NBER WORKING PAPER SERIES

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Zack Cooper
Fiona Scott Morton
Nathan Shekita

Working Paper 23623
http://www.nber.org/papers/w23623

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2017

This project received financial support from the National Institute for Health Care Management Foundation. We also received helpful feedback from Amanda Starc, Stuart Craig, Chima Ndumele, and Leemore Dafny. We are appreciative for the excellent research assistance from Eugene Larsen-Hallock and Charles Gray. All mistakes are our own. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Surprise! Out-of-Network Billing for Emergency Care in the United States
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JEL No. I11,I13,I18,L14

ABSTRACT

Using insurance claims data, we show that in 22% of emergency episodes, patients attended in-network hospitals, but were treated by out-of-network physicians. Out-of-network billing allows physicians to significantly increase their payment rates relative to what they would be paid for treating in-network patients. Because patients cannot avoid out-of-network physicians during an emergency, physicians have an incentive to remain out-of-network and receive higher payment rates. Hospitals incur costs when out-of-network billing occurs within their facilities. We illustrate in a model and confirm empirically via analysis of two leading physician-outsourcing firms that physicians offer transfers to hospitals to offset the costs of out-of-network billing and allow the practice to continue. We find that a New York State law that introduced binding arbitration between physicians and insurers to settle surprise bills reduced out-of-network billing rates.

Zack Cooper
Yale University
77 Prospect Street
New Haven, CT 06511
zack.cooper@yale.edu

Nathan Shekita
Yale University
77 Prospect Street
New Haven, CT 06511
nathan.shekita@yale.edu

Fiona Scott Morton
Yale School of Management
Box 208200
New Haven, CT 06520-8200
and NBER
fiona.scottmorton@yale.edu

A data appendix is available at http://www.nber.org/data-appendix/w23623

1. Introduction

Surprise medical billing occurs when a patient receives a bill from an out-of-network health care provider whom the patient reasonably thought would be participating in her insurer's network. The most troubling surprise bills are those that occur for emergency services, where patients are in medical distress and do not chose and cannot avoid out-of-network doctors. Each year, there are 41.9 emergency department (ED) visits per 100 people in the United States (US) (Centers for Disease Control and Prevention, 2013). When a person requires urgent medical care, she effectively chooses an "emergency bundle" that includes a hospital ED and the physicians working in that hospital. However, what most privately insured patients do not realize is that hospitals and physicians independently negotiate contracts with insurers. As a result, it is possible for a patient to choose a hospital ED that is in-network with her insurer, but receive care and a subsequent 'surprise' bill from a physician working in that ED who does not have a contract with her insurer. These out-of-network bills reflect physicians' charges, which, unlike payments for most medical services, are not set through a competitive process. In previous work, Cooper and Scott Morton (2016) found that 22% of privately insured patients who attended to in-network hospital ED were treated by an out-of-network physician.[1] They estimated that the average potential surprise bill was $622.55. Given that nearly half of individuals in the US do not have the liquidity to pay an unexpected $400 expense without taking on debt and ED visits are so common, these out-of-network charges can be financially devastating to a large share of the population and should be a major policy concern (Board of the Governors of the Federal Reserve System, 2016).

In this paper, we analyze data from a large insurer that covers tens of millions of lives annually to study the drivers of out-of-network billing for emergency care. Our data cover nearly $28 billion in emergency spending on nearly 9 million ED episodes from 2011 through 2015. We model the incentives for insurers and physicians to respectively, form and join provider networks. We also model hospitals' incentives to permit out-of-network billing to occur within their facilities. We then explore where and why out-of-network billing occurs and examine the impact of a 2014 New York State law designed to protect consumers from surprise bills. Finally, based on our analysis of the drivers of out-of-network billing and evidence from our assessment

[1] Garmon and Chartock (2016) also examined out-of-network billing rates using separate data. They found that 20% of in-network emergency visits involved an out-of-network physician.

of the New York State out-of-network law, we make policy recommendations aimed at protecting consumers and restoring a competitively set payment rate for physicians who staff emergency departments (ED physicians hereafter).[2]

There have been significant changes over the last several decades in the structure of emergency medicine and the role that EDs play as a source of patients for hospitals. Over time, EDs have become one of the main pathways through which patients are admitted to the hospital (Morganti et al., 2013). From 1993 to 2006, the share of all inpatient stays that were admitted to the hospital via an ED increased from 33.5% to 48.3% (Schuur and Venkatesh, 2012). Because EDs have become a major source of patients, hospitals now want to keep their EDs open at all hours and run them efficiently (Institue of Medicine, 2006, Morganti et al., 2013). As a result, there has been a marked increase in the outsourcing of management of hospital EDs. ED outsourcing companies hire and manage physicians, manage ED operations, and take care of billing. At present, approximately two-thirds of hospitals outsource their EDs (Deutsche Bank, 2013). Among the hospitals that outsource their services, approximately a third contract with a large, national outsourcing chain (Dalavagas, 2014). There are two leading national outsourcing firms – EmCare and TeamHealth - that collectively capture approximately 30% of the physician outsourcing market (Deutsche Bank, 2013).

In this paper, consistent with our previous analysis, we find that from 2011 through 2015, 22% of patients who attended an in-network ED were treated by an out-of-network physician. Out-of-network physicians charge, on average, 637% of what the Medicare program would pay for identical services. This compares to in-network payment rates that average 266% of the corresponding Medicare rates. Of note, out-of-network billing is concentrated in a minority of hospitals. We find that 50% of hospitals have out-of-network billing rates below 5% while 15% of hospitals have out-of-network billing rates above 80%. We also find that out-of-network rates are significantly higher at for-profit hospitals. We show that the two large, national ED staffing companies have distinct out-of-network strategies. We find that hospitals that contract with EmCare to run their EDs have an average out-of-network billing rate of 62%. In contrast, hospitals that contract with TeamHealth have an average out-of-network billing rate of 13%.

[2] Physicians who staff hospital EDs are not necessarily board certified in emergency medicine. For example, in Iowa, EDs are predominantly staffed by physicians trained in family medicine (Groth et al. 2013).

In our model of physician behavior, we show that out-of-network billing allows physicians to significantly increase their payment rates. Ultimately, because patients cannot avoid out-of-network physicians during emergency visits, this increase in price does not lead to a decrease in demand. Hospitals, by contrast, do not directly gain when physicians bill out-of-network from inside their facilities. Instead, hospitals may incur costs from the practice in the form of reputational harm. As a result, hospitals would prefer physicians not to bill out-of-network from within their facilities. To motivate hospitals to allow out-of-network billing to occur inside their facilities, we show that physicians and physician outsourcing companies may need to compensate hospitals with a sufficiently large transfer to outweigh the costs they incur from the practice.

In our analysis, we find empirical results consistent with our model. In our data, we find that when EmCare – which has an average out-of-network billing rate of 62% - takes over the management of emergency services at hospitals with low out-of-network rates, they raise out-of-network rates by over 81 percentage points and increases average physician payments by 117%. Consistent with our model, there are clear benefits for the hospital when EmCare takes over management of its ED. Following the entry of EmCare, facility payments increase by 11%. These increased payments are driven, in part, by increases in imaging rates of 5%, and a 23% increase in the rate that physicians admitted patients to the hospital. We also find that following the entry of EmCare, physicians were 43% more likely to bill for emergency visits using the highest paying and highest acuity billing code. Interestingly, TeamHealth – which has an average out-of-network billing rate of 13% - appears to have a somewhat different strategy. On average, in our data, when TeamHealth enters a hospital, out-of-network rates increase by 33 percentage points and physician payment rates increase by 68%. However, the entry of TeamHealth is not associated with an increase in the rate imaging studies are performed, the rate patients are admitted to the hospital, or the rate that physicians bill using the highest paying billing code for emergency care. Instead, we find that the entry of TeamHealth led to a 30% increase in the number of cases treated per year in entry hospitals' EDs. Our finding that the two large management companies pursue such distinct strategies indicates that any policy response in this area should be nuanced.

In addition, we use our data to study the impact of a 2014 New York law that was designed to protect patients from surprise out-of-network billing. The law prohibited patients who saw an out-of-network physician during an emergency episode from paying more than what they would have paid out-of-pocket had they been treated by an in-network physician (Hoadley et al., 2015). In order to determine the rate that insurers pay physicians for out-of-network ED services, the law created a binding, "baseball rules" arbitration process to settle payment disputes (Hoadley et al., 2015). We found that the New York law lowered the incidence of out-of-network billing by 34% and reduced the likelihood that patients saw an out-of-network physician. Going forward, we also explore additional policy alternatives that could increase competition in health care markets while reducing out-of-network billing.

This paper is structured as follows. Section 2 gives background on ED care in the US and describes the impact of surprise out-of-network billing on patients. In Section 3, we describe our data and give an overview of rates of out-of-network ED billing we observe across the US. In Section 4, we model the incentives of physicians and hospitals to engage in out-of-network billing. In Section 5, we identify the factors associated with out-of-network billing. In Section 6, we analyze the impact of the entry of EmCare and TeamHealth on out-of-network billing. Section 7 analyzes the impact of a New York State law designed to end out-of-network billing and propose our own policy to address the issue. We conclude in Section 8.

2. Background

2.1 The Evolution of Emergency Medicine in the United State

The field of emergency medicine developed in the wake of World War 2. From the 1970s through the 1990s, care in hospital-based EDs shifted from being provided on an ad hoc basis by community physicians to being delivered, round-the-clock, by doctors who often have completed ED residencies and are board-certified in emergency medicine (Institute of Medicine, 2006).[3] At present, there are over 4500 EDs in the US and approximately 40,000 physicians who staff them nationwide (Hsia et al., 2011; Morganti et al., 2013). EDs deliver more than 130 million episodes annually and approximately one in five individuals attends an ED each year. (Hsia et al., 2011).

The use of EDs has risen dramatically over time. From 1993 to 2003, the US population grew by 12%, hospitalizations increased by 12%, and ED visits increased by 26% (Institute of Medicine, 2006). From 2001 through 2008, the use of EDs increased 1.9% each year - 60%

[3] Many EDs are not staffed by board-certified ED physicians. Approximately a third of emergency care is provided by family physicians. In rural states, the share of family physicians delivering emergency care is over 50% (Wadman et al., 2005; Groth et al., 2013; McGirr et al., 1998).

faster than concurrent population growth (Hsia et al., 2011). The growth in ED visits drove, almost entirely, the growth in hospital admissions in the 2000s (Morganti et al., 2013). At present, nearly 50% of hospitals' inpatient beds are filled with patients who were admitted via the ED (Morganti et al., 2013). Overtime, as the use of EDs has gone up, waiting times to be treated inside EDs have also increased (Hing and Farida, 2012). In response to rising waiting times, EDs are increasingly competing on the length of time patients have to wait before they are treated (Esposito, 2016; Rice, 2016). As a result, efficiently run hospital-EDs are crucial to hospital revenue.

Ultimately, ED care is profitable for hospitals. Wilson and Cutler (2014) estimate that average ED profit margins are approximately 7.8%. However, the profit margins that hospitals face for ED care vary significantly depending on how patients' care is funded and based on whether or not a patient is admitted to the hospital. Wilson and Cutler (2014) found that hospitals had profit margins of 39.6% for privately insured patients treated in EDs, whereas the profit margin for patients covered by Medicare and Medicaid, and those uninsured were -15.6%, -35.9% and -54.4% respectively. They also found that patients who were admitted to the hospital were significantly more profitable than those who were not. Indeed, for Medicare patients, the profit margin on ED care for patients who were discharged from the ED was -53.6% whereas the profit margin for patients who were admitted to the hospital was 18.4% (Wilson and Cutler, 2014).

Payment rates to ED physicians from private insurers, measured as a share of Medicare payments, are higher than in other specialties in our dataset. Whereas orthopedists get paid 178% of Medicare rates for performing knee replacements and internists received 158.5% of Medicare rates for routine office visits, ED physicians were paid, on average, at 297% of Medicare payments (Cooper and Scott Morton, 2016). Likewise, Bai and Anderson (2017) found ED physicians' charge to Medicare ratio was in the top quartile of all specialties and was 4.0, compared to the median ratio among all physicians of 2.5. ED physicians are also well compensated relative to doctors working in other specialties. In 2016, according to two analyses, ED physicians earn approximately $320,000 per year, which puts them in the top half of the income distribution of all physicians by specialty (Peckham, 2016; Hamblin, 2015).

Over time, as ED care has accounted for a growing share of hospital admissions, the structure of emergency medicine has changed. Since the 1990s, there has been a steady increase in the rate that hospitals outsource the management, staffing, and billing of their EDs. As a William Blair & Company (2013) report noted, "this outsourcing trend is primarily driven by the difficulty of efficiently staffing and managing an ED; for many hospitals, this department is its most unprofitable unit. Yet efficient EDs (i.e. those with high throughput and strong customer satisfaction) are a critical function of the hospital" (Pg. 4). At present, roughly 65% of the physician market is outsourced (Deutsche Bank, 2013). Deutsche Bank estimated that across the US, 35% of ED physicians are self-employed, 12% work for regional groups, 31% work for local groups, and 22% work for national firms.

The national market for physician outsourcing is dominated by two firms that collectively account for approximately 30% of the outsourced physician market. EmCare is publicly traded, operates in 45 states, has 23,100 affiliated or employed physicians and health care professionals, and, according to their 2016 10K statement, delivers over 18 million emergency episodes per year. More recently, EmCare has partnered with a large, for-profit hospital chain and formed joint ventures where they and their hospital partners share in profits from physician bills (Deutsche Bank, 2013).

The second firm, TeamHealth, is approximately the same size. According to its most recent 10K statement, it has more than 18,000 affiliated health professionals and delivers approximately 10,000,000 ED cases per year. TeamHealth recently acquired another physician outsourcing company and now is likely to have the largest market share in the physician outsourcing space. The firm was previously publicly traded, but was taken private in 2016.

2.2 Out-of-Network Surprise Billing

There has been significant coverage of out-of-network billing in EDs in the popular press (Rosenthal, 2014a; Rosenthal, 2014b; Sanger-Katz and Abelson, 2016). However, until recently, there has been no systematic evidence on the frequency with which out-of-network billing occurs. Recent survey work suggests that it is fairly common for privately insured patients to be treated by out-of-network physicians. A Consumer Union (2015) survey found that 30% of privately insured individuals reported receiving a surprise medical bill in the last year. Likewise, among those with trouble paying a medical bill, 32% reported that their financial troubles stemmed from a bill from an out-of-network provider for services that were not covered or were only partially covered by their insurer (Hamel et al., 2016). In this Hamel et al. (2016) survey, the authors found that bills from ED physicians made up the largest share of debt that patients reported having problems paying.

The results of these surveys have been confirmed by recent empirical evidence. A 2014 report found that among the three largest insurers in Texas, 45%, 56%, and 21% of their in-network hospitals had *zero* in-network ED physicians (Pogue, 2014). Likewise, in the first national study of out-of-network billing, Cooper and Scott Morton (2016) analyzed data from a large commercial insurer and found that 22% of in-network ED hospital visits included a primary physician claim from an out-of-network doctor. Using completely different data, Garmon and Chartock (2016) found that 20% of ED cases delivered to privately insured patients involved an out-of-network physician.

There appear to be two forms of out-of-network billing. The first arises from frictions in contracting, such as transaction costs that make it difficult for a physician to enter into a contract with every possible insurer who covers patients they happen to treat that year. Indeed, given the stochastic nature of ED visits, it is not surprising that some out-of-network billing occurs. Physicians could contract with most insurers in their area, but might see a patient from out-of-state with coverage from an insurer who does not have a large market presence in their area. By contrast, the second form of out-of-network billing, as we discuss, is likely a deliberate strategy to increase physician compensation, since out-of-network payment rates are significantly higher than in-network rates.

In general, most patients face higher co-insurance rates when they see out-of-network physicians and some insurance policies do not cover out-of-network care at all. When an insured patient sees an out-of-network physician, there are three potential outcomes. First, the insurer may pay the physician’s out-of-network bill in its entirety. This will protect the patient, but ultimately, insurers will pass the cost of these higher payment rates onto all beneficiaries in the form of higher premiums. It should also be noted that patients generally face higher co-insurance rates when they see an out-of-network provider. As a result, even if their insurer pays their physician his charge, the patient may still face substantial cost sharing. Second, the insurer may pay the out-of-network physician his usual and customary rate, which the insurer calculates based on average charges for the services provided. This payment is generally lower than the total billed amount. When this occurs, the physician may accept the usual and customary rate the insurer is offering and move on. Alternatively, the physician may pursue the patient to pay the difference between their charge and whatever the insurer paid. This is referred to as 'balance billing'. Third, the insurer may not cover the costs of out-of-network care at all, leaving the patient to pay the entire physician bill herself. As we show later from our data, these physician bills can be extremely large.

3. Data and Descriptive Statistics on Out-of-Network Billing

3.1 Data

In this study, we use claims data from a large commercial insurer that covers tens of millions of lives annually. Our data run from January 1, 2011 through December 31, 2015. The data are structured at a service-line level and include detailed patient characteristics, a provider identifier, and the ability to link to a range of third-party datasets. We define ED episodes as those with a physician service line that includes a Current Procedural Terminology (CPT) code for emergency services and a hospital revenue code associated with an emergency visit.[4] We limit our analysis to episodes that occurred at hospitals registered with American Hospital Association, so we do not include, for example, treatment that was delivered at urgent care clinics.

At baseline, our data include 13,444,445 episodes. We introduce several sample restrictions to our data to produce an analytic dataset. First, we exclude episodes that were missing an AHA hospital ID or did not come from an AHA-identified hospital. The analysis is thus focused only on hospital-based ED care. This restriction eliminates 1,908,710 episodes. Second, we exclude episodes where the same physician billed as in-network and out-of-network on separate service lines within the same claim form. This restriction eliminates 264,636 episodes. Third, we exclude episodes with duplicative insurer payments, insurer payments that were negative, or episodes where the insurer paid $0 because the claims were denied. This restriction removes 217,267 episodes. Fourth, we exclude episodes where the start date of the episode occurs after the end date of the episode. This restriction excludes 79 episodes. Fifth, we limit our analysis to hospitals that delivered ten or more episodes per year and appear in all five years of the data. This restriction excludes 330,312 episodes. Sixth, we limit our analysis to

[4] We identify ED claims for physicians as those that include a CPT code of 99281, 99282, 99283, 99284, 99285, or 99291 and a hospital service line as those with a revenue code of 0450, 0451, 0452, 0453, 0454, 0455, 0456, 0457, 0458, or 0459. We require episodes in our analysis to have both a physician service line with an ED code and a facility service line with an ED code.

individuals who had six months of continuous enrollment before their emergency episode.[5] This restriction excludes 1,810,245 episodes from our analysis. Finally, we winsorize the top and bottom 1% of prices in our data.[6] We do this to limit the influence of idiosyncratically high-priced and low-priced episodes.

In our data, we observe the amount the ED physician submitted as a charge, the allowed amount that the insurer paid the physician, and patients' co-insurance payments, co-payments, and spending under their deductibles. We define the total amount an ED physician was paid as the sum of the insurer payment, patient coinsurance payment, patient copayment, and the patient deductible on physician service lines that have a CPT code for emergency services.[7] We calculate facility payments as the sum across the whole episode of the insurer payment, patient coinsurance, patient co-payment, and patient spending under their deductible.[8] Unfortunately, we do not observe whether or not patients were balanced billed by physicians, so it is possible that the physician collects more in total than we can measure.

In addition, we construct an indicator for whether or not imaging occurred during an episode based on whether or not there are facility claims with revenue codes associated with imaging studies.[9] Likewise, we identify episodes as involving an admission to the hospital if the facility claim for the episode includes a revenue code for room and board fees.[10]

For each episode, we also observe the patient's sex, age (measured in 10-year age bins), and race (white, black, Hispanic, and other). We also use our claims data to measure historical patient spending for six and twelve month periods preceding an episode. Because we do not want the emergency episodes we are analyzing to feed into the historical spending measures, we measure spending from two-weeks before the admission date on an episode back six and twelve months. In addition, we used six and twelve months of claims data to calculate Charlson measures of comorbidity (Charlson et al., 1987).[11]

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[5] We did so because we wanted to have the ability to control for patients' historical spending and comorbidity.
[6] Our results are robust to not winsorizing prices, but there are extremely large hospital and physician charges and payments.
[7] These are service lines with a CPT code of 99281, 99282, 99283, 99284, 99285, or 99291.
[8] All prices are put in 2015 dollars using the BLS All Items Consumer Price Index.
[9] We identified episodes that included imaging studies based on whether or not the facility claims had a service line with revenue codes of 350-352, 610-619, 400-404, or 409.
[10] We identified room and board fees based on the following revenue codes on facility claims: 100,101,103, 110-160, 164, 167, 169-176, 179, 190-194, 199-204, 206-214, 219, 658, or 1000-1005.
[11] We pooled individuals with a Charlson score of six and higher.

3.2 Identifying Where EmCare and TeamHealth Have Contracts

EmCare and TeamHealth bill using their contracted physicians' NPI numbers. As a result, our claims data do not indicate that a particular claim is being billed by a physician employed by one of these firms. To identify the hospitals where EmCare and TeamHealth have outsourcing contracts, we use data from the firms' own webpages and documents from a report produced by a leading financial firm. We require two independent sources of information to classify a hospital as a facility that outsourced its ED services to EmCare and TeamHealth.

We rely on maps with approximate firm locations to provide the first source of information on which hospitals are affiliated with EmCare and TeamHealth. Envision, the parent company of EmCare, posted a map on their webpage that included the approximate location of each of the hospitals where EmCare has a contract (see Appendix Figure 1A). The map on its webpage included embedded latitude and longitudes within the webpage's underlying code, which we use to identify hospitals. Likewise, we use a map from TeamHealth's initial public offering in 2009 that shows the locations where TeamHealth had contracts in 2009 (see Appendix Figure 1B) (TeamHealth, 2009). To identify hospital locations on the map, we scrape the map using mapping software from ArcGIS[12].

The second source of information we use to identify hospitals that contract with EmCare and TeamHealth comes from job advertisements. Each firm posts job advertisements for physicians on their respective webpages (see an example in Appendix Figure 2). The job advertisements include the name of the hospital where physicians are being recruited and the specialty of the physicians they are looking to hire. We scraped the name of hospitals and the specialty of the physicians being recruited from all job postings posted by each firm that were available from the firms' webpages and webpage histories.

Ultimately, we identify a hospital as having a contract with EmCare or TeamHealth if we are able to both identify the hospital on a map of the outsourcing firms' locations and we found a job hiring post for the hospital. This strategy exploits the fact that these firms generally wholly take over an ED and participate in exclusive contracts with hospitals (Deutsche Bank, 2013).

[12] To obtain the latitude and longitudes of hospital locations displayed on the Morgan Stanley Report map, we utilized georeferencing within ArcMap. This technique aligns a map with a known coordinate system to the map of interest (which has no identified coordinate system). After transforming and overlaying the two aligned maps, we then obtain coordinate estimates of each marked hospital with a reasonable range of accuracy.

Using this strategy, we are able to find 194 hospitals associated with EmCare and 95 hospitals affiliated with TeamHealth. As a result, of the 3,345 hospitals in our analysis that meet our sample criteria, 5.8% outsource their ED to EmCare and 2.8% outsource their ED to TeamHealth. Based on investor reports on EmCare and TeamHealth, our sample of hospitals with contracts with EmCare and TeamHealth represent an undercount of the total population of hospitals that have contracts with EmCare and TeamHealth. Appendix Table 1 provides characteristics hospitals that outsource their ED services to EmCare and TeamHealth. Fifty-six percent of hospitals we identify as affiliated with EmCare were private and for-profit, versus 19% in our general sample. The hospitals with EmCare affiliations are also smaller and less likely to be teaching hospitals.

We will exploit the change in status of a hospital's ED when its contract with EmCare or TeamHealth begins. To do so, we identify hospitals where these firms entered into an outsourcing contract in the years between 2011 and 2015. To identify the hospitals where EmCare and TeamHealth entered into outsourcing contracts, we searched both companies' webpages for press releases announcing new contracts. Likewise, we used LexusNexus and Google to search the popular press for news stories that announced when either EmCare or TeamHealth entered into a hospital. Using this strategy, we find evidence that during our time period (2011 through 2015), EmCare entered into contracts with 16 hospitals that were part of 7 health systems while TeamHealth entered into contracts with 10 hospitals that were part of 5 systems (See Appendix Table 2). As we demonstrate in Appendix Table 3, the characteristics of the hospitals where EmCare and TeamHealth entered are similar to the characteristics of the sample of EmCare and TeamHealth hospitals that we observe in the cross-section.[13] The lone statistically significant difference at $p < 0.05$ is that the hospitals where entry occurred are larger than the wider sample of EmCare facilities. Likewise, hospitals were EmCare entered have more technology than hospitals in our general sample of EmCare hospitals ($p < 0.10$). There are no statistically significant differences between the TeamHealth entry hospitals and the wider sample of TeamHealth hospitals that we analyze in the cross-section.

3.3 Summary Statistics for Our Data

[13] Insurer share captures the market share of our data supplier in the county in which the hospital is located.

Our final dataset is composed of 8,913,196 ED episodes funded by one large national insurer and delivered between January 1st 2011 and December 31st 2015 (see Table 1). Our data capture nearly $28 billion in emergency spending. Almost every episode in our data occurred at an in-network hospital. In our data, 76.7% of individuals with an ED episode had insurance from an administrative services only (ASO) insurance product, while the balance had coverage from fully insured plans. Appendix Table 4 includes descriptive statistics for our analytic sample of ED episodes. The average physician charge was $614.92. Physicians received, on average, 67% of their charge and were paid $412.09 for each case. The average facility claim had a charge of $6,642.39 and was paid $2,850.62 We find that 9% of patients who attended an ED were admitted to the hospital, and 28% of episodes involved some form of imaging. Finally, we find that among the five common ED physician CPT codes, 35% of cases were coded using the code for the most intensive services (CPT 99285), whereas 5% were coded using the code for the least intensive services (CPT 99281).

3.4 Descriptive Statistics on Out-of-Network Billing

Consistent with our results in Cooper and Scott Morton (2016), as we illustrate in Table 2, the average out-of-network rate nationally from 2011 through 2015 was 22%. We find that the median out-of-network billing rate, by hospital, was 26% and the rate of out-of-network billing for hospitals in the 75th percentile of the distribution of out-of-network billing rates was 48%. Together with Figure 1, which shows the distribution of out-of-network rates across hospitals in 2011, these show that there is a small group of hospitals with high rates of out-of-network billing. Indeed, we find that 15% of hospitals have out-of-network rates of over 80%

There is also significant variation in out-of-network rates across regions in the US. Appendix Figure 3 shows the distribution of out-of-network rates across hospital referral regions (HRRs) in the US.[14] Out-of-network rates are particularly high in Texas (46.3%), Florida (24.8%), and southern states such as Alabama (33.3%), Louisiana (34.9%), Mississippi (32.0%), Georgia (30.0%), and North Carolina (27.6%). Out-of-network rates, on average, have been falling over time. The rate dropped from 27.3% in the first quarter of 2011 to 17.6% in the fourth quarter of 2015 (see Appendix Figure 4). The drop in out-of-network rates over time came from

[14] A hospital referral region (HRR) is a geographic area defined by researchers at the Dartmouth Institute for Health Care Policy that captures the area where a patient may be referred for major cardiovascular surgery or neurosurgery. For more information, see dartmouthatlas.org.

hospitals located in both the upper end of the distribution (hospitals with out-of-network rates above 80%) and the bottom end of the distribution (hospitals with out-of-network rates below 20%) reducing their out-of-network rates (see Appendix Figure 5).

As Appendix Table 5 illustrates, the potential costs that patients face if they see an out-of-network ED physician is substantial. The average physician payment for an in-network ED visit in our sample was $326.70, which is 266% of the Medicare payment for these services.[15] The average charge for out-of-network physicians was $785.91 (637% of Medicare). We calculate patients' potential balanced bill as the difference between insurers' in-network payments and physicians' out-of-network charges on the same bills. We estimate that if the insurer paid out-of-network physician claims at in-network rates and the patient was responsible for the balance, the average patient would face a potential balanced bill of $448.78.

3.5 Generalizability of Our Data

Our data come from a single insurer that operates across all fifty states. Our data capture nearly $28 billion in economic activity, so it constitutes an interesting sample to study regardless of generalizability. However, to gauge the generalizability of our results, we compare the out-of-network rates we observe to out-of-network rates presented in Garmon and Chartock (2016) (the only other study that examines out-of-network rates nationally)[16] Garmon and Chartock use 2007 to 2014 data from the Truven Health MarketScan database. They focus on whether patients at in-network hospitals saw any out-of-network physicians. This is slightly different from our measure; we focus on the network participation of the primary physician on ED cases at in-network hospitals. Garmon and Chartock (2016) find that emergency cases that had an admission had out-of-network bills in one in five cases; outpatient emergency cases had out-of-network bills in 14% of cases. These results are fairly similar to our findings. They find out-of-network rates for admitted patients in in Florida, Texas, and New York of 37%, 34%, and 35% respectively. For those same states, when we focus on patients with an admission, we observe out-of-network rates during the 2011 to 2015 period of 25.6%, 42.4%, and 14.1%, respectively. They also find, like we do, that out-of-network rates are decreasing over time.

[15] These results differ somewhat from results presented in Cooper and Scott Morton (2016) because, in this version, we winsorize the top and bottom 1% of all payments.

[16] Cooper and Scott Morton (2016) is a national study, but it uses the same data used in this analysis.

4. Modeling Surprise Out-of-Network Billing

4.1 Incentives for Physicians to Engage in Out-of-Network Billing

Below, we present a simple model of the decision by a physician or physician group to contract with an insurance company.

A physician or physician group, indexed by *i*, considers the incremental profit it will obtain by failing to sign a contract with an insurer, *m*, and instead providing services out-of-network within hospital *h*. The physician can charge an out-of-network price (the charge) p^o that is weakly higher than their in-network rate p^n. In a standard market with downward-sloping demand, the physician would experience a decline in the number of patients she treats due to the higher out-of-network price. However, because we are modeling ED physicians, we make the more realistic assumption (for this setting) that demand is inelastic.[17] Therefore, if the physician does not enter into an insurance network and charges p^o, she obtains a quantity of patients that is equal to what she would receive if she were in-network, such that $q^o = q^n$. The physicians face some cost $c(q^o)$ to billing out-of-network. We do not model this cost, but it could include fixed costs, such as the physicians' own intrinsic dislike of the practice, potential peer pressure or disutility from colleagues, an unpleasant meeting at the hospital to explain the practice, and the cost of better software and staff necessary to collect p^o. There are also potential variable costs of out-of-network billing, such as more costly communications with patients, hospitals and insurers, and the costs of collecting on each individual bill.

Ultimately, in deciding whether to bill out-of-network, each physician *i* considers the incremental revenue from engaging in the practice for each hospital and insurer with which she interacts:

(1) $$\Delta Rev_{i,h,m}^{OON} = p_{i,h,m}^{o} q_{i,h,m}^{o} - p_{i,h,m}^{n} q_{i,h,m}^{n} .$$

This can be re-arranged, yielding:

(2) $$\Delta Rev_{i,h,m}^{OON} = \left(p_{i,h,m}^{o} - p_{i,h,m}^{n}\right) q_{i,h,m}^{n} + p_{i,h,m}^{o}\left(q_{i,h,m}^{o} - q_{i,h,m}^{n}\right) .$$

[17] We posit that demand is inelastic because ED physicians are not chosen by patients and cannot be avoided. Previous studies have exploited the fact that patients do not choose ED physicians as a source of plausibly exogenous variation in work assessing the impact of seeing physicians with greater or lower likelihood of prescribing opioids and seeing physicians at the end of their shift (Barnett et al., 2017; Chan, 2015).

The crucial observation we noted above is that within the emergency context, patients choose a bundle that includes physician and facility services and have no choice over their individual emergency physician. As a result, $q^{o}_{i,h,m} = q^{n}_{i,h,m}$. When this holds, Equation (2) simplifies to:

$$(3) \qquad \Delta Rev^{OON}_{i,h,m} = \left(p^{o}_{i,h,m} - p^{n}_{i,h,m}\right) q^{o}_{i,h,m} \, ,$$

for any given provider, where the key parameter determining revenue gains is the increase in price that the physician can obtain from going out-of-network. Summing over hospitals and subtracting the cost of out-of-network billing leads to the net profit for physician *i* to be out-of-network for any insurer *m*:

$$(4) \qquad \Delta \pi^{OON}_{i,m} = \sum_{h=1}^{H} \left[\left(p^{o}_{i,h,m} - p^{n}_{i,h,m}\right) q^{o}_{i,h,m} - c_{i,h,m}(q^{o}_{i,h,m}) \right] ,$$

It is worth discussing where the out-of-network rate, $p^{o}_{i,h,m}$, comes from. It is the physician charge and it is not competitively set (Reinhardt, 2006). Previous research shows that health care providers' charges have little correlation to their negotiated rates and are not influenced by bargaining leverage (Cooper et al., 2015). Bai and Anderson (2017) found that physicians who are not generally chosen by patients (ED physicians, anesthesiologists, and radiologists) have the highest charges relative to their actual payment rates. If demand is truly inelastic, then the out-of-network charges must be constrained away from infinity by factors such as the possibility of negative media coverage, negative public opinion, and the threat of litigation.

In our setting, we think ED management firms may have greater awareness of the intricacies of physician payment and better understand the benefits of setting higher charges than individual physicians operating in small group practices. Previous work from Clemens et al. (2016) show that individual physicians and physicians in small groups tend to set commercial prices that follow Medicare rates. In contrast, physicians in large group practices tend to have payment rates that are less strongly correlated with Medicare payment rates. Other market characteristics that reflect supply and demand, such as the number of physicians per capita, and market structure measures such as hospital, physician, and insurer Herfindahl Hirschman Indexes (HHIs) are likely to impact competitive prices (p^n). If p^o is not responsive to market characteristics, then the difference between the two prices will change with physicians' in-network payments and therefore the profit gain from moving out-of-network.

4.2 Incentives Facing the Insurer in Forming a Network

The insurer faces a tradeoff between including more physicians in its network and the higher price it would need to pay in order to contract with these physicians. The decision about how broad a network to create is a function of the preferences' of buyers (these are employers who purchase insurance plans on behalf of their employees and individuals who purchase insurance products in the individual market). A more complete physician network might be attractive to employers despite the cost. Alternatively, employers might be very responsive to the higher premiums needed to increase the ED physician network, and inattentive to the benefits of its breadth. A third view of the employers' preferences is that out-of-network ED physician billing may function as a very high co-payment for ED visits, which employers may actually like because it holds down utilization. Because we cannot observe the preferences of individuals and employers buying insurance, in this paper our model will omit the impact of the size of the ED physician network on employer demand for the plan. The incentives for the insurer become very simple when we omit the consumers' response to network size, but the model nonetheless yields useful insights.

The remaining cost to the insurer if it does not include a physician in its network is the high payment rates it will have to make to the out-of-network physician who treats the insurer's customers. Without a contract between an insurer and a doctor, there is no competitively set price. In these instances, the physician typically attempts to set the missing price by sending a bill with a charge on it; the insurer attempts to set the missing price by offering to pay either its standard contractual payment or their "usual and customary" payment.[18] It is likely that the physician charge is significantly higher than usual and customary rates and in-network payment rates, so they two sides may not reach an agreement. These disputes can be handled via litigation or by forcing patients to pay for the difference between what insurers are willing to pay and providers are willing to accept. States can also regulate the missing price. At present,

[18] Usual and customary payments are typically set at the average physician charge in a market.

approximately a quarter of states have introduced some form of legislation designed to address out-of-network billing.[19] In these states, the out-of-network payment rate that the insurer will pay is largely determined by states' policies, which, for the most part, seek to regulate the missing price.

In New Jersey, for example, insurers are required to pay physicians' charges if one of their beneficiaries sees an out-of-network doctor (Avalere Health LLC, 2015). Therefore, we can deduce that insurers in New Jersey would prefer to enroll physicians in their networks at a market price, but physicians have no financial incentive to join such a network. Without significant costs from going out-of-network, a physician would prefer to be paid at $p^{o}_{i,h,m}$ rather than accepting the lower network price. This type of policy raises the cost of emergency services, which will be passed along to consumers in the form of higher premiums.

In states such as California and Maryland, the insurer is required to pay the maximum of a fixed percentage of the Medicare payment rate (usually 125% of the Medicare rate) or the usual and customary charge (the average provider charge). Because physician charges are completely under the control of physicians and are not the result of any market interaction, when the law makes market prices out of physician charges, it creates an incentive for providers to inflate their charges. As a result, we overwhelmingly observe that usual and customary rates (which reflect physician charges) are greater than 125% of Medicare. If, counterfactually, the state's required payment were below the market price, the insurer would have no incentive to include physicians in a network at market prices.

In New York State, a 2014 law was passed that stipulates that if physicians and insurers cannot agree to a rate to cover out-of-network care, they will enter binding, "baseball rules" arbitration based on the existing paper trail (Department of Financial Services, 2015). Under this system, the physician sends a bill with their requested charge and the insurer either pays that amount or offers its usual and customary rate. If no agreement is reached, the bill moves to arbitration. The patient may not be billed and an arbitrator choses one of the two offers (either the physician charge or the insurer's usual and customary rate). Under these circumstances, $p^{o}_{i,h,m}$ should move closer $p^{n}_{i,h,m}$ but may not equal market rates in any given case because of imperfect information, measurement error, or other frictions.

[19] The nature of state policies vary dramatically both in terms of which insurance products they regulate (e.g. HMOs versus PPOs) and in how and if they seek to determine appropriate out-of-network payment rates.

These policy interventions represent solutions that states have come up with to fill in the missing price in the market. The price states choose to set is inevitably not the market price an insurer-physician pair would arrive at via standard negotiation. When providers (or insurers) anticipate that they will do better from the regulated price than the market price, they have an incentive to stay out (be kept out) of the insurer's network. As a result, state laws designed to address surprise billing can lead *more* physicians to opt out of joining networks.

4.3 Incentives Facing the Hospital

A hospital does not benefit directly from physicians engaging in out-of-network billing. Instead, hospitals experience costs from having out-of-network physicians work inside their facilities. These costs include reputational harm from patients who receive a surprise bill and attribute it to the hospital, the costs of dealing with aggrieved patients, and a decline in their reputation with insurers, who may be more likely to omit them from networks. These costs of out-of-network billing should be juxtaposed with the costs of having in-network physicians, which might include recruitment and training.

The change in profit to a hospital of having out-of-network billing occur inside its facility is therefore only a function of the differential costs that the hospital incurs from this practice, where:

$$\Delta\pi^{H}_{i,h,m} = C\left(q^{o}_{i,h,m}, q^{n}_{i,h,m}\right) . \tag{4}$$

For a hospital to avoid taking action to stop out-of-network billing by physicians, the physicians would need to compensate the hospital with a transfer, T, which must be weakly higher than the hospital's increased costs, such that:

$$T_{i,h,m} \geq C\left(q^{o}_{i,h,m}, q^{n}_{i,h,m}\right). \tag{5}$$

These transfers could take the form of physicians allowing the hospitals to share in physicians' profits (e.g. by allowing them to enter into joint ventures) or via increases in facility fees that result from increased testing rates, imaging rates, or admissions to the hospital. Recall that, ultimately, physicians control patient utilization and what gets billed by the hospitals. As a result, ED physicians have significant influence over hospitals' revenue.

5. Cross-Sectional Variation in Out-of-Network Billing

5.1 Lasso and Within HRR Variation in Hospitals' Out-of-Network Billing Rates

To assess the factors driving the variation in hospitals' out-of-network billing rates, we follow the approach of Finkelstein et al. (2016) and run a Lasso regression on a range of hospital characteristics, local area characteristics, physician market characteristics, and hospital market characteristics (a complete list and description of variables that we include in our first-stage Lasso are available in Appendix 1). We also include indicator variables for whether or not EmCare and TeamHealth had contracts with hospitals. The Lasso method applies a penalizing parameter to the coefficient of the explanatory variables included the regression. We use 10-fold cross-validation to choose the penalizing parameter that minimizes the mean squared error. We use this Lasso procedure to select a set of variables that we include in a second stage least squares regression that we run with year fixed effects.

Figure 2 presents our least squares estimates of variables selected using Lasso. We have also included several variables not included by the Lasso but which our model indicates should be in the regression because they affect the profitability of moving out-of-network. These include a measure of physicians per capita, and hospital, physician, and insurer Herfindahl Hirschman Indexes (HHIs).[20] We have standardized all continuous variables so that they have a mean of zero and a standard deviation of one. For continuous variables, the point estimates show the effect of a one standard deviation change in the measure. For binary variables, the point estimate illustrates the impact of having the variable take a value of one. These results are descriptive (e.g. not causal) and illustrate the partial correlates of hospital out-of-network billing rates.

[20] We created hospital HHIs for each hospital registered with the AHA. For each hospital, we drew a circle with a radius of 15-miles around each hospital We calculated an HHI within that circular area where the total market was the total number of hospital beds within that area and a firm's market share was its share of total beds in that area. We constructed insurer HHIs for each county using data from the HealthLeaders Insurance data. We defined the total market as the covered lives in the small and large group market. A firm's market share was its share of the total lives in that county in the small and large group market. We used physician HHIs measured at the county level, which we were graciously given by Loren Baker. The methods used to build these measures are described in Baker et al. (2014). We construct measures of physician per capital using physician information from the SK&A database and population data from the US Census Bureau.

As Figure 2 shows, the outsourcing firms are by far the most important predictors of out-of-network billing rates across hospitals. When EmCare manages a hospital's ED, the out-of-network rate is higher by 24 percentage points. In contrast, outsourcing a hospital's ED to TeamHealth is associated with a nine percentage point lower level of out-of-network billing.

In addition, we find that non-profit hospitals, government hospitals, and teaching hospitals have lower rates of out-of-network billing. Larger hospitals also have lower rates of out-of-network billing. Hospital concentration is associated with a 2.9 percentage point higher level of out-of-network billing. There is, however, not a precisely estimated relationship between insurer HHI and out-of-network billing. We also do not find a precisely estimated relationship between ED physicians per capita, physicians per capita, physician HHI, and out of-network billing. The higher the share of Medicare patients at a hospital, the higher the out-of-network billing rates. We also find that hospitals with lower amounts of technology have higher rates of out-of-network billing. Finally, we find that out-of-network billing is more common in high population areas. Likewise, we observe lower rates of out-of-network billing in areas with low inequality and high rates of married adults.

5.2 Within HRR Variation in Payment Rates and Out-of-Network Billing

Results from Figure 2 suggest that out-of-network billing is significantly higher at hospitals that outsource their ED to EmCare. To complement these results, we produce additional descriptive statistics on the within-HRR variation in payment and out-of-network rates for hospitals; we also examine the extent to which there is a positive correlation between hospital outsourcing of ED services and rates of out-of-network billing. To do so, we estimate:

$$(6) \qquad Y_{i,h,t} = \beta_0 + \beta_1 EmCare_i + \beta_2 TeamHealth_i + \sigma_h + \mu_t + \varepsilon_{i,h,t},$$

where we regress in turn physician payments, hospital payments and out-of-network rates for hospital *i,* located in HRR *h,* in quarter *t* against a vector of HRR fixed effects σ_h, quarter dummies μ_t, and indicators $EmCare_i$ and $TeamHealth_i$ that take a value of 1 if a hospital has outsourced its ED to EmCare or TeamHealth. Our EmCare and TeamHealth indicators are time invariant. Standard errors are clustered around hospitals.

As we illustrate in Table 3, hospitals that outsource their ED care to EmCare have higher physician charges, higher physician payments, higher facility charges, and higher out-of-network rates. The scale of these effects is large. When EmCare has an outsourcing contract with a hospital, physician payments are 36% higher than physician payment rates at hospitals that do not outsource their ED care to the firm. Likewise, hospitals that outsource their ED services to EmCare have out-of-network rates that are 75% higher than at hospitals that do not outsource their ED care to the firm. Indeed, within our data, while EmCare manages EDs at hospitals where 6.2% of the episodes in our data are performed, 13.3% of episodes with out-of-network physician claims occurred in EmCare facilities. We note that these results are not causal, as our outsourcing firms could be choosing to contract with a non-random set of hospitals.

Hospitals that outsource their ED care to TeamHealth also have higher physician charges and physician payments. However, hospitals that outsource ED care to TeamHealth have out-of-network billing rates that are 13.2 percentage points lower than hospitals that do not outsource to the firm.

6. The Effect of the Entry of EmCare and TeamHealth on Physician Payments, Hospital Activity and Out-of-Network Billing

6.1 Estimating the Impact of Firm Entry

One explanation for our cross-sectional results is that outsourcing ED care to EmCare raises hospitals' out-of-network billing rates. In what follows, we provide evidence on the causal impact that the entry of EmCare and TeamHealth into hospitals had on physician payments, hospital payments, hospital activity, and out-of-network billing rates. To do so, we compare hospital outcomes immediately before and immediately after EmCare and TeamHealth enter hospitals. We exploit evidence we collected from press releases, news stories on the firms' webpages, and articles in the popular press announcing the timing of the entry of EmCare and TeamHealth into hospitals. In total, we analyze the entry of EmCare into 16 hospitals between 2011 and 2015 and the entry of TeamHealth into 10 hospitals during the same period. We begin by showing trends in the raw data of hospitals where EmCare and TeamHealth entered. We follow that up with regression-based analysis.

Because EmCare and TeamHealth appear to have different strategies, we separately test the impact of their entries on hospital and physician behavior while constraining the specification to have one constant term and set of year dummies. Our estimation equation is therefore as follows:

$$(7) \qquad Y_{i,j,t} = \beta_0 + \beta_1 EmCare\_Entry_{j,t} + \beta_2 TeamHealth\_Entry_{j,t} + \delta_j + \theta_t + \varepsilon_{i,j,t}$$

where we estimate outcomes for episode *i* that occurs at hospital *j* in at time *t*. We regress this against indicators – $EmCare\_Entry_{j,t}$ and $TeamHealth\_Entry_{j,t}$ - that switch on take a value of one on and after the date the firm has taken over the management of a hospital's ED. The indicators return to zero on the dates that the firms exit hospitals if they lose a contract. We also include a vector of hospital fixed effects δ_j and unique month dummy, θ_t, for each month in the data. Our standard errors are clustered around hospitals. We interpret a discontinuous change in hospital behavior immediately following the entry of an outsourcing firm into a hospital as the causal impact of entry.

We compare outcomes at hospitals where the two outsourcing firms entered to outcomes at three sets of control hospitals: 1) all hospitals nationally which did not have EDs managed by EmCare or TeamHealth; 2) hospitals drawn from the same states where the hospitals that experienced entry were located, but did not outsource their ED services to EmCare or TeamHealth; 3) hospitals that were not managed by EmCare or TeamHealth that we matched to entry hospitals using propensity scores.[21]

It is conceivable that EmCare and TeamHealth entered hospitals with trends in out-of-network billing (or other outcomes) that differed from the trends in hospitals where entry did not occur. To test for this, we also introduce a second, more flexible estimation that allows us to follow the changes in out-of-network billing rates year by year at hospitals where entry occurred (relative to hospitals that did not outsource their ED services) from two years before entry occurred until two years after entry. We only have enough data to run this test on EmCare.[22]

[21] To calculate propensity scores, we ran a logistic regression separately for EmCare and TeamHealth where the dependent variable was an indicator variable that took a value of '1' if one of the national ED staffing companies took over management of the hospital's ED. We regressed that against hospital beds, technology, the square and cubic forms of beds and technology, and non-profit/for-profit status. The predicted values from this regression produce a propensity score for a hospital. We then use a propensity score match to determine hospitals most similar to those with entry, with the condition that matching hospitals must be in the same state.

[22] Sixty percent of the entries we observe for TeamHealth occur in the final year of our data. As a result, we cannot use this flexible estimation approach to enter the effect of entry from two years before to two years after for hospitals that outsourced their ED services to TeamHealth.

This more flexible estimator takes the form:

(8) $$Y_{i,j,t} = \beta_0 + \sum_{g=-2}^{2} \beta_{1_g} E_{i,j,T+g} + \delta_j + \theta_t + \varepsilon_{i,j,t}$$

Where $E_{i,j,T+g}$ is defined such that: $E_{i,j,T+g}$=1 from the year of entry (T)+g of EmCare onwards.

In this estimator, we analyze the outcomes for patient *i* who is being treated in hospital *j* at time *t*. For EmCare, we identify the date the firm entered each hospital from 2011 through 2015. We define five distinct treatment indicators: the first switches on from two years before the time of entry through the remainder of our data; the second switches on from one year before entry through the remainder of our data; the third switches on from the time of entry through the remainder of our data; the fourth switches on from a year after the data of entry through the remainder of our data; and the fifth switches on from two years after the data of entry through the remainder of our data. The coefficients on the entry variables tell us the incremental change in the outcome variable from one year to another. We measure the incremental impact annually from two years prior to the entry of EmCare until two years after the firm entered a hospital. We also include a vector of hospital fixed effects δ_j and unique month dummies, θ_t, for each month in the data.

6.2 Identifying the Impact of EmCare Entering a Hospital

As we illustrate in Appendix Figure 6A, the mean out-of-network billing rate for hospitals managed by EmCare is 62%. However, the hospitals that EmCare entered between 2011 and 2015 can be divided into two groups based on their pre-entry out-of-network billing rates. The first group includes eight hospitals that have out-of-network rates below 10.1%. The second group includes eight hospitals that have out-of-network rates above 97.7%. Obviously there is no scope to increase out-of-network rates in this latter group. As a result, when we estimate equations (7) and (8), we focus on the impact of entry on out-of-network billing separately for hospitals EmCare entered that had out-of-network rates below 10.1% versus those with out-of-network rates above 97%.

In Figure 3, we plot the raw, quarterly average out-of-network rates by hospital at the hospitals where EmCare entered between 2011 and 2015. We present data from the four quarters before and four quarters after EmCare took over the management of the hospitals' EDs. The vertical hashed red line indicates, based on public reporting, the date EmCare took over emergency care at the hospital. It is clear from the figures that almost immediately after EmCare took over the management of hospital EDs, physician out-of-network billing rates increased to nearly 100%. In almost all cases, after EmCare entered, the hospitals continued to have out-of-network billing rates of approximately 100% through the remainder of our data.

Table 4 shows least-squares estimates of (7) where we identify the impact that the entry of EmCare had on out-of-network rates in these two groups of hospitals. Columns 1 through 3 present the impact of the entry of EmCare into the low OON group of hospitals. These results mirror what we observe in the raw data. Results in Table 4 show that the entry of EmCare into these hospitals raised out-of-network rates by between 81.5 and 89.6 percentage points depending on the control group we use.[23] That is, immediately after EmCare entered these low out-of-network rate hospitals, the out-of-network rates increased to approximately 100%. In Columns 4 through 6, we show the rate of out-of-network billing at hospitals where EmCare entered that already had out-of-network billing rates above 97.7% did not change. This is not surprising because there is no room to increase out-of-network billing at these hospitals.

In Figure 4, we present the monthly hospital-level raw averages out-of-network billing rates, physician charges, physician payments, facility charges, facility payments, the rates that episodes involved an imaging study, the rates patients were admitted from the ED to the hospital, and the rates that EmCare physicians billed using the highest intensity CPT code for 12 months before EmCare entry occurred to 12 months after entry occurred for all 16 hospitals in our entry sample (with the exception of our graph for out-of-network billing, where we only include hospitals with out-of-network rates that were below 97% when EmCare entered). We also include a smoothed average of the monthly values that we fitted using a local polynomial regression. When we look at the raw monthly hospital averages for out-of-network billing, physician charges and payments, admission rates, and rates of using the highest intensity CPT code, there is an immediate and discontinuous change after EmCare entered the hospitals. There is also no evidence in the raw data of changes in these outcomes prior to the entry of EmCare.

In Table 5, we present least squares estimates of Equation (7) to identify and quantify the impact that the entry of EmCare had on physician payments and physician charges, hospital payments and hospital charges, and hospital behavior relative to hospitals that did not contract with EmCare or TeamHealth (in Appendix Tables 6 and 7, we recreate Table 5 using other

[23] This result is robust to estimating equation (7) using logistic regression.

control groups).[24] In Column 2, we show that when EmCare entered a hospital, it led to increases in physician payments of $447.90. This is a 117% increase. In many instances, the insurer supplying our data pays the entirety of physicians' out-of-network bills, so the amount paid in those instances matches the physician charges. However, to the extent that the payer does not pay the entire increase in physician charges (e.g. they only pay usual and customary charges), this estimate represents a lower bound of the increase in payments physicians can receive from going out-of-network. In addition, when EmCare entered a hospital, it also increased physician charges by $556.84 (96%). By raising physician charges, this practice could also raise usual and customary rates in states that use usual and customary rates as the basis for physician payments when the physician is out-of-network. Likewise, if out-of-network physicians were able to fully collect on their charges they billed patients and insurers in every out-of-network case, this estimate would provide the upper bound estimate of the effect of entry on physician payments. Finally, as we illustrate in Column 8, after EmCare enters a hospital, there is also a 14.8 percentage point increase in the rate that there is a physician claim on each episode that is coded with the CPT codes for the most intensive physician services. This represents an increase in the likelihood having an episode coded using the most intensive physician emergency CPT code of 42.7%.

Recall that in Section 4.3, we noted that for hospitals to allow out-of-network billing to occur, they would likely require compensation for the costs they bear from allowing the practice to occur at their facilities. Our results presented in Table 5 are consistent with the physician group providing a transfer to hospitals it entered. We find that following the entry of EmCare, facility payments increased by $294.58 (10.7%). To analyze the factors driving the increase in hospital payments, we analyze whether the entry of EmCare increased the likelihood of an imaging study. In Column 5, we show that after EmCare entered an ED, a patient was 5% more likely to have an imaging study performed. Also recall that hospitals make significantly more profits when a patient from the ED is admitted. With that in mind, we test whether, following the entry of EmCare, patients treated in the ED were more likely to be admitted to the hospital. In Column 6, we present results showing that patients were 2.1 percentage points more likely to be

[24] In one of the hospitals where EmCare entered during our sample period, the ED management contract was eventually shifted to TeamHealth. Our results are robust to whether or not we include that hospital in our analysis.

admitted to the hospital after EmCare entered the ED. This is a 23% increase in hospital admissions rates.[25]

In Table 6, we examine the year-by-year incremental treatment effects of the entry of EmCare into hospitals. In Column (1), we identify the impact of EmCare entry on low out-of-network hospitals. We find that there was no difference in out-of-network rates from two years before EmCare entry up until entry occurred. However, out-of-network rates increased by 70.7 percentage points the year EmCare entered a hospital relative to out-of-network rates the year before entry. Likewise, from the first year after EmCare entry to the second year after entry, out-of-network rates increased another 24.9 percentage points.[26] In Table 6 Columns (2) through (9), we show that there were also large, discrete changes in hospital and physician behavior immediately upon EmCare's entry into the hospital. We show that physician payments increased by $392.06 immediately after entry (Column (3)), facility payments increased by $231.48 (Column (5)), imaging rates increased by 0.7 percentage points (Column (6)), and the rate patients were admitted from the ED to the hospital increased by 2 percentage points (Column (7)). We also find a discontinuous increase in the severity coding of physician claims of 13.3 percentage points immediately after EmCare entered a hospital relative to the previous year (Column (9)). It is possible that the start dates of when EmCare took over a hospital that we gleaned from media sources were inaccurate by several days or weeks in one direction or another. Indeed, at one hospital, one media report noted that the previous ED outsourcing firm's contract ended in April, while a separate media report noted that the new EmCare contract began in July.[27] This could explain why we observe small (e.g. $67) increase in payment before entry occurred, while the increase in payment in the entry quarter is large (e.g. $400) relative to the prior year.

6.3 Identifying the Effect of TeamHealth Entering Hospitals

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[25] We observe that the entry of EmCare increases facility payments, imaging rates, hospital admission rates, and the rate that physicians bill using the most service-intensive codes for hospitals, which, prior to entry, have high and low out-of-network rates (Appendix Tables 8 and 9)

[26] We can also observe a discontinuous change in outcomes following the entry of EmCare when we run the above entry regression by quarter.

[27] In this case, when we examine the raw data, we observe a change in behavior after the previous outsourcing firm's contracted ended in April. However, we have kept the EmCare start date as the date reported in media coverage.

Our descriptive results suggest that, unlike EmCare, TeamHealth has below average rates of out-of-network billing. In this section, we build on our cross-sectional analysis by estimating the causal impact that the entry of TeamHealth had on hospital and physician behavior.[28]

In Figure 5, we present the raw, quarterly averages of out-of-network billing rates at hospitals where TeamHealth took over management of emergency services. Each panel presents the trends for a single hospital. It is clear from the graphs that near our recorded entry date, there is an increase in out-of-network billing. However, in most instances, after increasing, the out-of-network rates fall back down again within approximately a year after entry. Indeed, in several instances, such as with Hospital G, TeamHealth took over management of a hospital that previously had high out-of-network rates and then immediately lowered the out-of-network billing rates to zero. In Figure 4, we present the monthly hospital-level averages of our main outcomes variables from one year before TeamHealth entered a hospital until one year after TeamHealth entered. As we did in Figure 4, we also include a smoothed average of the monthly values that we fitted using a local polynomial regression. The raw data show a clear increase in out-of-network billing rates after TeamHealth enters the hospitals, however the rate drops down four months late. We also observe a discontinuous increase in physician payments. Notably, there we observe a discontinuous drop in admission rates and a discontinuous increase in total episodes at the hospitals where EmCare entered.

Table 7 presents least squares estimates of Equation (7) where we identify the impact of the entry of TeamHealth into hospitals. We find that after TeamHealth entered a hospital, there was an increase in out-of-network billing of 32.6 percentage points. This is a qualitatively large increase, although it is still approximately half the size of the out-of-network entry effect that we observed for EmCare. Consistent with what we observed for EmCare, we also observe that when TeamHealth entered a hospital, there was a large increase in physician charges and physician payment rates. The payment rate for physicians following the entry of TeamHealth increases by $269.01 (68%).[29] However, unlike the results we see for EmCare, following the entry of TeamHealth, we do not observe an increase in facility payments. Indeed, we also see a small decrease in imaging and the rates that patients are admitted to the hospital. However, while

[28] Appendix Figure 6B shows the distribution of out-of-network rates at hospitals where TeamHealth enters during our period of analysis.

[29] We present similar estimates of Equation (7) for the entry of TeamHealth using alternative control groups in Appendix Tables 10 and 11.

facility payments do not increase, we observe a 30.5% increase in the number of patients the TeamHealth EDs treated following entry. This output expansion could be welfare improving, if, for example, it reflects a quality improvement that attracts patients from rival EDs. Likewise, increased out-of-network billing. Recall also that the out-of-network billing increase is much lower for TeamHealth than EmCare, so under our model, the TeamHealth transfer could be lower.

6.4 Robustness Checks

It is possible that the entry of EmCare and TeamHealth led to subsequent changes in the case mix of patients that hospitals treat. Indeed, both EmCare and TeamHealth advertise that a benefit of their service is to shorten ED waiting times (Cantlupe, 2013). With shorter waiting times, hospitals could potentially attract healthier patients who would have otherwise received treatment at urgent care centers. Likewise, on its webpage, EmCare has highlighted its excellence in improving the treatment of complex cases, like stroke care (EmCare, 2017). To the extent that this improves a hospital's reputation, it could allow that hospital to attract more complex patients. Any changes in the case mix of hospitals EmCare entered could explain why, after the firm entered hospitals, rates of hospital admissions, imaging tests, the rate physicians code for the most intensive services increased.

In Appendix Table 12, we analyze the impact that the entry of EmCare and TeamHealth had on the case mix of patients that hospitals treat. We find evidence that after EmCare entered a hospital, the hospital attracted a sicker mix of patients. In Column (1) and (2), we show that after EmCare entered a hospital, the six-month historical spending of its patients increased by $916.02 (15%) and the 12-month historical spending increased by $1306.16 (11%). We also find that after the entry of EmCare into a hospital, the patients who attend the ED were 3.3 percentage points more likely to have a non-zero Charlson co-morbidity score measured using six-months of patient history and a 3.8% more likely to have a non-zero Charlson co-morbidity score measured using 12-months of patient history. In contrast, following the entry of TeamHealth, hospitals attracted seemingly healthier patients who spent $336.35 (5.4%) less in the six-months preceding an episode and $783.08 (6.8%) less in the 12-months preceding an episode.

However, despite seeing sicker patients, we find no evidence that this change in case mix was the driver of the increases we observe in the rate patients are admitted from the ED to the hospital, imaging rates, facility spending or coding severity following the entry of EmCare into a hospital. In Appendix Table 13, we estimate equation (7) using several different sample restrictions and sets of controls for the health of the patients. We focus on the impact that the entry of EmCare had on the frequency that physicians code using the most intensive emergency CPT code. We find that even among patients with low historical spending and no comorbidities, there was a substantial increase in the rate they had episodes that included physician claims coded using the most high intensity CPT code. In Column (1), we estimate equation (7) with no patient controls; in Column (2), we re-estimate equation (7) with control for patients' age, sex, and race; and in Column (3) we control for patients' age, sex, race, and their Charlson co-morbidity score. Across all three estimates, the point estimate on the impact of entry on the rate of using the highest severity CPT code for emergency physician visits is consistent and ranges from 0.148 to 0.151. In Column (4), we estimate equation (7) and limit our analysis to patients throughout our sample who have a Charlson score of 0 (e.g. patients who have no comorbidities). In Column (5), we estimate equation (8) and limit our analysis to patients throughout our data who have a non-zero Charlson score. The point estimates in Columns (4) and (5) illustrate that, whether or not they had comorbidities, patients were almost equally more likely to have physician visits coded using the most intensive emergency CPT code after EmCare entered a hospital. Likewise, in Columns (6), (7), and (8), we estimate Equation (7) on the samples of patients in the lower third ($0 - $279.67), the middle-third ($279.68 - $2,033.59), and the top-third ($2033.6 - $115,499.3) of the distribution of historical six-month patient health spending. Across all three sub-samples, the entry of EmCare led to an increase in the rate patients had physician claims coded using the most severe emergency CPT code.

In Appendix Table 14, we repeat this analysis and examine the impact of the entry of EmCare on facility spending across different samples of the data. We see that there was increased facility spending across patients with and without comorbidities and with high and low historical spending. Likewise, controlling for patients' comorbidities does little to alter the impact of the entry of EmCare on facility spending. In Appendix Table 15, we see similarly robust findings for imaging studies. After the entry of EmCare into a hospital, patients with no comorbidities are 4.9% more likely to receive an imaging study.

Finally, in Appendix Table 16, we analyze whether we observe higher hospital admission rates for patients with low historical spending and no comorbidities following the entry of

EmCare. In Column (4), we find that after EmCare entered a hospital, patients with no comorbidities were 20% more likely to be admitted to the hospital. In Column (6), we find patients with low historical spending (e.g. less than $279.67 in the previous six months) were 17% more likely to be admitted to the hospital after EmCare took over the management of hospital EDs.

7. Policy Solutions to Address Out-of-Network Surprise Billing

7.1 New York State's Laws to Address Surprise Out-of-Network Billing

On April 1, 2014, New York State passed a law designed to protect patients who receive emergency care from out-of-network physicians. At its core, the law has two parts. The first part of the law introduced a hold harmless provision that requires patients receiving emergency medical care pay no more to out-of-network providers in out of pocket costs than they would pay to providers that are in-network. The second part of the law introduced a process to determine what providers are paid when they treat a patient and do not participate in the patient's insurer's network.

The law stipulates that insurers must develop reasonable payment rates for out-of-network care, illustrate how their out-of-network payments were calculated, and show how they compare to usual and customary rates (Hoadley et al., 2015).[30] When a patient is seen out-of-network, the insurer makes their payment to the provider. If the out-of-network provider does not accept the payer's offer, she can initiate an independent dispute resolution process. The independent dispute resolution process is judged by practicing physicians who use baseball rules arbitration and have only two choices: they can stipulate that the provider will be paid the insurer's original payment or that the insurer will pay the provider's original charge. Ultimately, this policy disadvantages providers who bill for unreasonably high charges and punishes insurers who offer unreasonably low initial payments. The law also encourages physicians and payers to negotiate independently and avoid arbitration.

Ultimately, the law protects consumers from out-of-network billing. However, the law has several shortcomings. First, the law only applies to fully-insured insurance products. Administrative services only (ASO) plans, which account for the majority of privately insured

[30] Usual and customary rates are defined in the New York State law as the 80th percentile of charges based on the Fair Health database, which captures physician charges in the states for most medical procedures.

products in the US, are not regulated by states and therefore are not directly impacted by this policy (Kaiser Family Foundation, 2015). Second, if patients receive a surprise out-of-network bill and are charged out-of-network rates, they must be aware that the protections exist and fill out the form included in Appendix 2. This process may be too administratively complex for some patients. Third, by benchmarking payments to physicians' charges, the law promotes payments on rates that are not set via competition and it creates an incentive for physicians to inflate their charged amounts to raise average usual and customary payment calculations.

7.2 Analyzing the Impact of New York State's Law

As Appendix Table 17 shows, our data includes 323,936 ED episodes between 2011 and 2015, which captures approximately $1bn in emergency health care spending. 90.2% of patients in our data in New York are in ASO products.[31] To test the impact of New York State laws, we run a difference-in-difference regression and compare New York hospitals' out-of-network rates, physician payment rates, and facility payment rates before and after the passage of the out-of-network legislation to outcomes in hospitals in New Jersey, Pennsylvania, Connecticut, Vermont, and Massachusetts. To do so, we estimate:

$$(9) \qquad Y_{i,h,t} = \beta_0 + \beta_1 NY_t + \beta_2 Post_t + \beta_3 NY_t * Post_t + \gamma_h + \mu_t + \varepsilon_{i,h,t}$$

where the dependent variable is our outcome of interest for patient *i*, treated at hospital *h*, in quarter *t*. We include an indicator for whether a hospital is located in New York. This is our treatment variable and, if the hospital is located in New York, takes a value of one for all time periods. $Post_t$ takes a value of 1 for all periods April 1, 2014 onwards, after New York State passed its out-of-network billing laws. Our β_3 coefficient is the coefficient of interest and captures the interaction between our treatment variable (that a hospital is located in New York) and our post variable, which is turned on after the out-of-network billing law was passed. All standard errors are clustered around hospitals.[32] In addition, we introduce a non-parametric specification of equation (8) where our treatment variable is interacted with dummy variables for

[31] Unfortunately, we do not have hospitals with EDs managed by EmCare or TeamHealth in our data for New York.
[32] Our results are also robust to clustering around HRRs.

each quarter. This allows us to illustrate graphically the parallel trends between New York and other New England States prior to the passage of the New York law.

7.3 The Impact of New York State's Out-of-Network Billing Laws

Table 8 presents least-squares estimates of equation (9) and shows the impact of the New York State law on out-of-network rates, hospital charges and payments, and physician charges and payments. As Column (1) illustrates, the New York state law reduced out-of-network rates by 6.8 percentage points relative to changes observed in other New England states. Figure 7 presents non-parametric estimates of Equation (8) graphically.[33] The out-of-network rates in New York and the other New England states followed similar trends before the introduction of the New York State out-of-network protection law in 2014. However, almost immediately after the law was passed (and before the required implementation date), there was a marked reduction in out-of-network billing in the state. Figure 8 shows the distribution of out-of-network rates across hospitals in 2013 and 2015. The out-of-network rate in New York in 2013 was 20.1%. Two years later, the rate was 6.4% and the reduction in out-of-network rates was driven by reductions in out-of-network rates across nearly all hospitals, including those that previously had high rates of out-of-network billing.

Columns (6) and (7) from Table 8 suggest that while the law only applied to fully-insured insurance products, the reduction in out-of-network rates occurred for patients with fully-insured insurance plans and those covered by ASO policies. It is likely that we see this result because physicians cannot infer, before sending the bill to the patient or insurer, whether that patient has an ASO or fully-insured insurance product.

Columns (2) through (5) from Table 8 illustrate the impact of the law on facility charges and payments and physician charges and payments. As we illustrate in Column (3), the law lowered average physician payments by $43.74 (13%). We do not find that the law had a precisely estimated impact of facility payments.

7.4 Regulating Hospital/Insurer Contracts to Address Out-of-Network Billing

There are two core objectives that policy-makers must address when they seek to rein in out-of-network ED billing. The first is to protect consumers from large, unexpected bills. The second is

[33] This result is robust to estimating equation (7) using logistic regression.

to establish a price that insurers should pay out-of-network physicians for their services that is either competitively set or is as close to the competitively set price as possible. At present, about a quarter of states have laws aimed at addressing out-of-network billing. Most states have included a hold harmless provision to protect patients from out-of-network bills and tried to set out-of-network provider payment rates via regulation. However, it is extremely unlikely that a regulated price will match the market price for any given insurer-physician pair in a particular year. Moreover, as soon as the regulated price differs from the market price, either the insurer or the physician will take advantage of a regulated price that favors them (e.g. insurers will cease to build networks or physicians will cease to join networks). New York State's laws are the most ambitious to date and seem to be effective thus far. However, the New York law, like the laws passed in other states, is focused exclusively on fully-insured insurance products.[34] While the New York law seems to have reduced out-of-network billing, it offers no financial protection to individuals who have ASO insurance products.

Rather than try to regulate the *price*, an alternative to the current policies would be to regulate the nature of the underlying *contract*. When patients choose an ED, they are choosing a "bundle" of emergency services that includes a hospital and a physician. Patients do not separately select a physician so it is inefficient to have a separate network and consumption decision for the physician. In lieu of the status quo, under this alternative approach, states would require hospitals to sell and insurers to contract for an ED service bundle. That bundle would include hospital and physician services. Under this policy, the hospital would purchase the inputs into ED services the way it purchases other inputs like nurses. This would require the hospital to buy ED physician services in a local labor market, which would expose both sides to competitive forces and produce a market price for ED physicians.

With this type of policy in place, patients consuming emergency services would be protected from surprise bills as long as they chose in-network facilities. Given that only 14.5% of ED patients arrive at EDs via ambulance, most patients are in a position to select where they receive emergency care (Centers for Disease Control and Prevention, 2013). Indeed in our dataset only 1% of the ED claims we analyze are from out-of-network facilities. Moreover, negotiation between the insurer and hospital would maintain payments for ED services that are competitively determined. This type of policy would preserve competition at every level of the

[34] States cannot regulate ASO products.

health system. Negotiations between hospitals and ED physicians would result in ED physician rates that were competitive in the local labor market. Insurers would compete over premiums and the breadth of their networks to attract customers. Hospitals would compete on price and quality to attract patients and be included in insurers' networks. Likewise, hospitals would compete on physician payments in order to attract physicians to staff their EDs. Physicians would need to compete on quality and prices in order to obtain permission to practice at hospitals.

This policy also solves the inability of states to regulate ASO products. Rather than regulating insurance, this would be a form of hospital regulation, so it could apply to all patients in a state regardless of the type of insurance they have. Further, the law could be implemented by the federal government, who could make these types of ED bundles a requirement in exchange for receiving Medicare payments.

9. Conclusions

Each year, one in five individuals in the U.S. attends an ED for medical care (Morganti et al., 2013). What most patients with private health insurance do not realize is that the physicians working inside a hospital may not participate in the same insurance networks as the hospital itself. As a result, it is possible for a privately insured patient to attend an in-network hospital but receive care from an out-of-network physician. These out-of-network bills can expose patients to significant financial risk. These bills are particularly troubling in the case of ED care, where patients do not choose and cannot avoid out-of-network physicians. Further, surprise out-of-network billing undercuts the functioning of health care markets by allowing physicians who face inelastic demand to be paid their charges, which are not set via competition.

In this paper, we find that approximately 15% of US hospitals have extremely high out-of-network billing rates. Results from our Lasso analysis suggest that for-profit hospitals and hospitals that outsource their ED services to EmCare, a large physician outsourcing company, have significantly higher rates of out-of-network billing than other providers.

Our cross-sectional results motivated us to test what happens when ED physician staffing companies enter hospitals. We assume that hospitals face reputational costs when out-of-network billing occurs within their facility. The physicians engaging in out of network billing can offset hospitals' costs by giving a transfer to the hospital. In our empirical analysis, we focus on the impact of entry from two national firms that are increasingly taking over the management of hospital EDs.

We find that when both firms enter hospitals, there is a large increase in out-of-network billing. Following the entry of EmCare, we observe that hospitals' out-of-network billing rates increased by between 81 and 90 percentage points. Likewise, after TeamHealth entered hospitals, out-of-network billing rates in our data increased by 33 percentage points. Consistent with our model, we find evidence of a transfer to hospitals following the entry of these firms. In addition to increasing out-of-network billing, we find that when EmCare enters a hospital, it increases the amount facilities get paid via increases in imaging rates and the rates that patients are admitted from the ED to the hospital. We also find that after EmCare enters a hospital, patients are 43% more likely to have physician services coded using the most high intensity, high paying codes. We find that TeamHealth pursues a different strategy. When TeamHealth enters a hospital, it raises out-of-network rates significantly (although out-of-network billing rates at these hospitals drop over time after entry) and also raises hospital activity rates.

What is the appropriate policy response to surprise out of network billing? A variety of states have implemented different policies to protect consumers. One of the most innovative was introduced in New York. In 2014, New York State passed a law that bans balanced billing and requires insurers and physicians to enter into binding arbitration to settle disputed bills. We assessed the impact of this law and found that it did indeed reduce out-of-network billing. However, the law still bases out-of-network ED payments on physicians' charges, which are not competitively set. In addition, the law offers no protection to individuals enrolled in ASO insurance products, who account for approximately half of individuals with private insurance in the US.

The fundamental problem in this setting is that there is a missing contract between the physician and the insurer. Most states have tried to address the missing contract by setting a regulated payment rate. However, a regulated price will, in general, not be equal to a market price. Basic economic logic suggests that mandating the contract will achieve the efficient price more often than choosing a regulated price. Both may protect consumers, but only the former will restore price competition in emergency care. Rather than allowing physicians and facilities to separately negotiate contracts with insurers, an alternative policy approach would be for states to require hospitals to sell an ED service bundle that includes both physician and facility services. In a state with this type of bundled payment, hospitals would negotiate ED payment rates with insurers and reach competitively set prices that reflect the cost of both the physician and the facility. Under this alternative policy, a patient using an in-network ED would be treated by in-network physicians. Further, this alternative policy would promote competition at all levels of the health system. Crucially, under this type of alternative policy, privately insured patients accessing EDs in emergencies would also be fully protected from surprise bills.

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Table 1: ED Episodes and Annual Spending

	Emergency Episodes	Total Facility Spending	Total Physician Spending	Percent ASO	Share of Episodes at in-network hospitals
2011	1,699,451	$4,291,953,485	$571,908,442	74.4%	99.2%
2012	1,899,513	$4,856,435,414	$695,541,017	76.6%	99.3%
2013	1,820,059	$5,010,500,462	$741,108,491	78.7%	99.4%
2014	1,745,100	$5,037,042,350	$750,805,079	78.1%	99.4%
2015	1,749,073	$5,262,533,069	$778,608,140	75.9%	99.3%
Total	8,913,196	$24,458,464,780	$3,537,971,169	76.7%	99.3%

Notes: This table shows episodes per year, facility spending per year, physician spending per year, the share of episodes where the patient is on an administrative services only (ASO) plan, and the share of all episodes that occur at an in-network hospital.

Table 2: HRR and Hospital-Level Out-of-Network Rates, 2011-2015

	Mean	S.D.	P25	P50	P75	Max
By HRR: 290 observations						
Out-of-Network ED Physician Rate	0.22	0.18	0.07	0.19	0.33	0.99
By hospital: 3,345 observations						
Out-of-Network ED Physician Rate	0.26	0.35	0.00	0.05	0.48	1.00

Notes: For HRRs, we limit to those with more than 500 episodes per year from 2011-2015. HRR out-of-network rates have been weighted by the number of episodes in each HRR. We only include hospitals that are registered with the American Hospital Association, are in-network, appear in all 5 years of the data and have more than 10 episodes per year.

Table 3: Physician and Facility Payments and Out-of-Network Rates for Hospitals that Outsourced ED Services to EmCare and TeamHealth

	(1)	(2)	(3)	(4)	(5)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	OON Rate
EmCare Hospital	145.13***	142.66***	1116.18***	-60.72	0.166***
	(25.59)	(26.98)	(308.65)	(100.62)	(0.048)
TeamHealth Hospital	97.39***	52.46**	-483.69*	-170.31	-0.132***
	(27.09)	(25.44)	(270.40)	(110.39)	(0.036)
HRR FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Mean	592.71	396.94	6394.63	2744.07	0.222
SD	375.15	309.76	12531.03	5025.05	0.416
Observations	8,913,196	8,913,196	8,913,196	8,913,196	8,913,196
R-Square	0.278	0.259	0.090	0.077	0.205

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (6). Each observation is a patient episode. Payments and charges for physicians and facilities are winsorized at the top and bottom first percentile. EmCare and TeamHealth are indicators that denote whether an episode occurred in a facility owned by these firms. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Table 4: The Impact of the Entry of EmCare on Hospital Out-of-Network Rates

	(1)	(2)	(3)	(4)	(5)	(6)
	Hospitals with Out-of-Network Rates Below 97% Prior to Entry			Hospitals with Out-of-Network Rates Above 97% Prior to Entry		
	OON Indicator			OON Indicator		
EmCare Entry	0.815***	0.846***	0.896***	-0.030	0.035	-0.032
	(0.061)	0.073	(0.156)	(0.044)	(0.048)	(0.060)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.204	0.372	0.549	0.209	0.392	0.896
SD	0.403	0.483	0.498	0.407	0.488	0.306
Observations	8,351,799	1,654,456	34,876	8,401,884	1,704,541	85,741
Control	All Non-Entry Hospitals	Hospitals in Same State	Propensity Score Match	All Non-Entry Hospitals	Hospitals in Same State	Propensity Score Match

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7) separately on hospitals with out-of-network (OON) rates below 11% (Columns 1-3) and above 97% (Columns 4-6). The dependent variable in all regressions is a binary indicator for whether a patient at an in-network hospital was treated by an out-of-network physician. Our analysis is run at the patient-level. The control groups for Columns (1) and (4) are all hospitals in the US that did not outsource their ED management to EmCare. The control groups for Columns (2) and (5) are all hospitals in same states as the treated hospitals, excluding hospitals that outsourced their ED services to EmCare. The control groups in Columns (3) and (6) are hospitals matched to treated hospitals using propensity scores calculated using entry as predicted by a treated hospital's beds, technology, and non-profit/for-profit status. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Table 5: The Impact of the Entry of EmCare on Payments and Provider Behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
EmCare Entry	556.84***	447.90***	1683.63***	294.58***	0.014***	0.021***	-104.0	0.148***
	(62.12)	(55.16)	(401.04)	(113.64)	(0.005)	(0.006)	(218.1)	(0.030)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	578.95	383.64	6304.63	2744.27	0.278	0.090	1695.5	0.347
SD	364.61	297.99	12415.53	5034.47	0.448	0.286	1566.5	0.476
Observations	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Table 6: Estimating the Impact of the Entry of EmCare by Year

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Out-of-Network Rate	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
Incremental entry effect (t-2) relative to (t-3)	0.030	-51.23	8.22	-158.46	-68.54	-0.010	-0.00003	183.9***	-0.009
	(0.044)	(46.86)	(25.17)	(211.86)	(64.57)	(0.007)	(0.004)	(50.1)	(0.020)
Incremental entry effect (t-1) relative to (t-2)	-0.023	111.12**	67.31***	294.03	53.88	-0.006	0.001	21.5	0.023
	(0.054)	(22.83)	(21.48)	(284.19)	(76.80)	(0.008)	(0.002)	(127.2)	(0.013)
Incremental entry effect (t) relative to (t-1)	0.707***	436.44***	392.06***	1192.50***	231.48**	0.007	0.020***	-109.6	0.133***
	(0.074)	(63.67)	(60.02)	(347.75)	(108.70)	(0.004)	(0.007)	(139.2)	(0.032)
Incremental entry effect (t+1) relative to (t)	0.249**	98.05***	40.63	377.80	65.34	0.019**	-0.0006	-31.9	0.012*
	(0.097)	(20.57)	(32.61)	(288.58)	(70.12)	(0.008)	(0.003)	(50.9)	(0.007)
Incremental entry effect (t+2) relative to (t+1)	-0.016	9.41	-71.07**	761.56***	53.12	0.002	0.001	-76.8	-0.012
	(0.084)	(17.43)	(21.66)	(205.82)	(68.09)	(0.009)	(0.006)	(55.8)	(0.010)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.204	578.95	383.64	6304.63	2744.27	0.278	0.090	1695.5	0.347
SD	0.403	364.61	297.99	12415.53	5034.47	0.448	0.286	1566.5	0.476
Observations	8,351,799	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare.We windsorized the top and bottom percentile of hospital and physician payments. Standard errors are clustered around hospitals. Column (1) presents the estimates of entry on the sample of hospitals that have out-of-network rates below 10% prior to the entry of EmCare. In Column (1) we estimate the impact of EmCare entry on the sample of hospitals who have out-of-network rates below 11%.

Table 7: The Impact of the Entry of TeamHealth on Payments and Provider Behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Out-of-Network Rate	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
TeamHealth Entry	0.326***	52.49	269.01***	170.17	-52.19	-0.008**	-0.006**	515.4***	0.016
	(0.030)	(35.90)	(19.06)	(174.03)	(82.70)	(0.003)	(0.002)	(182.8)	(0.015)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.226	589.58	395.38	6400.68	2749.89	0.279	0.091	1692.1	0.346
SD	0.419	374.63	310.46	12555.33	5041.25	0.448	0.287	1557.4	0.476
Observations	8,661,796	8,661,796	8,661,796	8,661,796	8,661,796	8,661,796	8,661,796	8,661,796	8,661,796
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

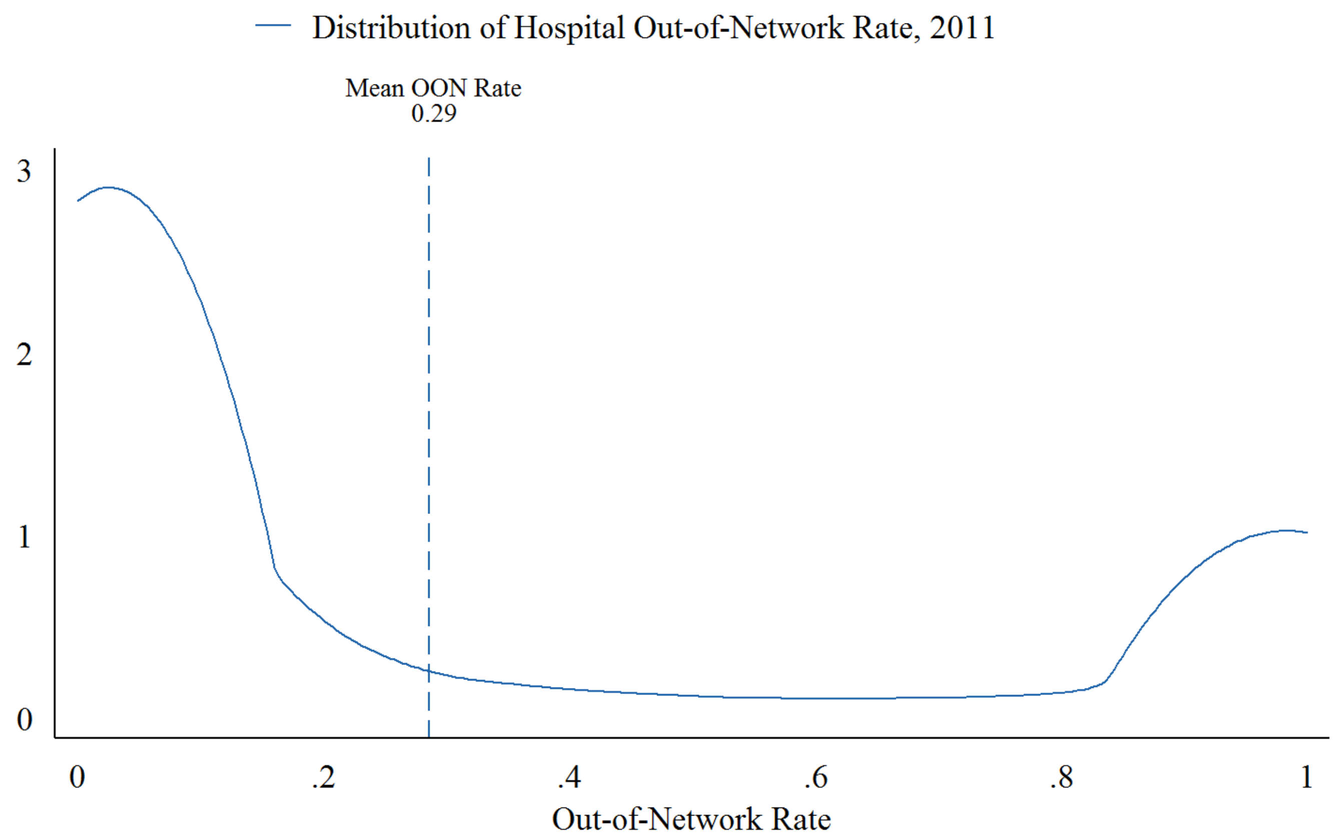
Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squared estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to TeamHealth. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Table 8: Estimating the Impact of the New York State's Surprise Billing Law

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Out-of-Network Rate	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Out-of-Network Rate (ASO)	Out-of-Network Rate (Full Insurance)
NY*Post dummy	-0.069**	21.46	-43.74***	-98.73	-1.21	-0.069**	-0.062**
	(0.030)	(20.74)	(11.51)	(148.39)	(81.85)	(0.031)	(0.031)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarterly FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.202	499.17	335.86	6100.52	2571.28	0.198	0.227
SD	0.401	313.11	251.95	12693.62	5122.37	0.399	0.419
Observations	905,441	905,441	905,441	905,441	905,441	787,005	116,642
R-Square	0.636	0.435	0.488	0.113	0.114	0.629	0.687

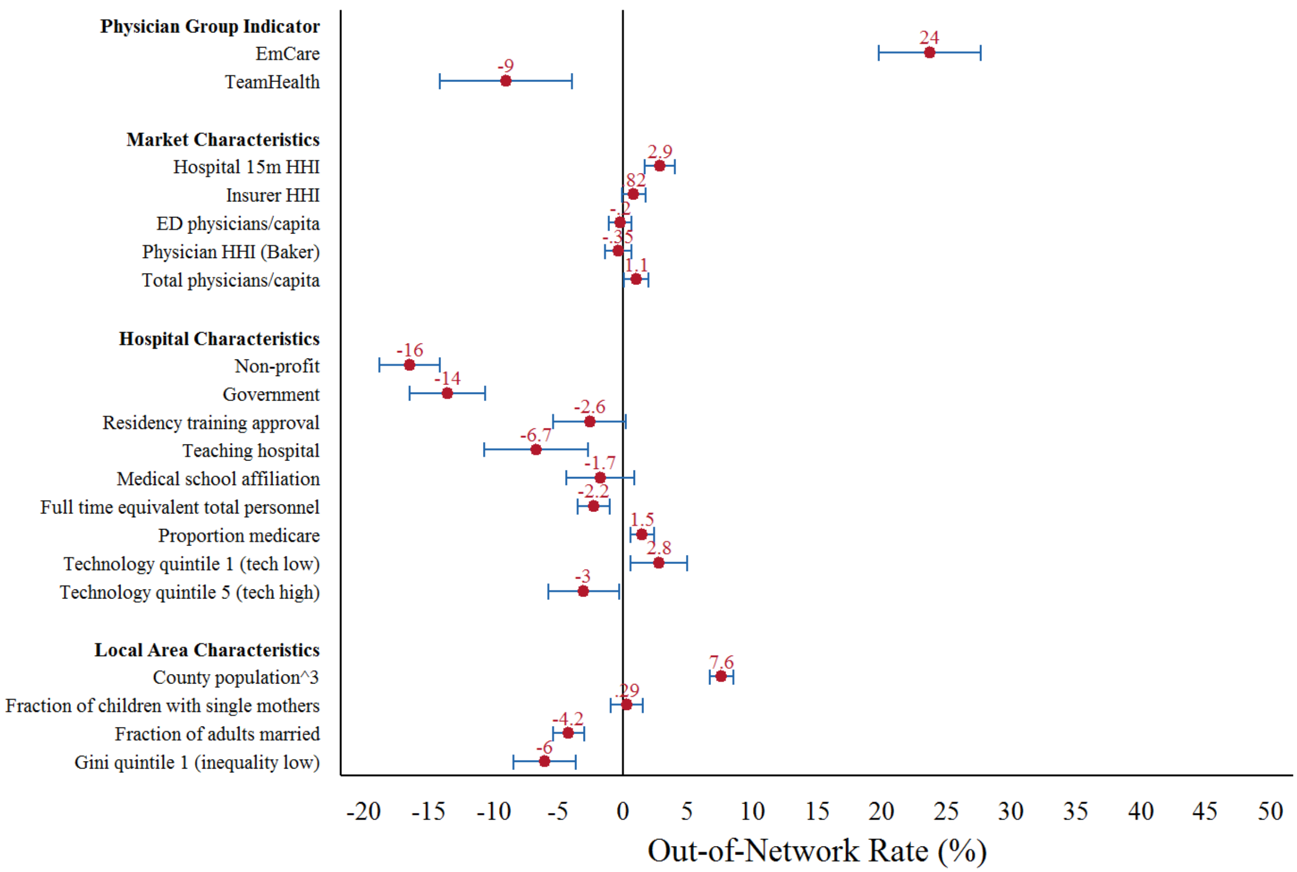
Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (9). All regressions are run at the patient level. Each estimate includes an indicator variable for whether the episode occurred in New York. The post dummy turns on in 2014 Q1 (when the NY vote was passed). Hospital and physician payments are winsorized at the top and bottom one percentile. The control states included are NJ, PA, CT, VT, and PA. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Figure 1: The Distribution of Hospital Out-of-Network Billing Rates in 2011



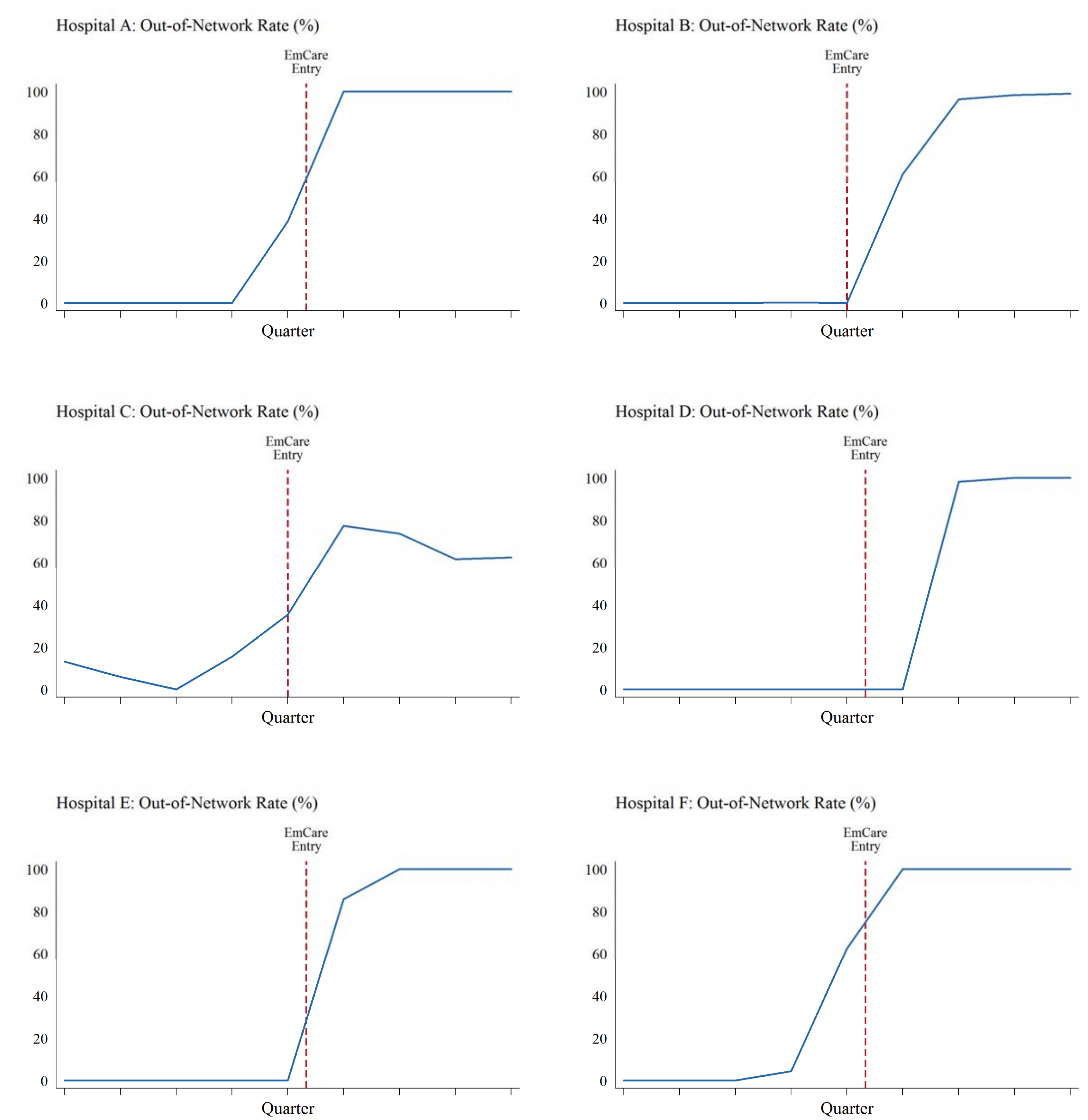
Notes: The table shows the distribution of ED physicians out-of-network rates across hospitals in 2011. The average rate across hospitals is not weighted by number of episodes. The mean hospital out-of-network rate in 2011 was 29%.

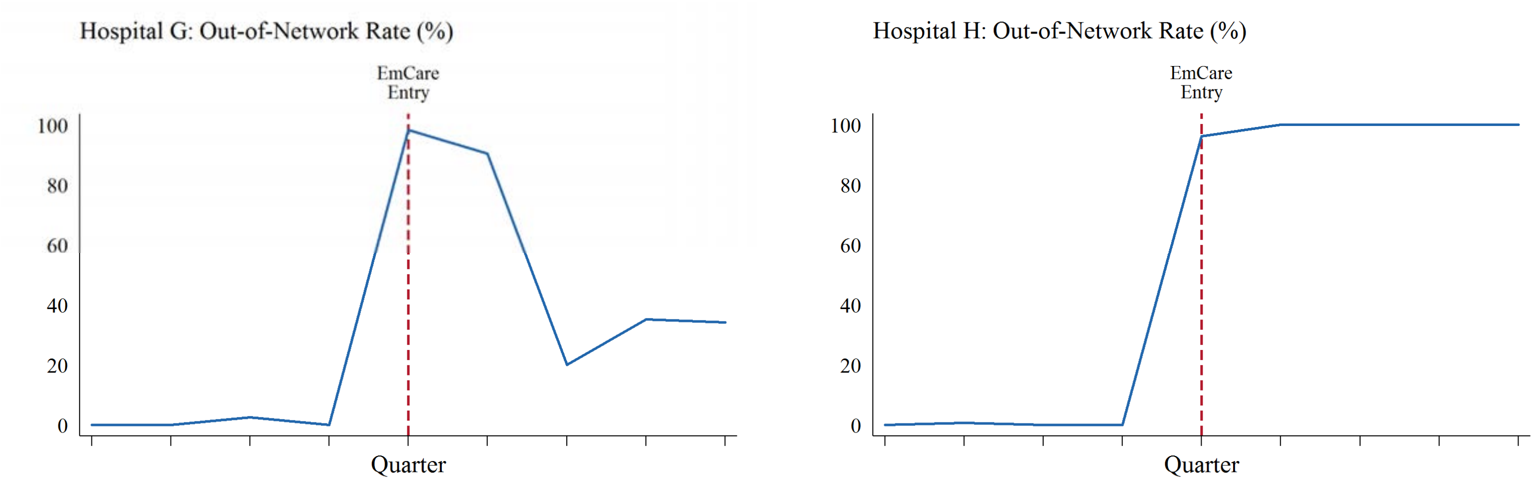
<u>Figure 2: Conditional Correlates of Hospital Out-of-Network Billing</u>



Notes: The figure shows the point estimates from a regression of hospital out-of-network rates on variables chosen from our Lasso. We used data from 2011 through 2015. Each observation is a hospital-year rate of out-of-network billing. The regression includes year fixed-effects. For continuous variables, the point estimates can be interpreted as the percentage point change in out-of-network rate for a one standard deviation increase in the explanatory variable. For binary variables, the point estimate illustrates the impact of having the variable take a value of one. To obtain these results, we first run a Lasso with all possible variables (90 in total). We then square and cube continuous variables chosen from the Lasso and run a second Lasso that includes all variables in addition to those that are now squared and cubed. We then run an OLS regression of hospital out-of-network rates on variables chosen from the Lasso. We also included measures of physician, hospital and insurer market concentration and physician group indicators.

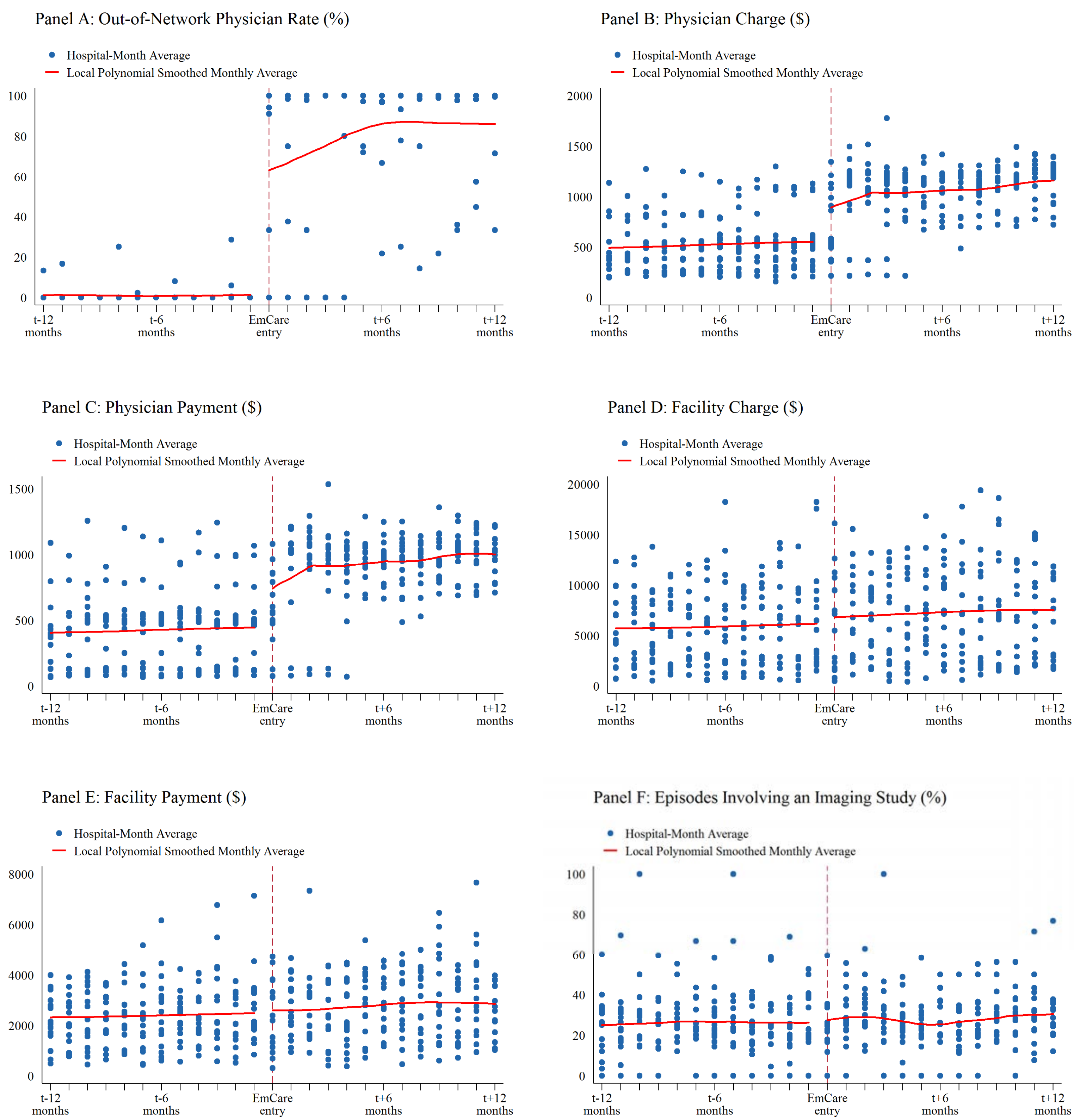
Figure 3: Out-of-Network Rates at Hospitals Where EmCare Entered



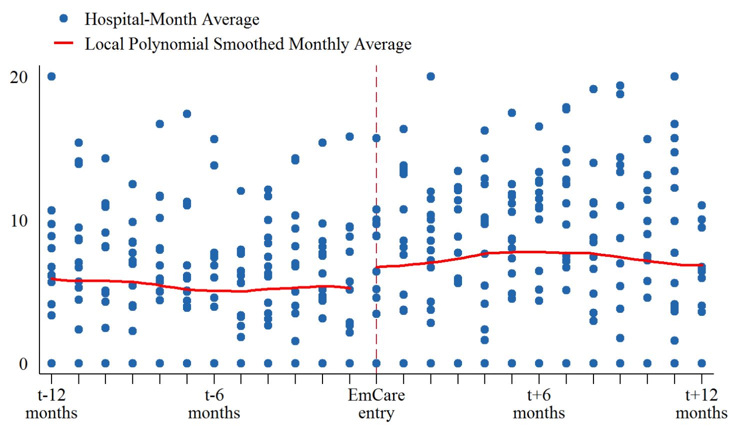


Notes: This figure plots the average quarterly out-of-network rates at hospitals where EmCare entered. We present figures for hospitals that had out-of-network billing rates below 97% in 2011. We present data from the four quarters before and the four quarters after EmCare took over the management of each hospital's ED.

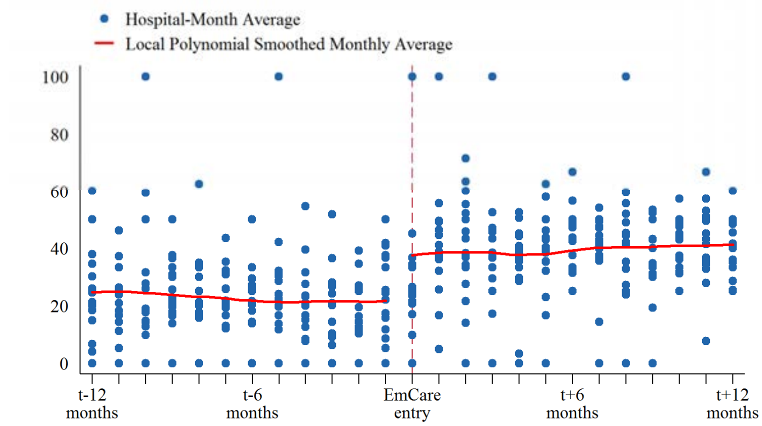
Figure 4: Discontinuity Analysis at Hospitals Where EmCare Took Over Management of ED Services



Panel G: Admissions Rate (%)

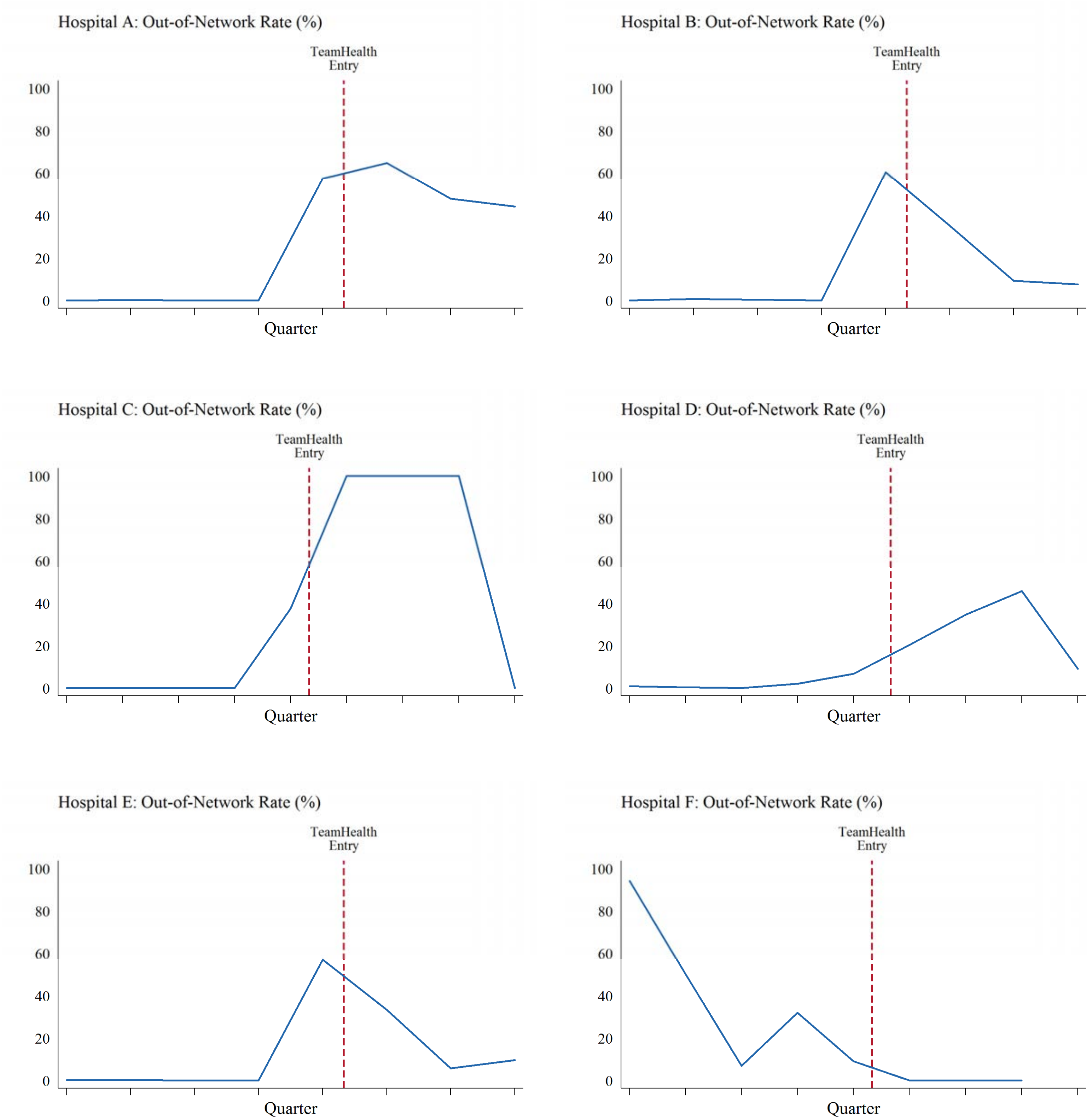


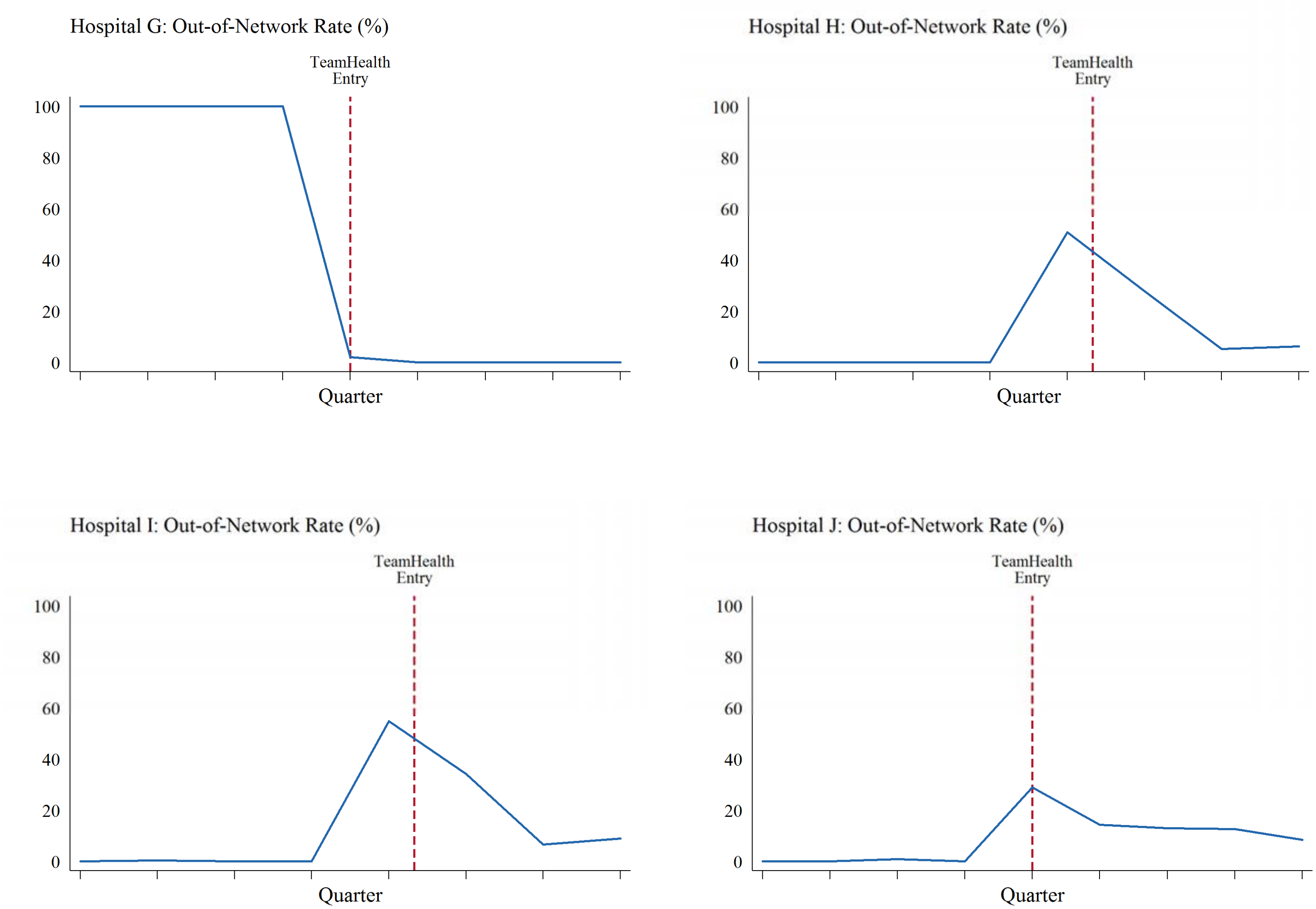
Panel H: Rate of Using CPT 99285 (%)



Notes: The panels plot the monthly average by hospital from 12 months before entry to 12 months after EmCare entered the hospital. For Panel A, we limit our analysis to hospitals with out-of-network rates below 97% in 2011.

Figure 5: Out-of-Network Rates at Hospitals Where TeamHealth Entered

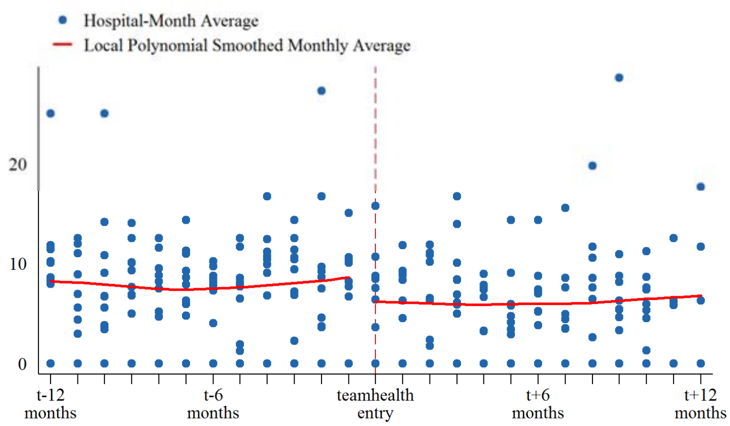




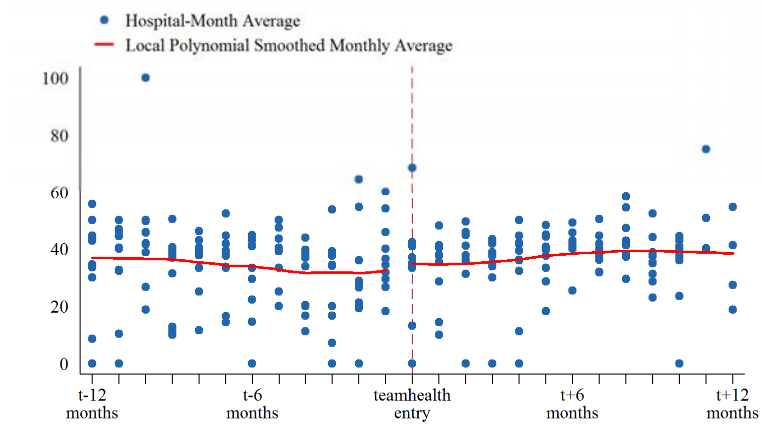
Notes: This figure plots the average quarterly out-of-network rates at hospitals where TeamHealth entered. We present data from the four quarters before and the four quarters after TeamHealth took over the management of each hospital's ED.

Figure 6: Discontinuity Analysis at Hospitals Where TeamHealth Took Over Management of ED Services

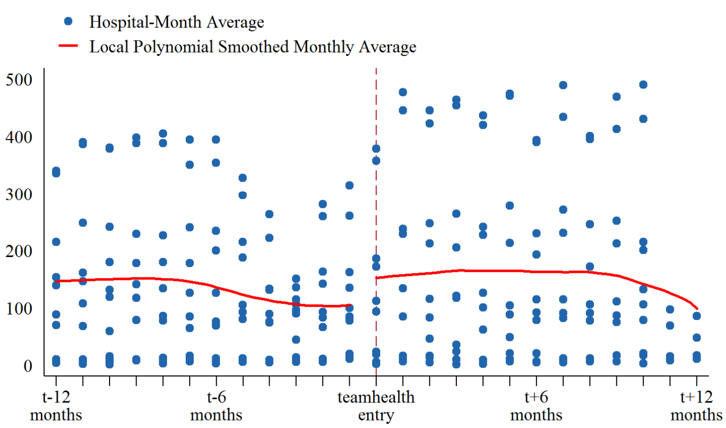
Panel G: Admissions Rate (%)



Panel H: Rate of Using CPT 99285 (%)

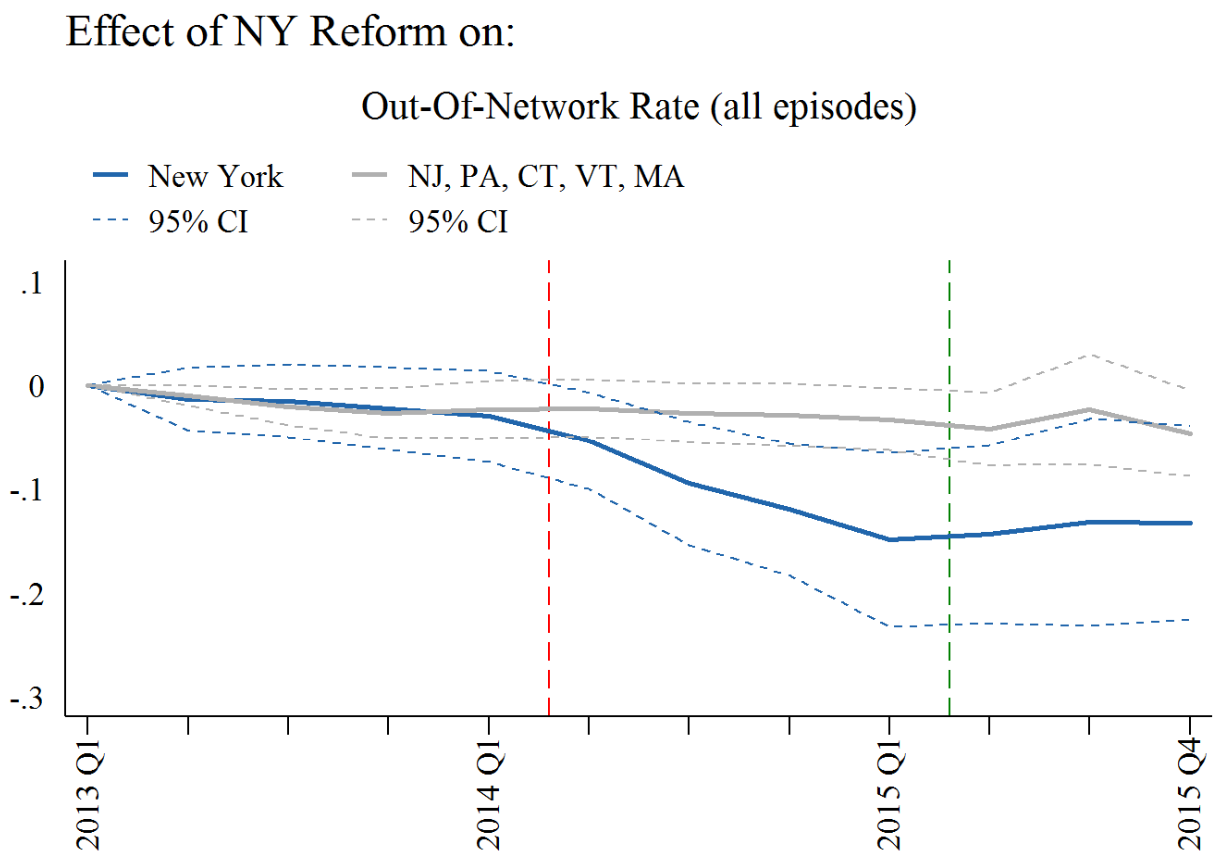


Panel I: Total Episodes



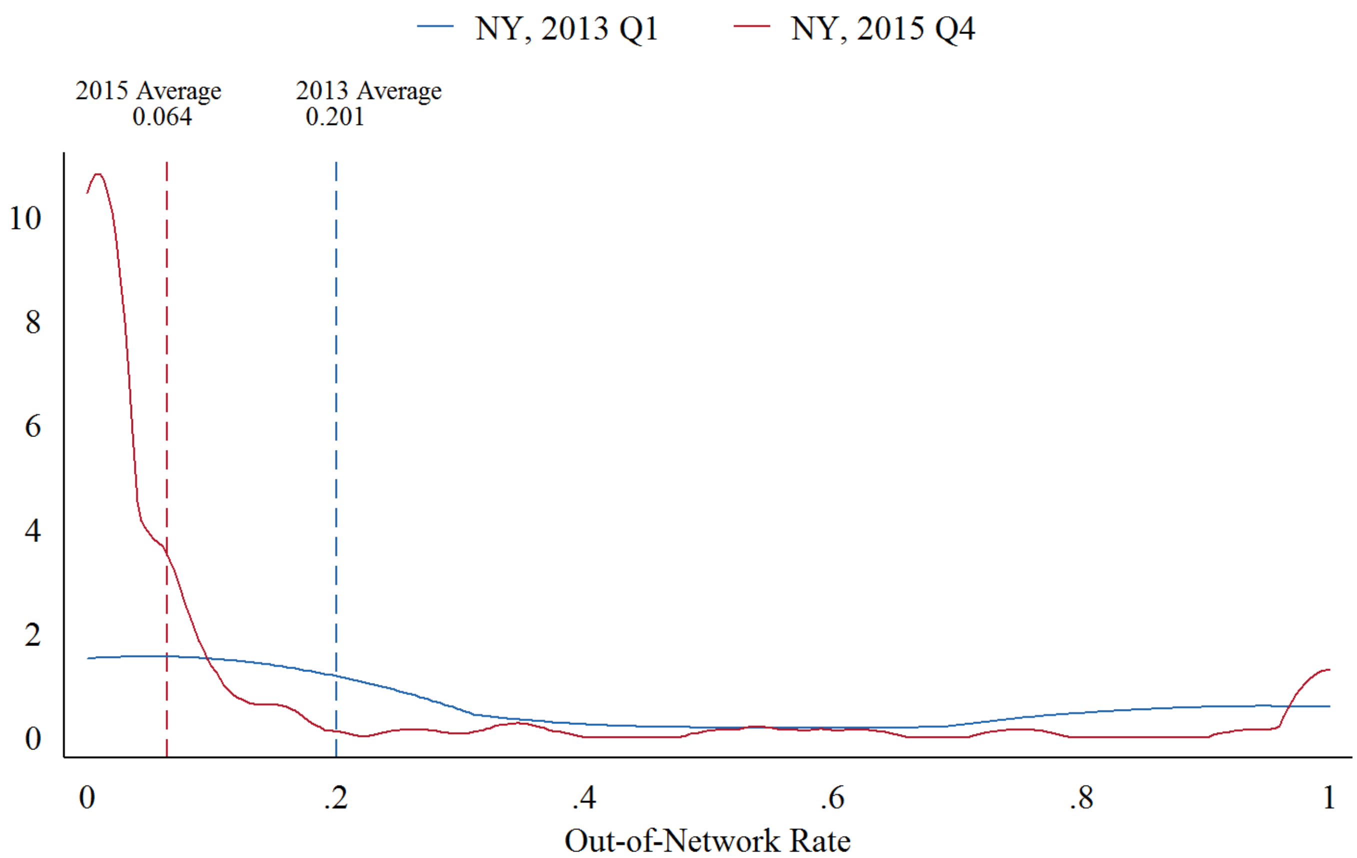
Notes: The panels plot the monthly average by hospital from 12 months before entry to 12 months after TeamHealth entered the hospital.

Figure 7: Out-of-Network Billing Rates in New York Versus Surrounding States



Notes: The figure presents least-squares estimates of an episode-level regression where the dependent variable is whether or not a patient at an in-network ED received bill from an out-of-network physician. We regress that against an indicator for whether the episode occurred in the state of New York, a vector of quarterly fixed effects, and the interaction of the New York indicator and the quarterly fixed effects. Patient age, gender, race, and Charlson scores are included as controls. The omitted category is Q1 2014. We include a vector of hospital fixed effects. The control group is composed of ED episodes that occurred in New Jersey, Pennsylvania, Connecticut, Vermont, and Massachusetts. Standard errors are clustered around hospitals. The red dotted line denotes when the NY vote passed, and the green dotted line denotes when the NY law was enacted.

Figure 8: The Distribution of Out-of-Network Billing in New York in 2011 and 2015



Notes: The figure shows the kernel density distribution of hospital out-of-network rates in New York in 2013 and 2015

Appendix 1: Variables Used in Lasso

	Description	Source
aha_admtot	Total facility admissions	AHA
aha_births	Total births (excluding fetal deaths)	AHA
aha_c_g	Government	AHA
aha_c_np	Non-profit	AHA
aha_fte	Full-time equivalent total personnel	AHA
aha_ftelpn	Full-time equivalent licensed practical or vocational nurses	AHA
aha_ftemd	Full-time equivalent physicians and dentists	AHA
aha_fteoth94	Full-time equivalent all other personnel	AHA
aha_fteres	Full-time equivalent medical and dental residents and interns	AHA
aha_ftern	Full-time equivalent registered nurses	AHA
aha_ftetran	Full-time equivalent other trainees	AHA
aha_ftettrn	Full-time equivalent total trainees	AHA
aha_ftlab	Full-time lab techs	AHA
aha_ftlpntf	Full-time licensed nurses	AHA
aha_ftmdtf	Full-time physicians and dentists	AHA
aha_ftres	Full-time medical & dental residents, interns	AHA
aha_fttoth	Total full-time hospital unit personnel	AHA
aha_fttotlt	Total full-time nursing home personnel	AHA
aha_fttran84	Full-time other trainees	AHA
aha_hcount_15m	Hospital count 15m	AHA
aha_hmocon	# HMO contracts	AHA
aha_hospbd	Total hospital beds	AHA
aha_mapp1	Accreditation by JCAHO	AHA
aha_mapp10	Medicare certification	AHA
aha_mapp11	Accreditation by American Osteopathic Association	AHA
aha_mapp12	Internship approved by AOA	AHA
aha_mapp13	Residency approved by AOA	AHA
aha_mapp16	Catholic church operated	AHA
aha_mapp19	Rural Referral Center	AHA

	Description	Source
aha_mapp2	Cancer program approved by ACS	AHA
aha_mapp20	Sole Community Provider	AHA
aha_mapp21	DNV	AHA
aha_mapp3	Residency training approval	AHA
aha_mapp5	Medical school affiliation	AHA
aha_mapp6	Hospital-controlled professional nursing school	AHA
aha_mapp7	Accreditation by CARF	AHA
aha_mapp8	Teaching hospital	AHA
aha_mapp9	Blue Cross contracting or participating	AHA
aha_mcddc	Total facility Medicaid discharges	AHA
aha_mcdipd	Total facility Medicaid days	AHA
aha_mcrdc	Total facility Medicare discharges	AHA
aha_npayben	Total facility employee benefits	AHA
aha_paytot	Facility payroll expenses	AHA
aha_prop_caid	Proportion medicaid	AHA
aha_prop_care	Proportion medicare	AHA
aha_ptlab	Part-time laboratory technicians	AHA
aha_ptlpntf	Part-time licensed practical or vocational nurses	AHA
aha_ptmdtf	Part-time physicians and dentists	AHA
aha_ptphr	Part-time pharmacists, licensed	AHA
aha_ptpht	Part-time pharmacy technicians	AHA
aha_ptrad	Part-time radiology technicians	AHA
aha_ptres	Part-time medical and dental residents and interns	AHA
aha_ptresp	Part-time respiratory therapists	AHA
aha_pttoth	Total part-time hospital unit personnel	AHA
aha_pttotlt	Total part-time nursing home personnel	AHA
aha_pttran84	Part-time other trainees	AHA
aha_sunits	Separate nursing home	AHA
aha_suropip	Inpatient surgical operations	AHA

	Description	Source
aha_suroptot	Total surgical operations	AHA
aha_syshhi_15m	Hospital 15m HHI	AHA
aha_techtotal	Technology (put into quintiles)	AHA
aha_vem	Emergency room visits	AHA
aha_vtot	Total outpatient visits	AHA
eop_cs00_seg_inc	Income segregation	Equality of Opportunity Project
eop_cs_divorced	fraction of divorced adults	Equality of Opportunity Project
eop_cs_elf_ind_man	manufacturing employment share	Equality of Opportunity Project
eop_cs_fam_wkidsinglemom	Fraction of children with single mothers	Equality of Opportunity Project
eop_cs_labforce	Labor participation rate	Equality of Opportunity Project
eop_cs_married	Fraction of adults married	Equality of Opportunity Project
eop_cs_race_bla	Fraction black	Equality of Opportunity Project
eop_cs_race_theil_2000	Theil Index of racial segregation	Equality of Opportunity Project
eop_frac_traveltime_lt15	Fraction with commute less than 15 minutes	Equality of Opportunity Project
eop_gini	Gini (includes top 1%)	Equality of Opportunity Project
eop_hhinc00	Household Income (put into quintiles)	Equality of Opportunity Project
eop_inc_share_1perc	Top 1% income share	Equality of Opportunity Project
eop_incgrowth0010	income growth, 2000-2006/10	Equality of Opportunity Project
eop_intersects_msa	Urban indicator	Equality of Opportunity Project
eop_mig_inflow	Migration inflow rate	Equality of Opportunity Project
eop_mig_outflow	migration outflow rate	Equality of Opportunity Project
eop_rel_tot	Fraction religious	Equality of Opportunity Project
eop_subcty_expend	Local government expenditures/capita	Equality of Opportunity Project
eop_taxrate	local tax rate	Equality of Opportunity Project
baker_hhi	Physician HHI	Baker et. al
hli_hhi_all	Insurer HHI	Health Leader Interstudy
hli_share	Insurer share of market	Health Leader Interstudy
cen_countypop	County population	US Census Bureau
ska_ed_phys_per_capita	ED Physicians/capita	SKA
ska_phys_per_capita	Physicians/capita	SKA
EmCare	Indicator for EmCare hospitals	Internal
TeamHealth	Indicator for TeamHealth hospitals	Internal

Notes: AHA: American Hospital Association Annual Survey. Equality of Opportunity Project: Selected variables from (http://www.equality-of-opportunity.org/data/). Baker et. al: Physician HHI constructed by Laurence Baker, Kate Bundorf, and Anne Royalty. Health Leader Interstudy: Data from US Managed Market Solutions, formerly Health Leader Interstudy. SK&A: Healthcare database with list of physicians for marketing purposes. Internal: See Appendix Figure1A and 1B. These are all variables that may be selected from the Lasso. Hospitals missing any of these variables or not appearing in all 5 years of the data are not included. A total of 1,602 unique hospitals are included.

Appendix 2: Surprise Billing Forms from New York State

New York State Out-of-Network Surprise Medical Bill

You may not be responsible for a surprise bill for out-of-network services

A "Surprise Bill" is when you have insurance coverage issued in the State of NY:

Hospital or surgical centers: You are a patient at a participating hospital or ambulatory surgical center and you receive services for which:

- A network doctor was not available
- An out-of-network doctor provided without your knowledge
- Unforeseen medical circumstances arose at the time the health care services were provided.

It will not be a surprise bill if you chose to receive services from an out-of-network doctor instead of form an available network doctor.

Referrals: Your network doctor did not ask your consent to refer you to an out-of-network doctor, lab or other health care provider, and did not tell you it would result in costs not covered by your health plan.

An independent dispute resolution entity (IDRE) can determine if you need to pay the bill. You, the plan or your doctor may request an independent dispute resolution (IDR) for surprise bills and referrals. Use the form on the next page to submit your request. You do not have to pay the bill in order to be eligible to submit the dispute for review to an IDRE.

Dispute resolution process

1. **Submit your request for independent review:** Complete the form on the next page. You can call Customer Service if you need help completing the form. The phone number is on you ID card. You may mail the form to us at:

   Consolidated Health Plans 2077
   Roosevelt Ave.
   Springfield, MA 01104

   Or send the form electronically to:
   customerservice@consolidatedheathplan.com

2. **An independent dispute resolution entity (IDRE) approved by the State of New York will screen your request for eligibility.**

   If the IDRE needs more information, it will contact the health plan or health care provider. If the requested information is not submitted with three business days, or if the application is not eligible, the IDRE will reject the application.

3. **The IDRE will send a letter to the person who initiated the request (you, the doctor, CHP)**

   The letter will include:

   - A request for the information needed to complete the review
   - A request for any additional information that may be available to support the request
   - Where to send the information

4. **You must submit any requested information within five business days of receiving the letter**

   If IDRE receives a partial response or no response, the dispute will be decided based on the available information. You cannot ask for reconsideration by submitting additional information after the decision is made.

5. **The IDRE will make a determination within 30 days of receiving the request**

   If IDRE feels either the provider's bill or the health plan's coverage policy is extreme, it may direct them to attempt a good faith negotiation for settlement. They will have up to ten business days for this negotiation.

   A neutral and impartial reviewer with training and experience in health care billing, reimbursement, and usual and customary charges will review the dispute. The IDRE will forward copies of its decision to the health plan, the physician, superintendent, and as applicable, the nonparticipating referred health care provider and the patient, within two business days of making the decision.

New York State Out-of-Network Surprise Medical Bill Assignment of Benefits Form

Use this form if you receive a surprise bill for health care services and want the services to be treated as in network. To use this form, you must: (1) fill it out and sign it; (2) send a copy to your health care provider (include a copy of the bill or bills); and (3) send a copy to your insurer (include a copy of the bill or bills). If you don't know if it is a surprise bill, contact the **Department of Financial Services at 1-800-342-3736**.

A surprise bill is when:

1. You received services from a nonparticipating physician at a participating hospital or ambulatory surgical center, where a participating physician was not available; or a nonparticipating physician provided services without your knowledge; or unforeseen medical circumstances arose at the time the services were provided. You did not choose to receive services from a nonparticipating physician instead of from an available participating physician; OR
2. You were referred by a participating physician to a nonparticipating provider, but you did not sign a written consent that you knew the services would be out-of-network and would result in costs not covered by your insurer. A referral occurs: (1) during a visit with your participating physician, a nonparticipating provider treats you; or (2) your participating physician takes a specimen from you in the office and sends it to a nonparticipating laboratory pathologist; or (3) for any other health care services when referrals are required under your plan.

I assign my rights to payment to my provider and I certify to the best of my knowledge that:

I (or my dependent/s) received a surprise bill from a health care provider. I want the provider to seek payment for this bill from my insurance company (this is an "assignment"). I want my health insurer to pay the provider for any health care services I or my dependent/s received that are covered under my health insurance. With my assignment, the provider cannot seek payment from me, except for any copayment, coinsurance or deductible that would be owed if I or my dependent/s used a participating provider. If my insurer paid me for the services, I agree to send the payment to the provider.

Your Name: ____

Your Address: ____

Insurer Name: ____

Your Insurance ID No: ____

Provider Name: ______________________ Provider Phone Number: ______________

Provider Address: ____

Date of Service: ______________

Any person who knowingly and with intent to defraud any insurance company or other person files and application for insurance or statement of claim containing any materially false information, or conceals for the purpose of misleading, information concerning any fact thereto, commits a fraudulent insurance act, which is a crime, and shall also be subject to a civil penalty not to exceed five thousand dollars and the stated value of the claim for each such violation.

____

(Signature of patient) (Date of signature)

Appendix Table 1: Hospital Characteristics

	All Hospitals	EmCare	TeamHealth
Hospital Characteristics			
Insurer HHI	0.37	0.36	0.35
Insurer Market Share	0.13	0.14	0.16
Hospital HHI	0.55	0.57	0.59
Government	0.15	0.17	0.13
Non-profit	0.66	0.26	0.57
For-profit	0.19	0.56	0.29
Hospital Beds	228.37	185.43	197.63
Teaching	0.09	0.05	0.04
Technologies	55.52	44.38	47.79
Number of Hospitals	3,345	194	95

Notes: These are the hospital characteristics of all AHA identified hospitals in the ED episode data. Hospitals must appear in all five years of the data and have more than 10 episodes per year.

Appendix Table 2: Hospital Entry from EmCare and TeamHealth

	EmCare	TeamHealth
2012	3 Hospitals	1 Hospital
2013	1 System (8 hospitals); 1 Hospital	2 Hospitals
2014	4 Hospitals	1 Hospital
2015	0	1 System (5 hospitals); 1 Hospital
Total	*9 Entries (16 hospitals)*	*5 Entries (10 hospitals)*

Notes: We identified hospitals that entered into an outsourcing contract with EmCare and TeamHealth between 2011 and 2015 based on press releases and news stories.

Appendix Table 3: Comparison of Hospital Characteristics

	EmCare Hospitals	EmCare Entry Hospitals	P-value from two-sided t-test	TeamHealth Hospitals	TeamHealth Entry Hospitals	P-value from two-sided t-test
Hospital Characteristics						
Insurer HHI	0.36	0.35	0.73	0.35	0.40	0.35
Insurer Market Share	0.14	0.13	0.69	0.16	0.17	0.82
Hospital HHI	0.57	0.58	0.97	0.59	0.66	0.48
Government	0.18	0.21	0.75	0.13	0.00	0.22
Non-profit	0.28	0.21	0.62	0.57	0.70	0.45
For-profit	0.54	0.57	0.85	0.29	0.30	0.96
Hospital Beds	176.49	266.50	0.04	197.63	227.40	0.50
Teaching	0.05	0.00	0.40	0.04	0.00	0.54
Technologies	43.41	57.79	0.07	47.79	54.80	0.45

Notes: The table compares characteristics of identified EmCare and Teamhealth hospitals to characteristics of hospitals where we have entry. Hospitals with entry are excluded from identified Teamhealth and EmCare hospitals. We drop two hospitals with EmCare entry that are missing measures for variables in the table. The p-value is reported from a two-sided t-test comparing the difference in means between hospitals and hospitals with entry.

Appendix Table 4: ED Episode Descriptive Statistics

	Mean	SD	Min	P10	P25	P50	P75	P90	Max
Physician Payment	412.09	320.02	49.15	106.43	182.40	314.33	543.82	872.11	1,642.45
Physician Charge	614.92	385.70	107.10	224.64	332.80	519.18	787.52	1,136.10	2,146.42
Facility Payment	2,850.62	5,218.31	119.22	400.40	689.52	1,139.04	2,418.20	6,379.46	36,286.11
Facility Charge	6,642.39	13,011.33	172.38	552.70	1,065.90	2,325.69	5,802.44	15,300.48	90,184.31
Admissions	0.09	0.29	0	0	0	0	0	0	1
Imaging	0.28	0.45	0	0	0	0	1	1	1
Length of Stay	0.58	1.97	0	0	0	0	0	1	30
CPT 99281	0.05	0.21	0	0	0	0	0	0	1
CPT 99282	0.13	0.34	0	0	0	0	0	1	1
CPT 99283	0.48	0.50	0	0	0	0	1	1	1
CPT 99284	0.50	0.50	0	0	0	0	1	1	1
CPT 99285	0.35	0.48	0	0	0	0	1	1	1
Hispanic	0.08	0.28	0	0	0	0	0	0	1
Black	0.10	0.30	0	0	0	0	0	1	1
White	0.48	0.50	0	0	0	0	1	1	1
Ages 57-65	0.17	0.38	0	0	0	0	0	1	1
Ages 47-56	0.18	0.38	0	0	0	0	0	1	1
Ages 37-46	0.17	0.37	0	0	0	0	0	1	1
Ages 27-36	0.16	0.36	0	0	0	0	0	1	1
Ages 20-26	0.13	0.33	0	0	0	0	0	1	1

Ages 0-19	0.20	0.40	0	0	0	0	0	1	1
Charlson Scores	0.34	0.99	0	0	0	0	0	1	17
6-month Spending	6,248	17,195	0	0	149	757	3,548	14,254	115,499
Episodes per hospital	2,665	3,821	60	190	442	1,177	3,279	6,964	47,599

Notes: These are the descriptive statistics for all ED episodes in our data. These are limited to episodes that occurred at in-network hospitals. Payment and charges are winsorized at the top and bottom one percentiles. Payments and charges are also inflation adjusted into 2015 dollars using the BLS All Consumer Price Index.

Appendix Table 5: Physician Payment Rates for ED Visits

	Mean	S.D.	P25	P50	P75	Max
By episode: 8,913,196 observations						
In-Network ED Physician Payment	$326.70	$238.99	$156.55	$267.14	$422.12	$1,642.45
(Percent Medicare)	(266%)					
Out-of-Network ED Physician Charge	$785.91	$443.86	$440.64	$680.34	$1,013.29	$2,146.42
(Percent Medicare)	(637%)					
Potential Balance Bill	$448.78	$369.50	$169.60	$354.60	$624.28	$2,015.28

Notes: We limit our data to hospitals with more than 10 episodes per year from 2011 to 2015. Physician charges and payments are winsorized at the top and bottom percentile. Prices are inflation adjusted using the BLS All Consumer Price Index. We calculate the potential balanced bill as the difference between the physician's charge and 266% of Medicare payments (the average in-network payment rate) for the corresponding services.

Appendix Table 6: Estimating the Impact of the Entry of EmCare on Payments and Provider Behavior
Propensity Score Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
EmCare Entry	478.19***	432.50***	1238.37***	120.90	0.018	0.011	-58.6	0.144***
	(77.87)	(64.73)	(412.95)	(129.20)	(0.010)	(0.010)	(211.7)	(0.034)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	817.20	661.80	8396.29	3098.62	0.304	0.095	1797.0	0.357
SD	485.98	452.12	14579.69	4938.14	0.460	0.294	1021.8	0.479
Observations	130,263	130,263	130,263	130,263	130,263	130,263	130,263	130,263
Control	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control groups in are composed of hospitals matched to treated hospitals using propensity scores calculated using entry as predicted by a treated hospital's beds, technology, and non-profit/for-profit status. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 7: Estimating the Impact of the Entry of EmCare on Payments and Provider Behavior
Same-State Hospitals Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
EmCare Entry	548.40***	443.22***	1522.14***	237.41**	0.012***	0.017***	-189.0	0.148***
	(62.97)	(56.13)	(395.07)	(112.91)	(0.005)	(0.006)	(219.4)	(0.030)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	615.73	471.30	7306.00	3299.64	0.280	0.090	1542.9	0.357
SD	386.33	340.41	13678.35	5587.82	0.449	0.287	1288.7	0.479
Observations	1,720,883	1,720,883	1,720,883	1,720,883	1,720,883	1,720,883	1,720,883	1,720,883
Control	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control includes hospitals in the same states as the treated hospitals. There are no hospitals that outsource their ED services to EmCare in the control group. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 8: The Impact of the Entry of EmCare on Payments and Provider Behavior
Only Hospitals with High Out-of-Network Rates (8 Hospitals)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
EmCare Entry	582.92***	414.82***	1969.88***	348.33***	0.013***	0.022***	-137.5	0.161***
	(65.52)	(62.82)	(453.98)	(133.68)	(0.005)	(0.007)	(265.8)	(0.034)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	578.72	383.27	6307.50	2745.23	0.278	0.090	1696.7	0.347
SD	364.43	297.52	12418.57	5036.10	0.448	0.286	1567.5	0.476
Observations	8,401,884	8,401,884	8,401,884	8,401,884	8,401,884	8,401,884	8,401,884	8,401,884
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7) separately on hospitals with out-of-network (OON) rates above 97%. Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 9: The Impact of the Entry of EmCare on Payments and Provider Behavior
Only Hospitals with Low Out-of-Network Rates (8 Hospitals)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
EmCare Entry	443.75***	593.24***	437.89***	60.29	0.018	0.013***	42.7	0.093***
	(129.24)	(78.12)	(106.51)	(58.42)	(0.014)	(0.003)	(32.6)	(0.034)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	576.67	380.87	6275.14	2740.55	0.277	0.090	1690.2	0.347
SD	362.08	294.61	12378.94	5035.83	0.448	0.286	1569.2	0.476
Observations	8,351,799	8,351,799	8,351,799	8,351,799	8,351,799	8,351,799	8,351,799	8,351,799
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7) separately on hospitals with out-of-network (OON) rates below 11%. Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 10: Estimating the Impact of the Entry of TeamHealth on Payments and Provider Behavior

Propensity Score Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Out-of-Network Rate	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
TeamHealth Entry	0.261***	-28.42	234.04***	-153.30	-285.15*	-0.008	-0.010	340.8*	0.027
	(0.082)	(44.01)	(27.91)	(270.94)	(132.72)	(0.010)	(0.007)	(181.8)	(0.024)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.232	705.85	503.96	7396.29	2972.14	0.304	0.083	2587.3	0.387
SD	0.422	372.52	304.59	12920.69	5045.28	0.460	0.275	1458.9	0.487
Observations	132,549	132,549	132,549	132,549	132,549	132,549	132,549	132,549	132,549
Control	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match	Propensity Score Match

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control groups in are composed of hospitals matched to treated hospitals using propensity scores calculated using entry as predicted by a treated hospital's beds, technology, and non-profit/for-profit status. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 11: Estimating the Impact of the Entry of TeamHealth on Payments and Provider Behavior
Same-State Hospitals Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Out-of-Network Rate	Physician Charge	Physician Payment	Facility Charge	Facility Payment	Imaging	Admissions	Episode Count	CPT Severity
TeamHealth Entry	0.376***	13.63	249.08***	112.10	-96.24	-0.008**	-0.008***	507.3***	0.023
	(0.035)	(37.39)	(20.91)	(179.33)	(84.41)	(0.004)	(0.003)	(188.0)	(0.015)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.305	635.76	451.66	6248.05	2862.60	0.280	0.082	1984.0	0.362
SD	0.460	397.92	342.54	12156.69	4983.97	0.449	0.274	1563.2	0.481
Observations	2,118,144	2,118,144	2,118,144	2,118,144	2,118,144	2,118,144	2,118,144	2,118,144	2,118,144
Control	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State	Hospitals in Same State

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control includes hospitals in the same states as the treated hospitals. There are no hospitals that outsource their ED services to TeamHealth in the control group. We windsorized the top and bottom percentile of hospital and physician payments. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals.

Appendix Table 12: The Impact of Entry on Historical Patient Spending and Charlson Scores

	EmCare				TeamHealth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	6 month historical spending	12 month historical spending	6 month Charlson	12 month Charlson	6 month historical spending	12 month historical spending	6 month Charlson	12 month Charlson
Firm Entry	916.02***	1306.16***	0.033***	0.036***	-336.35**	-783.08**	0.004	0.006
	(253.83)	(425.64)	(0.010)	(0.012)	(166.74)	(305.09)	(0.005)	(0.005)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	6247.15	11476.89	0.326	0.449	6266.03	11512.46	0.326	0.450
SD	17201.02	27910.51	0.919	1.056	17236.61	27971.30	0.919	1.056
Observations	8,418,226	7,056,427	8,418,226	7,056,427	8,661,796	7,256,251	8,661,796	7,256,251
Control	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals	All Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare or TeamHealth. We windsorized the top percentile of 6 and 12 month historical spending. Standard errors are clustered around hospitals. For columns 2,4,6, and 8 we restrict to patients who were enrolled with our insurer for either six or 12 months prior to the episode.

Appendix Table 13: The Impact of the Entry of EmCare on Coding Severity from Physician Visits, Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CPT Severity	CPT Severity	CPT Severity	CPT Severity	CPT Severity	CPT Severity	CPT Severity	CPT Severity
EmCare Entry	0.151***	0.149***	0.148***	0.148***	0.156***	0.142***	0.152***	0.153***
	(0.031)	(0.030)	(0.030)	(0.030)	(0.033)	(0.030)	(0.030)	(0.031)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.347	0.347	0.347	0.326	0.445	0.297	0.319	0.424
SD	0.476	0.476	0.476	0.469	0.497	0.457	0.466	0.494
Observations	8,418,226	8,418,226	8,418,226	6,960,514	1,457,712	2,806,097	2,806,055	2,806,074
Controls	No Controls	Patient Characteristics	Patient and Charlson	Charlson Score of 0	Non-zero Charlson Score	Lowest third of the historical spending distribution	Middle third of the historical spending distribution	Upper third of the historical spending distribution

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of facility payments. Standard errors are clustered around hospitals. In columns 6,7, and 8 historical spending is split into thirds where each column contains the sample of patients from the bottom, middle, and upper third of spending.

Appendix Table 14: The Impact of the Entry of EmCare on Facility Payments, Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Facility Payment	Facility Payment	Facility Payment	Facility Payment	Facility Payment	Facility Payment	Facility Payment	Facility Payment
EmCare Entry	316.63**	309.57***	294.58***	204.95**	742.32**	215.42**	228.37**	428.78***
	(124.89)	(115.77)	(113.64)	(82.50)	(356.38)	(106.80)	(109.11)	(160.14)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	2744.27	2744.27	2744.27	2417.80	4303.16	2353.30	2355.26	3524.26
SD	5034.47	5034.47	5034.47	4418.88	7084.79	4492.45	4350.98	6001.00
Observations	8,418,226	8,418,226	8,418,226	6,960,514	1,457,712	2,806,097	2,806,055	2,806,074
Controls	No Controls	Patient Characteristics	Patient and Charlson	Charlson Score of 0	Non-zero Charlson Score	Lowest third of the historical spending distribution	Middle third of the historical spending distribution	Upper third of the historical spending distribution

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of facility payments. Standard errors are clustered around hospitals. In columns 6,7, and 8 historical spending is split into thirds where each column contains the sample of patients from the bottom, middle, and upper third of spending.

Appendix Table 15: The Impact of the Entry of EmCare on the Frequency of Imaging, Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Imaging	Imaging	Imaging	Imaging	Imaging	Imaging	Imaging	Imaging
EmCare Entry	0.016***	0.014***	0.014***	0.013**	0.028***	0.014**	0.017**	0.012**
	(0.005)	(0.005)	(0.005)	(0.006)	(0.009)	(0.007)	(0.008)	(0.005)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.278	0.278	0.278	0.268	0.324	0.254	0.261	0.319
SD	0.448	0.448	0.448	0.443	0.468	0.435	0.439	0.466
Observations	8,418,226	8,418,226	8,418,226	6,960,514	1,457,712	2,806,097	2,806,055	2,806,074
Controls	No Controls	Patient Characteristics	Patient and Charlson	Charlson Score of 0	Non-zero Charlson Score	Lowest third of the historical spending distribution	Middle third of the historical spending distribution	Upper third of the historical spending distribution

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of facility payments. Standard errors are clustered around hospitals. In columns 6,7, and 8 historical spending is split into thirds where each column contains the sample of patients from the bottom, middle, and upper third of spending.

Appendix Table 16: The Impact of the Entry of EmCare on the Frequency of Admissions, Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Admissions	Admissions	Admissions	Admissions	Admissions	Admissions	Admissions	Admissions
EmCare Entry	0.022***	0.022***	0.021***	0.014***	0.053***	0.011*	0.016***	0.035***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.019)	(0.006)	(0.005)	(0.010)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.090	0.090	0.090	0.071	0.181	0.066	0.070	0.134
SD	0.286	0.286	0.286	0.257	0.385	0.248	0.256	0.341
Observations	8,418,226	8,418,226	8,418,226	6,960,514	1,457,712	2,806,097	2,806,055	2,806,074
Controls	No Controls	Patient Characteristics	Patient and Charlson	Charlson Score of 0	Non-zero Charlson Score	Lowest third of the historical spending distribution	Middle third of the historical spending distribution	Upper third of the historical spending distribution

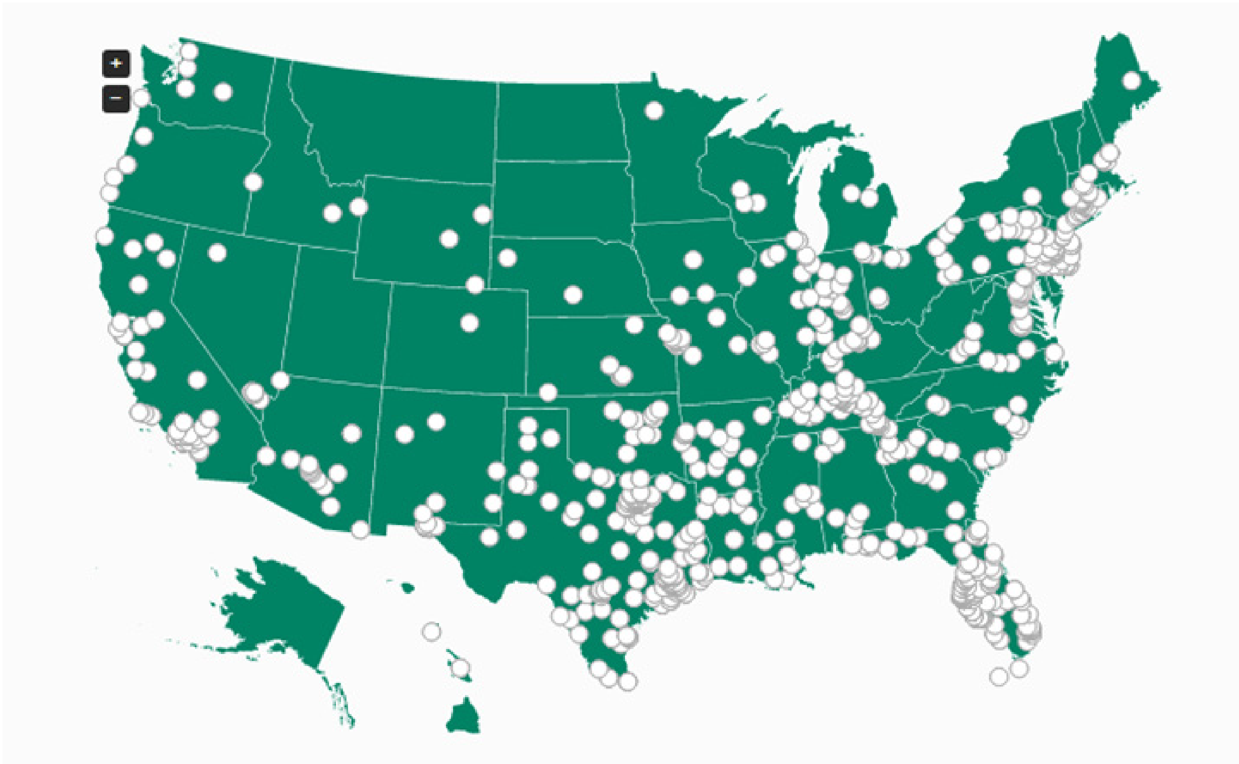
Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (7). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom percentile of facility payments. Standard errors are clustered around hospitals. In columns 6,7, and 8 historical spending is split into thirds where each column contains the sample of patients from the bottom, middle, and upper third of spending.

Appendix Table 17: ED Episodes and Annual Spending

	Emergency Episodes	Total Facility Spending	Total Physician Spending	Percent ASO	Share of Episodes at in-network hospitals
2011	61,331	$148,222,782	$19,125,875	87.6%	97.9%
2012	69,404	$170,582,628	$22,812,526	89.2%	99.0%
2013	67,317	$182,161,431	$22,551,581	91.5%	99.6%
2014	65,388	$187,074,086	$21,531,723	92.1%	99.8%
2015	60,496	$184,594,280	$21,197,031	90.4%	99.8%
Total	323,936	$872,635,207	$107,218,736	90.2%	99.2%

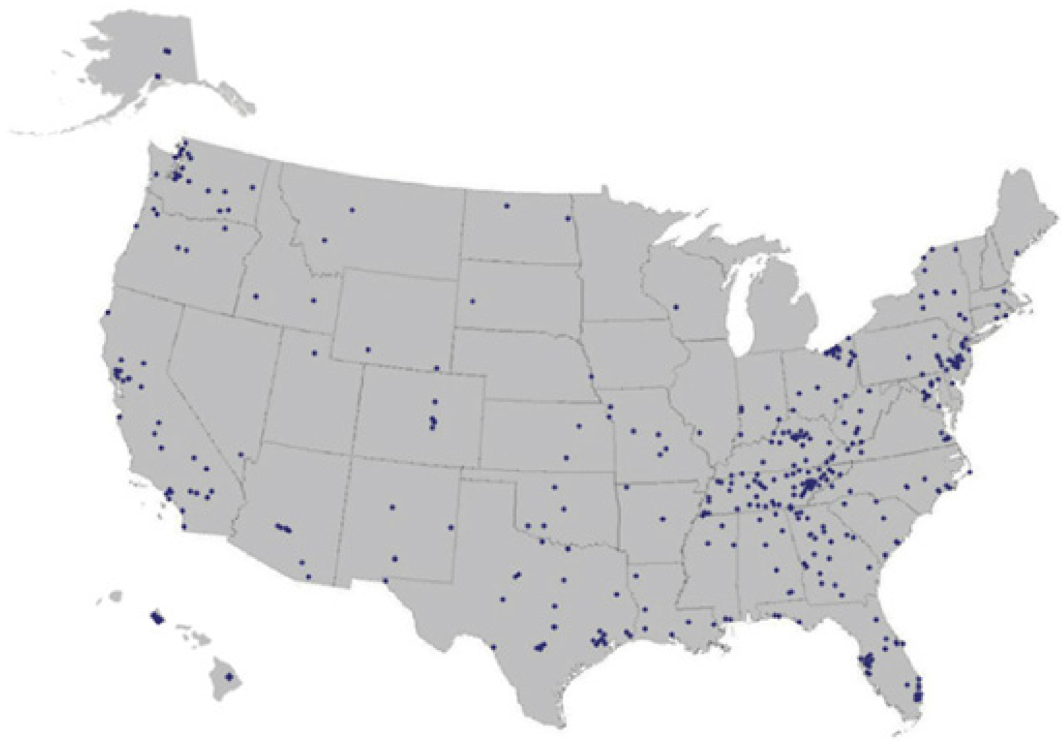
Notes: The table shows summary statistics for our data in New York State. Only episodes that occur in an in-network hospital are included. There are a small percentage of episodes (> 0.5%) that are missing a label for ASO or fully-insured.

Appendix Figure 1A: Map of EmCare Locations



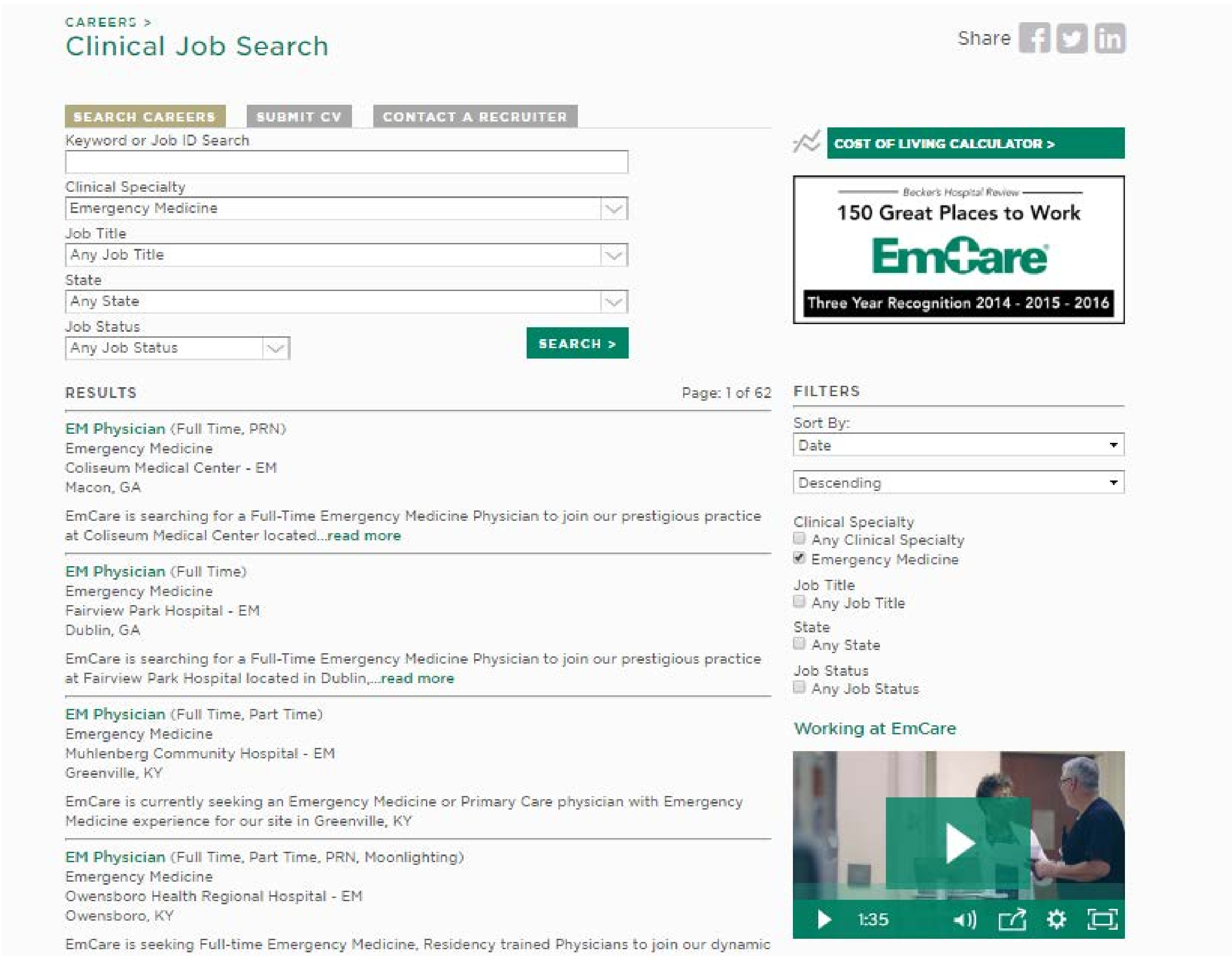
Notes: This map was taken from the webpage of EmCare's parent company Envision Healthcare (https://www.evhc.net/vision/emcare). The underlying HTML source code from the web page contains the latitude and longitude coordinates of each white point displayed. We calculate each coordinate pair's distance to AHA-registered hospital coordinates, and only keep hospitals that are within a 30-mile radius from an AHA-registered hospital. If there are multiple hospitals within a 30-mile radius, we keep only the nearest facility and define it as the identified hospital. We further cross-validate our findings with hospitals from EmCare's job listings found on their website. Our final list includes hospitals that are identified using mapping locations that are cross-validated with job hiring posts.

Appendix Figure 1B: Map of TeamHealth Locations



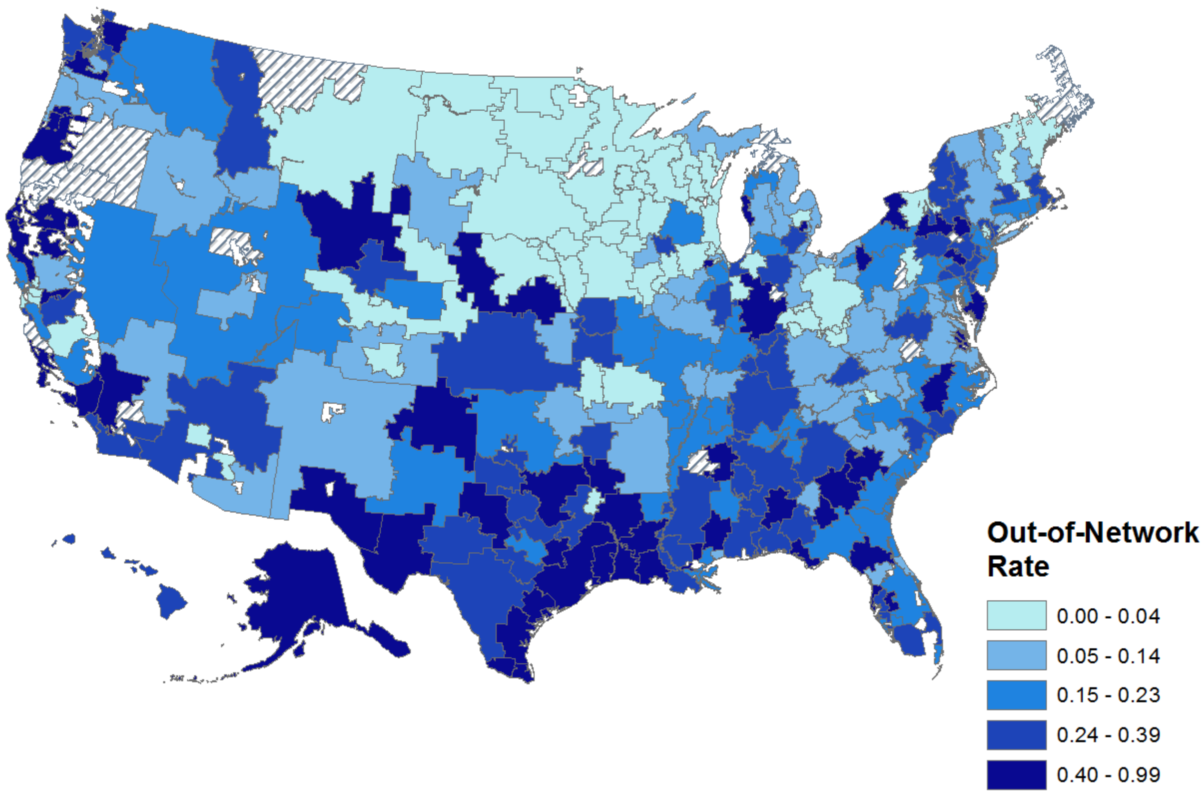
Notes: This is a map from a 2009 Morgan Stanley report on TeamHealth. To determine the hospital locations shown on this map, we used georeferencing in ArcGIS. Georeferencing takes an image or scanned photo without spatial reference information and aligns it to a map with a known coordinate system. In our case, we used a map of the United States (obtained here: https://www.census.gov/geo/maps-data/data/cbf/cbf_state.html), and linked control points from the US map to the map of TeamHealth's locations. To link control points, the location of two identical points on each map are identified (for example, the southern tip of Florida). With several control points defined, the TeamHealth map is then warped and transformed to overlay directly onto the known US map. With the map in place, we mark the center of each blue dot as a hospital location. Because the map now has a defined coordinate system, we are able to obtain the latitude and longitude from these markers. We subsequently calculate each coordinate pair's distance to AHA-identified hospital coordinates, and only keep hospitals that are within a 30-mile radius from an AHA-identified hospital. If there are multiple hospitals within a 30-mile radius, we keep only the nearest facility and define it as the identified hospital. We cross-validate our mapping with hospitals from TeamHealth's job listings page on their website. Our final list of hospitals only includes hospitals that are both identified from the map and appear in job listings.

Appendix Figure 2: Example of EmCare Job Listing



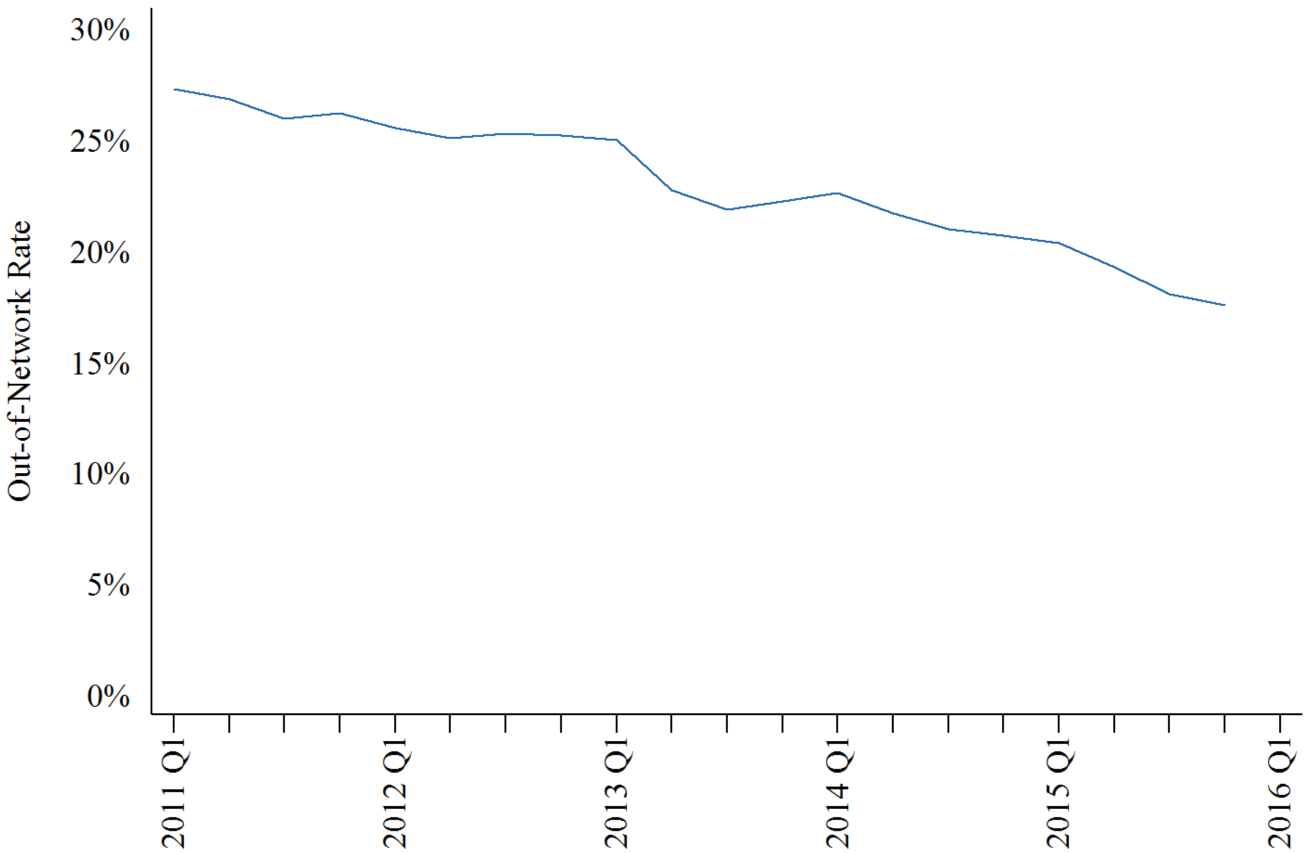
Notes: This screen grab is taken from EmCare's job hiring page. (https://www.emcare.com/careers/clinical-job-search).

Appendix Figure 3 – Map of 2011 to 2015 Out-of-Network Rates by HRR



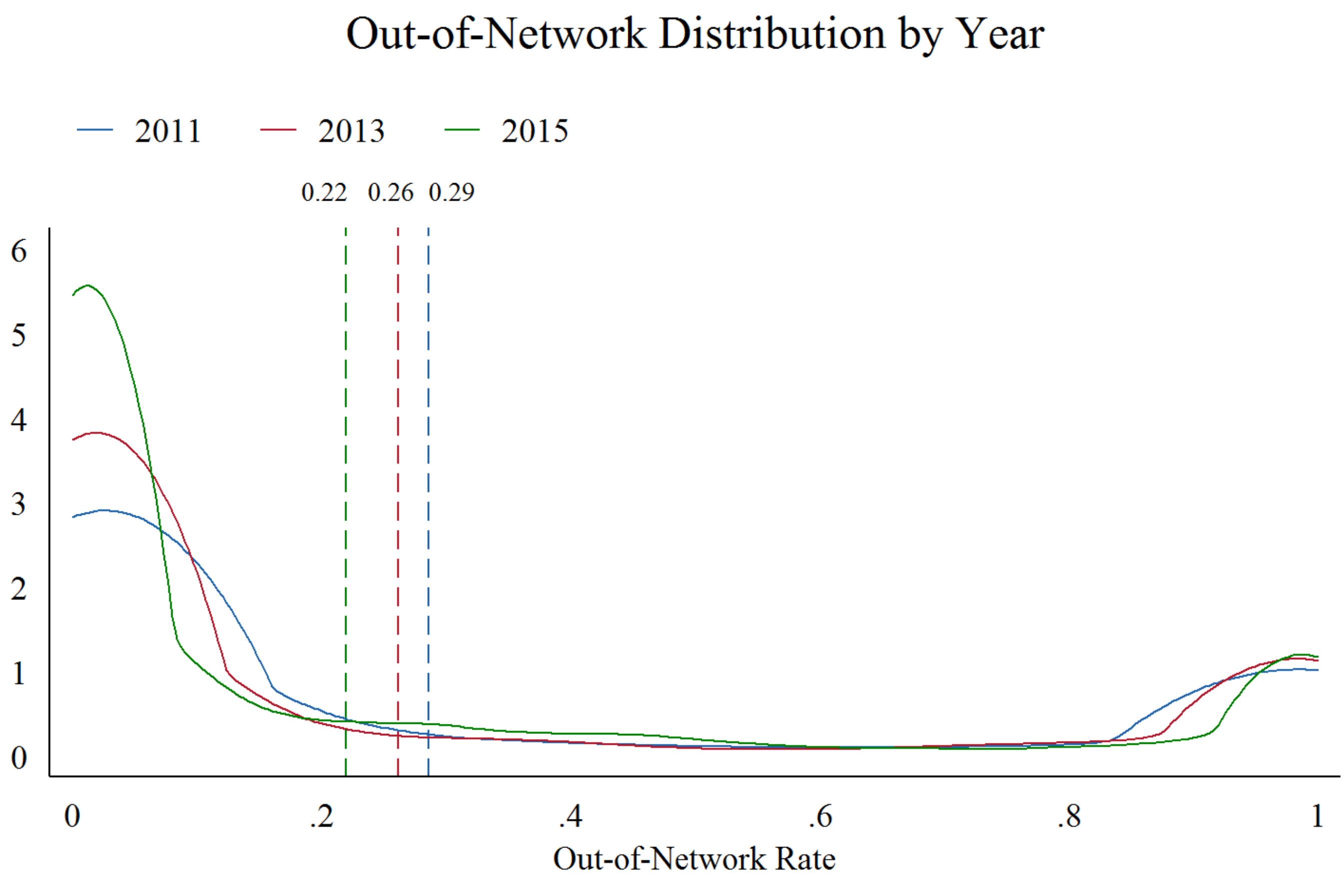
Notes: The figure shows the 2011-2015 out-of-network rates by HRR. To be included, a HRR must have more than 2,000 episodes in the 5 years of data.

Appendix Figure 4: Quarterly Out-of-Network Rates from 2011 to 2015



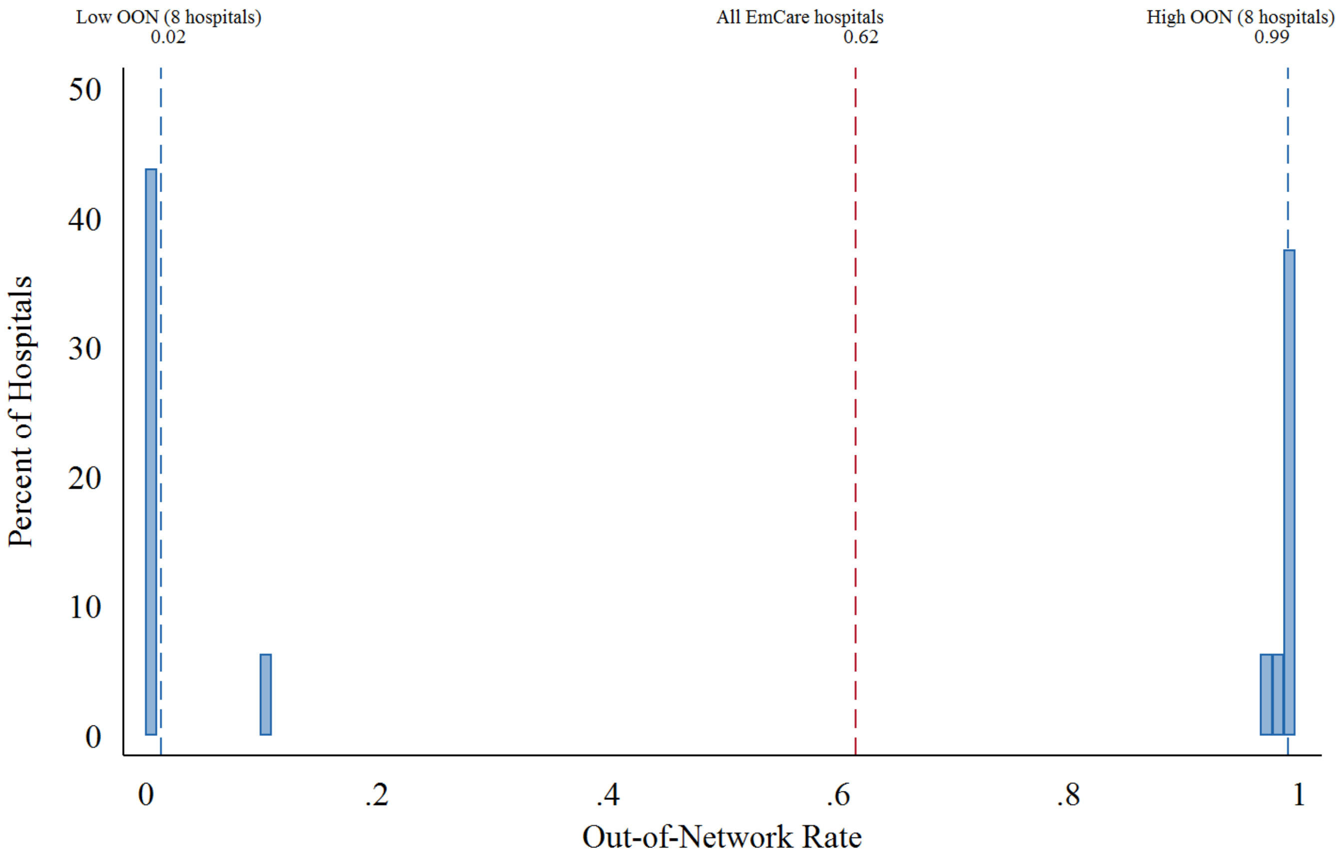
Notes: The figure shows quarterly out-of-network rates for all ED episodes in our data from 2011-2015. Out-of-network rates are first constructed at the HRR level. An HRR's out-of-network rate is weighted based on the count of episodes in 2011. An HRR must have more than 125 episodes per quarter.

Appendix Figure 5: The Distribution of Hospital Out-of-Network Rates, 2011, 2013, and 2015



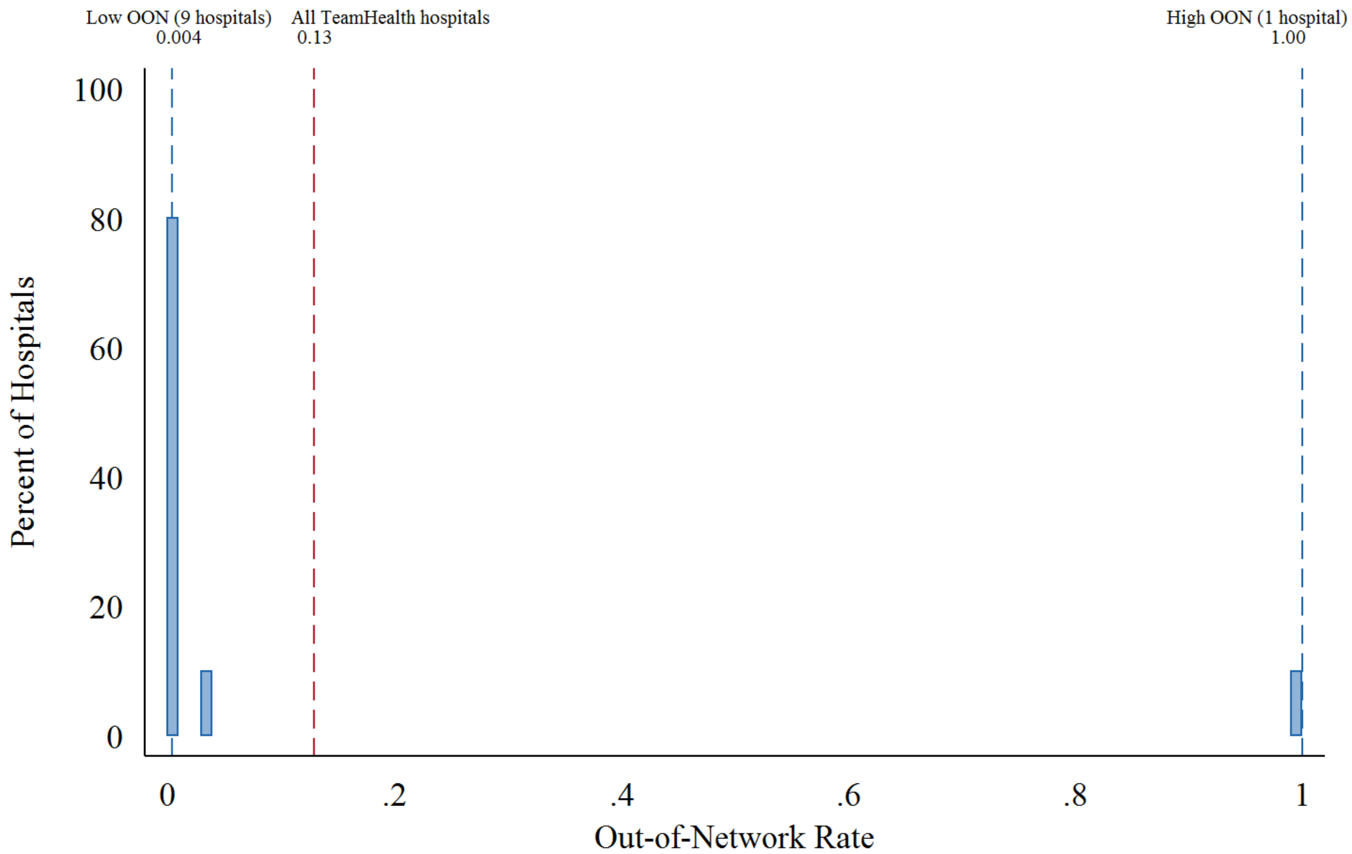
Notes: The figure shows the distribution of hospital out-of-network rates in years 2011, 2013, and 2015. There are 3,345 hospitals that appear in each year of the data.

Appendix Figure 6A: The Distribution of Out-of-Network Rates at Hospitals where EmCare Enters, 2011



Notes: The figure shows a histogram of out-of-network rates for hospitals prior to EmCare entry in 2011. There are a total of 16 EmCare entry hospitals. Each bar shows the percent of hospitals falling into a given out-of-network rate. The red vertical line is the average of all EmCare hospitals from 2011-2015.

Appendix Figure 6B: The Distribution of Out-of-Network Rates at Hospitals Where TeamHealth Enters, 2011



Notes: The figure shows a histogram of out-of-network rates for hospitals prior to TeamHealth entry in 2011. There are a total of 10 TeamHealth entry hospitals. Each bar shows the percent of hospitals falling into a given out-of-network rate. The red vertical line is the average of all TeamHealth hospitals from 2011-2015.