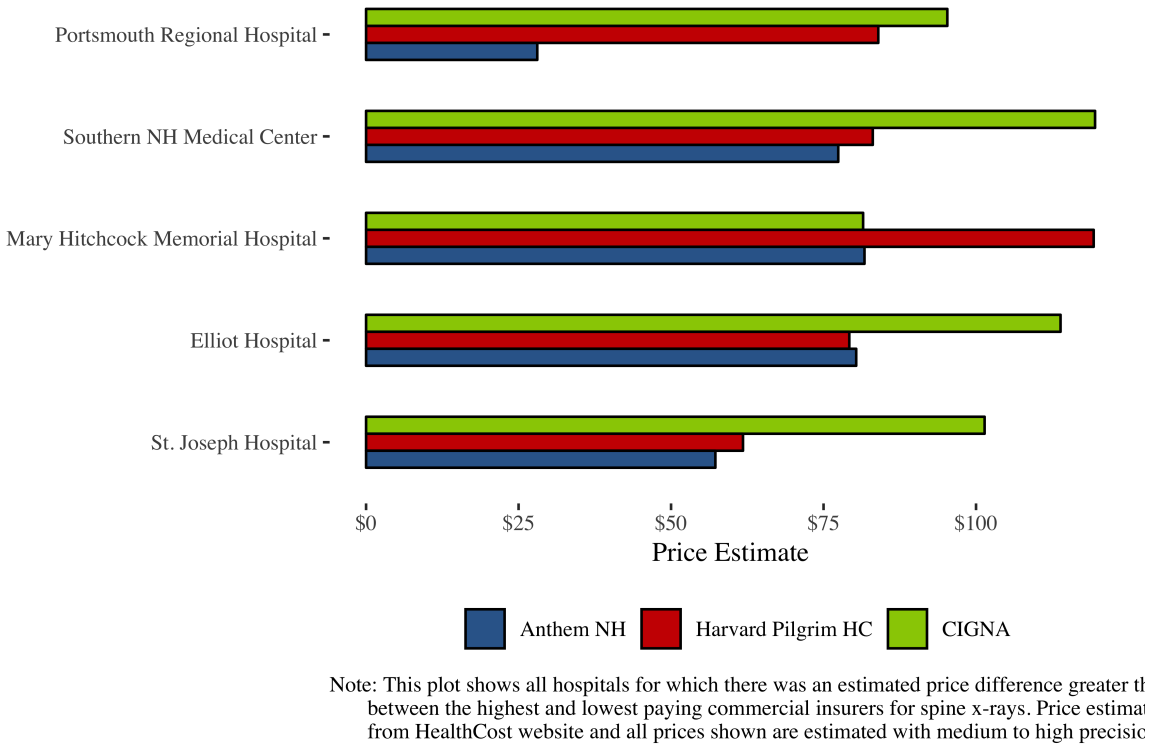


Figure 5: Prices Paid by Private Insurers for Spine X-Rays (Outpatient)

other potential sources of this variation, particularly the level of competition among insurers and hospitals that may allow each to exert certain levels of market power in the price bargaining scenario.

III Data

III.I HealthCost Data

The primary source of data on hospital prices comes from the New Hampshire Insurance Department HealthCost website, which is a publicly available tool that provides insurer-hospital specific estimations of costs for roughly 150 services and procedures. New Hampshire is one of the few states that makes such information publicly available,

hence why I use it as a case study for my analysis. The cost estimates are calculated using claims data from the New Hampshire Comprehensive Healthcare Information System (NHCHIS) to determine the median amount that insurance carriers and patients pay for each service. The estimated costs therefore reflect the rates negotiated between health care providers and insurance carriers (often referred to as the "allowable amount") rather than provider charges, which have been shown to have little relation to what most privately insured individuals actually pay for a given service.

For the services relevant to this paper (outpatient procedures and radiology services), the estimated prices may be "bundled" to include multiple services or independent providers; that is, the estimates aggregate the costs for what may be treatment received from several providers (billing separately) under the "lead provider" rather than distinguishing between what is paid to the facility versus the physicians who treat the patient. Price estimates for radiology services use a modified bundle that includes the facility and the professional fees associated with the patient receiving that service but not any other costs that the patient may have incurred on the same day.

Each service on HealthCost is identified with a description (e.g. "X-Ray - Abdomen") and one of the American Medical Association's Current Procedural Terminology (CPT) codes. However, there are multiple CPT codes for an abdominal x-ray (different codes for different numbers of views), so the CPT codes for similar services are counted and the most common ones identified through the frequency distribution. From there, the representative CPT code and description is chosen based on what will be the simplest and most easily recognized procedure, and, when available, clinical insight is also considered. This means that in some cases, multiple CPT codes may be combined, as long as the cost is similar, under a single service.

Additionally, HealthCost includes indicators of variability for each estimate under the

"Precision of the Cost Estimate" field, where "High" corresponds to cost estimates with little variability from one patient to the next, and risk-adjustment indicators under the "Typical Patient Complexity" field, which are evaluated for each hospital within that procedure. For example, a hospital may attract an average population when considering all procedures but a more complex population when only considering brain MRIs as compared to other hospitals. Thus, for brain MRIs, this hospital would have a "High" typical patient complexity as it tends to serve higher complexity patients than other hospitals. Lastly, HealthCost does not include visits where an infrequent and high cost procedure is performed in conjunction with a HealthCost procedure because the more expensive procedure may have also impacted the cost for performing the more routine services.

The data available on HealthCost allow me to construct a data set containing the estimated price for each procedure and each provider-insurer combination for which data was available. I also keep values for "Typical Patient Complexity" and "Precision of the Cost Estimate" to use as controls in my analysis. Because the prices are "bundled" and I want to standardize these prices according to unbundled Medicare prices, I deflate the private prices by a certain factor per procedure. This factor is equal to the amount I would have to multiply the price faced by each of the major private insurers such that the median price for the procedure as paid by these insurers is equivalent to 200% of the Medicare price for that procedure. This standardization factor is 0.2-0.6 for most of the procedures I consider.

Table 2: Median Price for Radiology Services by Payer

Procedure	All	Medicare	Anthem	HP	CIGNA	Uninsured
Myocardial Imaging	1,077	520	1,060	1,046	1,395	1,788
MRI - Pelvis	1,036	450	1,036	835	1,201	1,648
MRI - Brain	953	398	698	951	1,077	1,617
MRI - Back	772	237	512	792	826	1,248
CT - Abdomen/Pelvis, with contrast	656	328	610	671	889	1,405
MRI - Shoulder, Elbow, or Wrist	644	251	522	622	739	1,035
MRI - Knee	623	251	526	615	706	1,054
Ultrasound - Pregnancy	471	151	468	477	503	922
CT - Chest	458	207	446	365	541	698
Ultrasound - Pelvic	389	117	472	332	362	772
Ultrasound - Pregnancy follow-up	363	123	411	365	405	576
Ultrasound - Transvaginal	324	130	338	322	325	601
Mammogram	305	145	337	238	311	478
CT - Head/Brain, without dye	302	122	240	209	487	666
Ultrasound - Abdominal, Complete	294	130	274	289	294	519
Ultrasound - Head and Neck	257	124	267	258	257	394
Ultrasound - Abdominal, Limited	196	97	188	188	197	275
Ultrasound - Breast	187	93	190	180	207	334
X-Ray - Pelvis	113	34	156	125	162	173
X-Ray - Hip	97	44	90	101	112	170
Bone Density Scan	95	44	85	97	110	168
X-Ray - Knee	93	38	92	84	105	142
X-Ray - Neck	93	41	88	91	111	203
X-Ray - Middle Back	85	38	71	92	100	157
X-Ray - Spine	82	37	71	81	89	144
X-Ray - Hand	80	34	74	78	85	131
X-Ray - Wrist	80	37	76	78	91	132
X-Ray - Foot	78	31	68	79	88	133
X-Ray - Chest	77	34	68	75	82	135
X-Ray - Abdomen	77	35	63	76	91	122
X-Ray - Ankle	74	33	69	74	76	115
X-Ray - Shoulder	69	31	63	68	85	115
Urine Capacity Measurement	34	17	36	32	44	68

III.II CMS Data

III.II.1 Medicare Prices

The Center for Medicaid and Medicare Services (CMS) sets all of it prices centrally, allowing for some variation across regions, and reimburses outpatient services through Medicare Part B based on the services provided, defined at the CPT code level. This information is made public in the Physician Fee Schedule (PFS) 2018 Relative Value file, allowing me to construct the Medicare reimbursement rates at each hospital for each service observed in the HealthCost data by matching each hospital to a locality in the CMS data. I am able to calculate the 2018 Medicare Facility Pricing Amount $p_{2018}^{Medicare}$ for each procedure j at the locality level l using the following formula:

$$p_{jl,2018}^{Medicare} = [(RVU_j^{work} * GPCI_l^{work}) + (RVU_j^{PE} * GPCI_l^{PE}) + (RVU_j^{MP} * GPCI_l^{MP})] * CF_{2018}$$

where RVU_j^{work} denotes the Relative Value Unit (RVU) for the physician work involved in providing procedure j, RVU_j^{PE} denotes the RVU for the resource-based practice expense for the facility setting, and RVU_j^{MP} denotes the RVU for the malpractice expense. $GPCI_l^{work}$ denotes the Geographic Practice Cost Index (GPCI) corresponding to locality l and the work RVU, $GPCI_l^{PE}$ corresponds to the practice expense RVU, and $GPCI_l^{MP}$ corresponds to the malpractice RVU. CF_{2018} denotes the 2018 conversion factor ($35.996). For example, a foot x-ray has a work RVU of 0.17, a facility practice expense RVU of 0.64, and a malpractice RVU of 0.02 while an arthroscopic shoulder surgery has a work RVU of 8.843, a facility practice expense RVU of 7.997, and a malpractice RVU of 1.612 to capture how the arthroscopic shoulder surgery is a much more technical, expensive, and high-risk procedure to provide than a foot x-ray. These RVUs are then weighted by the locality l's corresponding GPCIs (values that range from 0.950 to 1.925 in the 2018 data) to account for labor costs, equipment costs, and

malpractice expenses in that region. As a result, Medicare pays $30.90 for a foot x-ray and $677.26 for an arthroscopic shoulder surgeryin in most New Hampshire hospitals but $34.25 for a foot x-ray and $729.84 for an arthroscopic shoulder surgery in the Boston metropolitan area.

Medicare treats all of New Hampshire as one locality, meaning that all hospitals in New Hampshire that are reimbursed through prospective payments are reimbursed the same amount for outpatient services through Medicare Part B. However, 13 out of the 32 hospitals in my dataset are Critical Access Hospitals (CAHs) that are eligible to receive cost-based reimbursements from Medicare. I was unable to obtain data on exactly how much these CAHs are reimbursed by CPT code and therefore use the prospective payment rates as an approximation for what they are reimbursed by Medicare. This should not have a major impact on the analysis as the focus is on private insurers, and I primarily use Medicare prices for the purposes of standardization of the private insurer prices available through NH HealthCost.

III.III Hospital Quality

The second dataset provided by CMS is the Hospital Compare data, which provides measures of quality. The hospital overall ratings attempt to capture 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. Hospitals are ranked out of five stars, and my dataset includes two hospitals with two stars, 11 hospitals with three stars, 16 hospitals with four stars, and three hospitals with five stars for their overall ratings.

IV Conceptual Framework

In standard micro-economic theory, resources are optimally allocated in a perfectly competitive market via the mechanism of price, which results from the intersection of the supply and demand curves. For producers, the price will be equivalent to the marginal cost of production, and for consumers, the price will reflect the value of their marginal unit of utility. In this standard model, both producers and consumers are price takers, making their production or consumption decisions based on an exogenous price.

However, in the real world it is often the case that firms, and occasionally consumers, can exercise some degree of market power; that is, their production or consumption decisions can affect price such that it is no longer exogenous. In this scenario, the agent with market power is no longer a price taker but also a price setter. The most extreme example of this of course is the monopolist, which sets its price to maximize profits given the demand curve for the good, and when profits are introduced, price is no longer welfare maximizing and a less than optimal amount of the good is consumed.

The market for health services is imperfect in several ways. Mainly, most patients do not face the full costs of the services they require due to health insurance coverage. Health insurance is made necessary because the market for health care is full of risk: health services are often compensated in a large one time payment and each person is uncertain about how much care she will require and when. Thus, insurance helps distribute the risk associated with each consumer across a pool of plan enrollees and, in exchange for monthly premiums, helps bear some of the costs of care. However, this structure leads to reduced pressure on hospitals to offer competitive prices as patients rarely "shop" for care on the basis of price; most patients do not observe prices for the care they receive and are restricted to go to only those hospitals in network or to which they are referred by their primary care decision, such that the main concern for

most patients is how accessibly or conveniently a hospital is located.

Because only about 14% of health spending is out-of-pocket (Fuchs 2012), insurers are the most proximate agents to the price setting process with hospitals, particularly for expensive technologically advanced services. Each hospital and insurer negotiate explicit contracts of the insurer's reimbursement rates, usually for each service, and this is possible because there are relatively few hospitals and relatively few insurers present in each market for health care. That is, unlike the perfectly competitive market where there are many producers and many consumers acting as price takers, insurers and hospitals are both price setters in the health care market because the decision of the marginal producer or consumer matters. An insurer can threaten not to include a hospital in its network, thereby reducing the likelihood that the patients it covers will go there for care. If the insurer covers many potential patients in that hospital's market, this threat could result in reduced volume and revenues for the hospital. However in return, hospitals can threaten not to be included in the insurer's network, making the insurer's plan less attractive to potential enrollees. If the hospital is a major hospital or the only hospital in a large geographic region, this threat can generate significant bargaining leverage as potential enrollees may place a high value on having convenient or well-known hospitals in their network. Therefore, the prices that result from these negotiations may reflect the relative bargaining power of the insurer and the hospital rather than the marginal cost and marginal utility of the services provided.

In these bilateral negotiations, 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, if market share is associated with bargaining power, prices are expected to be more favorable for the hospitals or insurers with greater market shares. I examine whether this is the case in the analysis that follows.

V Empirical Approach

My analysis seeks to identify whether the market share of hospitals and insurers is related to variation in the prices private insurers pay for hospital services. The first section concerns price variation across insurers and the second concerns price variation across hospitals. I restrict my analyses only to radiology services, which are among some of the most common outpatient procedures, only to hospitals (excluding ambulatory care centers, clinics, specialist practices, etc.), and only to the three major private insurers and Medicare (to provide a base price). This leaves me with 33 services, 31 hospitals,[4] and 2,308 observations.[5]

Radiology services (CT scans, MRIs, ultrasounds, x-rays, etc.) generally involve the use of an imaging device to capture an image which is then read (examined) by a radiologist who reports their findings to the patient or patient's doctor. The initial cost of purchasing one of these imaging devices is expensive and may vary somewhat, but the per unit cost of procuring and reading an image is likely to be similar across providers once controlling for wages. Particularly within the same hospital, the per unit cost of each radiology service is reasonably assumed to be constant. Similarly, within the same hospital, quality is plausibly assumed constant for the same service.

[4]Bridgton Hospital in Maine was dropped from the dataset as HealthCost did not provide data on the prices of any radiology services at this hospital

[5]HealthCost does not have prices for all three private insurers and all 33 services at each hospital

Furthermore, across hospitals, the quality of radiology services is assumed to be relatively similar. While the number of specialized radiologists employed by each hospital may vary, the emergence of telemedicine and New Hampshire legislation encouraging its use (mHealth Intelligence, 0ct. 27, 2015) may help to mitigate these disparities as rural hospitals can send imaging to be reliably read by specialized radiologists employed by telemedicine firms. Particularly after controlling for the hospital's overall quality, I assume that imaging service quality is minimally different between hospitals.

My outcome variable of interest is the percentage of the Medicare price that insurer i negotiates for a particular procedure j at a particular hospital h, denoted as y_{ijh}. That is,

$$y_{ijh} = \frac{p_{ijh}}{p_{jh}^{Medicare}} \tag{1}$$

where p_{ijh} denotes the price a particular insurer pays for procedure j at hospital h, and $p_{jh}^{Medicare}$ denotes the price Medicare pays for the same service at the same hospital.

In the first set of regressions, I estimate whether there is a statistical difference between the prices hospitals charge Anthem, Harvard Pilgrim, and CIGNA in New Hampshire for the same service, with the context that Anthem (the largest commercial insurer) composes 39% of the commercial insurance market, Harvard Pilgrim 27%, and CIGNA (the smallest major commercial insurer) 20%. I estimate what percentage of the Medicare price each insurer pays on average using the following linear model:

$$y_{ijh} = \sum_{k \epsilon K} \gamma_k \left[insurer_k \right] + \delta_j + \lambda_h + \varepsilon_{ijh} \tag{2}$$

where N is the set of private insurers (Anthem, Harvard Pilgrim, CIGNA), and

$insurer_n$ is an indicator variable that takes on the value of 1 or 0. The omitted dummy is Medicare such that the coefficient $\hat{\gamma}_k$ estimates the percentage of the Medicare price private insurer k pays on average, and the three resulting coefficients of the summation (one $\hat{\gamma}_k$ for each insurer) are the primary coefficients of interest. The regression also includes procedure fixed effects δ_j and hospital fixed effects λ_h so that the price for the same procedure at the same hospital can be compared among the commercial insurers. The error term is denoted by ε_{ijh}.

This analysis only reveals whether there are consistent differences between the prices each insurer pays and a possible correlation between the relative magnitudes of $\hat{\gamma}_k$ and the market share of insurer i. I cannot directly estimate the relationship between the market share of insurer i and the price of procedure j at hospital h because I only have the state-wide market shares of each insurer. Ideally, I would know the market power of each insurer within hospital h's market, and identify the relationship between the prices negotiated by insurer i and hospital h given insurer i's market share in hospital h's market. Nonetheless, in my analysis the relative magnitude of the coefficients $\hat{\gamma}_k$ and their statistical significance suggest the potential direction of this relationship. That is, each insurer's state-wide market share is known and can be ranked from largest to smallest, and a negative correlation between the size of the insurer's statewide market share and the magnitude of $\hat{\gamma}_k$ suggests that larger insurers may negotiate cheaper prices.

As with the imperfect measure of insurer market share, I also am unable to obtain data on the precise market share of each hospital in the market for outpatient radiology services because the outpatient volumes of each hospital are not provided in my data. However, I am able to construct a measure of the number of other hospitals present in hospital h's market to serve as a proxy for market share and concentration. This method is of course imperfect because there may be several hospitals in the same

market but one may perform significantly more outpatient radiology procedures than the others due to having a greater capacity, being more accessible by transit, or having a better reputation among other reasons. Nevertheless, I assume that because there are so few hospitals present in each market, the addition of a marginal hospital to hospital h's market does have a negative effect on the market power of hospital h as it faces greater competition. By counting the number of hospitals present in each hospital's market, I am able to construct a proxy for the level of hospital competition hospital h faces in its market.

Thus in the second set of regressions, I estimate how the presence of other hospitals within each hospital's market relates to the price (as a percentage of the Medicare price) for a particular service j that hospital h negotiates with each insurer i. Essentially, the hospital fixed effects variable Equation (2) is broken apart into various observable measures relating to a particular hospital and its market, resulting in the following linear model:

$$y_{ijh} = \sum_{k \epsilon K} \gamma_k \left[insurer_k \right] + \delta_j + \alpha m_h + \beta_1 \eta_{jh} + \beta_2 \vartheta_h + \beta_3 X_c + \varepsilon_{ijh} \tag{3}$$

where the summation of the insurer dummies and δ_j (procedure fixed effects) remain the same as in Equation (2); m_h represents the number of hospitals in hospital h's market; η_{jh} denotes the typical patient complexity for procedure j at hospital h; ϑ_h denotes overall hospital quality at hospital h as provided through the CMS Hospital Compare data; and $X_{c(h)}$ is a vector of county-level characteristics for each hospital $c(h)$ that include the median household income, the percentage of people over 65 years of age, and population density. Data for these controls come from the 2017 US Census.

A hospital's market is defined differently across several specifications, resulting in different meanings of m_h across different regressions. I first use two common definitions

for a hospital's market in the literature: Hospital Service Area (HSA) and Hospital Referral Region (HRR), both defined and made publicly available by the Dartmouth Atlas of Health Care. An HSA delineates a local market for hospital care, composed of a collection of zip codes whose residents receive most of their hospitalizations from the hospitals in that area. For the most part, this calculation is based on assigning each zip code to the area where the greatest proportion of its Medicare patients were hospitalzed. Most HSAs contain only one hospital. An HRR dilineates regional health care markets for tertiary medical care and each contains at least one hospital that performs major cardiovascular procedures and neurosurgery. HRRs were largely defined by assigning HSAs to the region where the greatest proportion of major cardiovascular procedures were performed. My dataset contains 29 unique HSAs and 4 unique HRRs.

For both the HSA and HRR market definitions, I count the total number of hospitals within each hospital's market as well as the number of hospitals that provide the same service/procedure within that market such that the market term in Equation (3) becomes m_{jh}. This attempts to isolate whether the hospital is truly competing with other hospitals in its market in providing procedure j or whether it may be the only hospital in its market providing that service and therefore faces no competitors. While the 33 radiology services I have restricted my analysis to are quite common, I do not observe prices for all service-hospital combinations in the HealthCost data because some hospitals provide certain services very infrequently or not at all. Thus, I restrict my estimates only to service-hospital combinations for which I observe prices. Most hospitals in the dataset do provide at least half of the relevant services and there does not appear to be a consistent set of services for which price data is missing.

The second set of market definitions I use are based on geographical radii drawn around each hospital. As with the HSA/HRR market definitions, I count the total

number of hospitals as well as the number of hospitals that also provide the same service/procedure within a 5 mile radius (local market) and a 25 mile radius (a broader market) of each hospital h. As the services being examined are all outpatient services, the HSA/HRR definitions may not truly capture the potential patient population and potential competitors because they are calculated on the basis of hospitalization (inpatient) events. For outpatient services, patients may be able to "shop" more easily among different hospitals and this may affect their choice of insurance plan. That is, potential patients may place greater weight on convenience and distance to the hospitals they can go to in the outpatient setting rather than the intensity of care they can receive there because their health status is often not as acute as in the inpatient setting. Therefore, insurers may want to provide attractive plans that offer patients enough convenient choice in their relevant market but without facing high premiums or out-of-pocket costs. Thus, this radial measure of a hospital's market may be more applicable to consumers' choices in the outpatient setting.

The primary coefficient of interest in this second set of regressions is $\hat{\alpha}$ which estimates how hospital competition may be related to prices. If $\hat{\alpha}$ is negative, this suggests that the more hospital competition there is within a hospital's market, the lower the prices.

The last regression I perform investigates whether hospital competition is related to negotiated prices differently for different insurers. That is, one insurer may be more sensitive to the number of hospitals present in hospital h's market because leveraging hospital competition is a more prominent strategy in their price negotiations. How well an insurer is able to leverage such information may in turn be a function of their own market share. Thus, the final regression equation is otherwise the same as Equation (3) but includes an interaction between the number of hospitals in hospital h's market and an indicator for

$$y_{ijh} = \sum_{k \epsilon K} \gamma_k \left[insurer_k\right] + \delta_j + \alpha m_h + \sum_{k \epsilon K} \zeta_k (m_h * [insurer_k]) + \beta_1 \eta_{jh} + \beta_2 \vartheta_h + \beta_3 X_{c(h)} + \varepsilon_{ijh} \tag{4}$$

The primary coefficient of interest is $\hat{\zeta}_k$ which estimates how the addition of one additional hospital to hospital h's market affects the price negotiated with insurer n for procedure j. The relative magnitudes of $\hat{\zeta}_k$ may indicate the ability or willingness of different insurers to leverage information on hospital competition in price negotiations.

VI Results

The first set of results presented in Table 2 demonstrate that there are statistically significant differences in the prices paid by each insurer for a particular service at a particular hospital. The coefficients are presented as the average percentage of the Medicare price that each insurer pays and in the primary regression (column 1), they suggest that on average Anthem pays 1.22 times the Medicare price, Harvard Pilgrim pays 1.37 times the Medicare price, and CIGNA 1.60 times the Medicare price. Alternatively, this means that Harvard Pilgrim pays on average 12.4% above Anthem's price and CIGNA 31.5% above Anthem's price.

The positive direction of the coefficients is unsurprising as Medicare consistently reimburses providers at much lower rates than do private insurers. The coefficients are estimated using standardized prices that attempt to account for the bundled nature of payments and match prior literature. However, it is interesting to note that among the inpatient services they examine, Cooper et al. (2015) find the greatest disparity in Medicare versus private reimbursement for lower limb MRIs, the only radiology service they consider, estimating that private insurers pay on average four

Table 3: Private Insurance Carrier and Relative Prices

	Dependent variable:		
	Percent of Medicare Price		
	(1)	(2)	(3)
Anthem	119.189***	123.428***	122.227***
	(4.676)	(4.797)	(4.936)
Harvard Pilgrim	145.762***	147.395***	145.991***
	(3.820)	(4.031)	(4.150)
CIGNA	163.349***	168.794***	166.321***
	(4.399)	(4.575)	(4.700)
Constant	95.590***	92.600***	100.000***
	(12.024)	(8.706)	(2.319)
Hospital Fixed Effects	Yes	No	No
Procedure Fixed Effects	Yes	Yes	No
Observations	1,651	1,651	1,651
R^2	0.655	0.598	0.559
Note:			*p<0.1; **p<0.05; ***p<0.01

times the Medicare price, so perhaps Medicare is particularly able to set low prices for radiology services given the low per-unit cost of radiology services. Additionally, the price data from HealthCost reflects "bundled" prices as detailed in Section III, so they are likely somewhat inflated compared to the Medicare prices. Importantly however, HealthCost bundles payments in the same way across all three private insurers and therefore the variation in the prices paid by each insurer is unaffected by this imperfect standardization to the Medicare price.

The second set of results presented in Tables 3-4 suggest that the number of hospitals in a hospital's market is negatively related to price, and this relationship is negative at a statistically significant level for most definitions of a hospital's market. Table 3 presents the results where markets are defined at the hospital level by HSA/HRR or radius, and Table 4 presents the results where markets are defined at the hospital-procedure level by HSA/HRR or radius. On the whole, these results suggest that, controlling

for typical patient complexity, hospital quality, and county level characteristics, the greater the number of hospitals in a hospital's market, the lower the prices at that hospital are. These results are consistent with the story that competition between hospitals may lead to lower prices.

The HSA coefficients and the 5-mile radius coefficients are identical within each specification as there were no hospitals for which the number of hospitals within the market differed between the HSA and 5-mile radius definitions. This speaks to the fact that especially for basic health needs, many patients choose which hospital to go to based on proximity. The relationship between price and hospital density becomes more negative in these local markets when considering competition at the hospital-procedure level, and it is estimated that the addition of one more hospital to hospital h's local market is associated with a decrease in the price for procedure j by roughly 10% of the Medicare price for that same procedure.

The coefficient on the number of hospitals within a hospital's HRR is consistently negative but only statistically significant at the 5% level when considering the total number of hospitals in a hospital's market. In contrast, the coefficient on the number of hospitals within a 25-mile radius of hospital h is highly statistically significant in both specifications; the addition of one hospital to hospital h's market (defined by a 25-mile radial distance) is associated with a price decrease equivalent to approximately 5% of the Medicare price for procedure j at hospital h. The difference in both the significance and magnitude of these two measures may be attributed to the fact that for basic primary care services, such as outpatient radiology services, the HRR definition of a hospital's market is not very applicable as HRRs attempt to capture the markets for tertiary (more specialized or involved) care. Rather, what may be most important to patients is how far the hospital is from their home or work, and a 25 mile radius equates to roughly a 30-45 minute drive in most parts of New Hampshire, which

Table 4: Hospital Competition and Relative Price

	Dependent variable:			
	Percent of Medicare Price			
	(1)	(2)	(3)	(4)
Total Hospitals in HSA	-7.267^{*}			
	(3.988)			
Total Hospitals in HRR		-2.020^{***}		
		(0.638)		
Total Hospitals in 5-mile radius			-7.267^{*}	
			(3.988)	
Total Hospitals in 25-mile radius				-3.448^{***}
				(1.319)
Typical Patient Complexity	7.582^{*}	7.294^{*}	7.582^{*}	7.255^{*}
	(4.322)	(4.309)	(4.322)	(4.313)
Hospital Quality	-0.010	-1.478	-0.010	0.020
	(2.541)	(2.445)	(2.541)	(2.494)
Median Income (1000s)	0.342	0.729^{***}	0.342	0.788^{***}
	(0.226)	(0.255)	(0.226)	(0.281)
Percent Population 65 and older	-1.618^{**}	-1.502^{*}	-1.618^{**}	-1.505^{*}
	(0.785)	(0.772)	(0.785)	(0.773)
Population Density	-0.039^{***}	-0.054^{***}	-0.039^{***}	-0.037^{***}
	(0.005)	(0.007)	(0.005)	(0.005)
Anthem	123.048^{***}	122.363^{***}	123.048^{***}	122.307^{***}
	(4.794)	(4.762)	(4.794)	(4.766)
Harvard Pilgrim	146.908^{***}	146.539^{***}	146.908^{***}	146.664^{***}
	(3.966)	(3.959)	(3.966)	(3.962)
CIGNA	166.070^{***}	165.780^{***}	166.070^{***}	165.624^{***}
	(4.527)	(4.516)	(4.527)	(4.521)
Constant	106.590^{***}	100.991^{***}	106.590^{***}	82.889^{**}
	(34.113)	(33.659)	(34.113)	(34.099)
Procedure Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,651	1,651	1,651	1,651
R^2	0.613	0.615	0.613	0.614
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5: Hospital Competition by Procedure and Relative Price

	Dependent variable:			
	Percent of Medicare Price			
	(1)	(2)	(3)	(4)
Hospitals in HSA w/ procedure	−9.315**			
	(4.108)			
Hospitals in HRR w/ procedure		−1.526***		
		(0.578)		
Hospitals in 5-mile radius w/ procedure			−9.315**	
			(4.108)	
Hospitals in 25-mile radius w/ procedure				−3.360***
				(1.256)
Typical Patient Complexity	7.322*	7.144*	7.322*	7.307*
	(4.316)	(4.313)	(4.316)	(4.313)
Hospital Quality	0.270	−1.325	0.270	−0.142
	(2.537)	(2.446)	(2.537)	(2.480)
Median Income (1000s)	0.350	0.684***	0.350	0.715***
	(0.225)	(0.258)	(0.225)	(0.263)
Percent Population 65 and older	−1.675**	−1.402*	−1.675**	−1.677**
	(0.784)	(0.771)	(0.784)	(0.780)
Population Density	−0.039***	−0.049***	−0.039***	−0.036***
	(0.005)	(0.007)	(0.005)	(0.005)
Anthem	123.020***	122.246***	123.020***	122.182***
	(4.782)	(4.766)	(4.782)	(4.766)
Harvard Pilgrim	146.822***	146.548***	146.822***	146.665***
	(3.964)	(3.963)	(3.964)	(3.962)
CIGNA	165.926***	165.756***	165.926***	165.724***
	(4.523)	(4.520)	(4.523)	(4.520)
Constant	109.379***	92.302***	109.379***	88.696***
	(34.125)	(33.714)	(34.125)	(33.808)
Procedure Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,651	1,651	1,651	1,651
R^2	0.614	0.614	0.614	0.614
Note:				*p<0.1; **p<0.05; ***p<0.01

means it is likely that many of a hospital's patients could live and/or work within that radius.

In addition the the variables concerned with the hospitals' market share, the control variables also provide some interesting coefficients. Higher typical patient complexity for procedure j at hospital h is positively associated with price, which is intuitive given that hospitals with higher typical patient complexity for procedure j are likely perceived to offer higher quality service for that procedure; this provides further control for quality variation because patients requiring more complex care will value hospital specialization in this area of care, and hospitals that do decide to specialize in providing procedure j may invest in more expensive equipment or techniques. The coefficient estimates that hospital's with "High" typical patient complexity for procedure j receive roughly 15% higher prices than hospitals with "Medium" patient complexity for procedure j and 30% higher prices than hospitals with "Low" typical patient complexity for procedure j. Overall hospital quality, after controlling for other hospital characteristics is consistently statistically equivalent to zero, which is in line with my theoretical framework that overall quality has little to do with prices for radiology services, and it appears that most quality variation may be accounted for by the "Typical Patient Complexity" control. The median household income of the county in which the hospital is associated is unsurprisingly positively associated with hospital prices, though more statistically so at the procedure-level. However, the controls for the percent of the population 65 and older and population density are consistently statistically significant and negative. This suggests when hospitals potentially serve a large number of Medicare patients, there may be downward pressure on prices, contrary to cost-shifting theory.

The last set of results presented in Table 5 shows the interaction between hospital density and each insurer, where hospital density is measured by counting the number

Table 6: Hospital Competition by Procedure and Insurer and Relative Price

	Dependent variable:
	Percent of Medicare Price
Hospitals in 25-mile radius w/ procedure x Anthem	−2.451
	(2.172)
Hospitals in 25-mile radius w/ procedure x Harvard Pilgrim	−9.831***
	(1.825)
Hospitals in 25-mile radius w/ procedure x CIGNA	0.359
	(2.259)
Hospitals in 25-mile radius w/ procedure	−0.624
	(1.495)
Typical Patient Complexity	7.117*
	(4.282)
Hospital Quality	−0.519
	(2.460)
Median Income (1000s)	0.706***
	(0.261)
Percent Population 65 and older	−1.755**
	(0.775)
Population Density	−0.037***
	(0.005)
Anthem	133.119***
	(11.658)
Harvard Pilgrim	190.692***
	(9.064)
CIGNA	163.482***
	(11.421)
Constant	79.469**
	(33.616)
Procedure Fixed Effects	Yes
Observations	1,651
R^2	0.622
Note:	*p<0.1; **p<0.05; ***p<0.01

of hospitals within a 25-mile radius of hospital h that also offer procedure j as I find this to be the most reasonable specification for hospital competition. The estimated coefficients suggest that the prices Harvard Pilgrim negotiates with hospitals are associated more strongly with the number of hospital's in that hospitals market than for Anthem and CIGNA. The addition of one more hospital that offers procedure j within hospital h's market and also has a contract with Harvard Pilgrim is associated with a price decrease for procedure j at hospital h equivalent to about 12% of the Medicare price for that procedure.

VII Discussion

The results as a whole suggest that the market power of insurers and hospitals may be related to the prices hospitals and insurers negotiate as the theoretical framework would predict. That is, the insurers and hospitals with the greatest market shares or that face the least competition are able to negotiate the most favorable prices; for the insurers, this translates into negotiating lower prices, and for hospitals, this means negotiating higher prices.

While definitive conclusions about the effect of insurer market share cannot be made from these results given the limitations mentioned in the Empirical Approach, the order of their magnitudes suggests that the larger the market share of the insurer, the more market power it is able to exert and the lower the prices that insurer pays at each hospital for a given procedure. Anthem, with the largest share of the market, pays less on average than both Harvard Pilgrim and CIGNA; Harvard Pilgrim, which is smaller than Anthem but bigger than CIGNA, pays somewhere between the Anthem and CIGNA price on average; and CIGNA, the smallest of the major insurers, consistently pays much more than both Anthem and Harvard Pilgrim.

The uniquely strong interaction between hospital competition and Harvard Pilgrim may be explained by differences in company structure between Harvard Pilgrim and the other two major insurers, Anthem and CIGNA. Harvard Pilgrim is a small, private, non-profit health insurance company active mainly in the Northeast United States whereas Anthem and CIGNA are both massive, publicly traded companies that provide insurance nationally. Anthem and CIGNA may not bargain as hard with hospitals on the basis of hospital competition because the marginal payoff from getting somewhat lower prices for a relatively small portion of the population they insure in New Hampshire is less than the effort investment it requires to acquire these lower prices. Harvard Pilgrim on the other hand may exert much more effort in leveraging hospital competition in its price negotiations because the marginal benefit of lower prices is greater given that New Hampshire residents make up a greater portion of the population it insures.

However, there are several key limitations of this analysis in addition to the few that have been mentioned above. Namely, the analysis is limited by the lack of granularity of the data. First, the insurers' market share is only available at the state-level and therefore it cannot be explored whether the market power of each insurer within each hospital's market affects negotiated prices. Next, the hospital's true market share is also unknown as I do not have volume data for each hospital for each service, and I also do not have data on the variation of this volume across different insurers. One hospital may serve many more Medicare patients or Anthem patients than another, but this cannot be accounted for in my analysis. Lastly, the availability of price data is very limited and somewhat aggregated. I restrict my analysis only to outpatient radiology services in order to plausibly control for cost and quality both within and across hospitals, but the results may not extend to other forms of hospital care.

VIII Conclusion

Despite the limitations of this analysis, both sets of results (insurer and hospital level) suggest that private insurers and hospitals with greater market shares are able to negotiate more favorable prices for themselves. This implies that prices are lower for the insurer with a greater market share and at the hospital with a smaller market share. Thus, taken at face value, policy aimed at lowering hospital prices should either aim to increase the market power of insurers or to increase hospital competition.

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