Surprise! Out-of-Network Billing for Emergency Care in the United States

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Abstract: Hospitals and physicians independently negotiate contracts with insurers. As a result, a privately insured individual can attend an in-network hospital, but receive care from an out-of-network physician. Because patients do not choose their emergency physician, emergency physicians can remain out-of-network and charge high prices without losing volume. This strong outside option improves their bargaining power with insurers. We show that emergency physician outsourcing firms take advantage of this strong outside option by either remaining out-of-network or by using it to negotiate higher in-network rates. We propose a policy that would restore competition to the ED physician market and protect consumers.

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1. Introduction

Each year, there are 41.9 emergency department (ED) visits per 100 people in the United States (US) (Rui et al. 2013). When patients access EDs, they are consuming a package of care that includes hospital and physician services. However, what most privately insured patients do not realize is that hospitals and physicians independently negotiate contracts with insurers. While patients generally have a choice over which hospital they attend (only 14.5 percent of ED patients arrive via ambulance), once they enter a hospital ED, they have little or no discretion over the ED physician who treats them (Rui et al. 2013). As a result, it is possible for a patient to choose a hospital ED that is in-network with his insurer, but receive care and a subsequent bill from a physician working in that ED who is out-of-network with his insurer. When a physician is out-of-network, she bills for her "charges," which we show in our data are more than double the standard, in-network, payments made to most ED physicians. As we describe in this paper, a fundamental problem in emergency medicine in the US is that ED physicians face completely inelastic demand when they are practicing inside in-network hospital EDs. As a result, they need not set their prices in response to market forces. Ultimately, the practice of out-of-network billing from inside in-network hospitals undercuts the functioning of health care labor markets, exposes patients to significant financial risk, and reduces social welfare.

The financial harm patients face if they are treated by an out-of-network physician can be substantial. In many instances, when a patient is treated by an out-of-network physician, insurers will only pay physicians a portion of their out-of-network charges. This leaves the physician to attempt to collect the difference between her charges and the insurer's payment (the balance) from the patient (so-called balanced or surprise billing). These balanced bills can be hundreds or thousands of dollars (Rosenthal 2014a, 2014b, Sanger-Katz and Abelson 2016). They are also unexpected by patients who reasonably assume that because they chose in-network hospitals for care, they would also be treated by in-network emergency physicians. Moreover, even when an insurer pays the entirety of a physician's out-of-network charges, those higher costs will be passed onto consumers via an increase in premiums and higher cost sharing (since patients will pay a fixed percentage of the physician's charges, rather than a fixed percentage of in-network rates).

More generally, the ability to successfully execute an out-of-network strategy creates a powerful outside option for ED physicians in their negotiations with insurers. If an insurer fails to offer a high enough in-network rate, ED physicians working inside in-network hospitals can refuse to contract with the insurer, treat patients out-of-network, and bill patients for their charges. Because patients cannot avoid out-of-network physicians in their chosen hospital, ED physicians who go out-of-network will not face any reduction in the number of patients they treat. This stands in contrast to other healthcare providers, such as primary care physicians, who will see a reduction in their patient volume if they do not join insurers' networks. Theory predicts that the availability of a lucrative outside option will give ED physicians bargaining leverage that will allow them to raise their in-network payment rates.[1] These higher payment rates, caused not by supply or demand, but rather by the ability to "ambush" the patient, represent a transfer from consumers to physicians and raise the cost of health care.

In this paper, we analyze data from a large insurer that covers tens of millions of lives annually to study where and why out-of-network ED billing occurs, to examine how it impacts in-network payment rates, and to test policy solutions designed to protect consumers. Our data cover nearly $28 billion in emergency spending on 8.9 million ED episodes from 2011 through 2015. We find that out-of-network physicians charge, on average, 637 percent of what the Medicare program would pay for identical services, which is 2.4 times higher than in-network payment rates. Consistent with the benefits of having a stronger outside option, we find that ED physicians in our data are paid in-network rates of 266 percent of Medicare payments, which is higher than what most other specialists are paid (for reference, in our data, in-network orthopedic surgeons are paid 178 percent of Medicare rates to perform hip replacements).

In previous research, Cooper and Scott Morton (2016) found that 22 percent of privately insured patients treated at in-network hospital EDs were treated by out-of-network ED physicians. In this paper, we show that focusing on the average frequency of out-of-network billing nationally masks important heterogeneity in out-of-network rates across hospitals. Out-of-network billing is concentrated in a small number of hospitals. We find that 50 percent of hospitals have out-of-network billing rates below two percent while 15 percent of hospitals have out-of-network billing rates above 80 percent. This paper explores the reasons for this heterogeneity and discusses the policy response that it requires.

Approximately two-thirds of hospitals in the US outsource the staffing of their EDs to physician management firms that hire and manage physicians, manage ED operations, and take

[1] For a description of this result, see Osborne, Martin and Ariel Rubinstein (1990).

care of billing (Deutsche Bank 2013). We analyze the behavior of the two largest ED outsourcing firms in the US: TeamHealth and EmCare. We find that the firms employ very different out-of-network strategies. However, we ultimately observe that both firms profit from the fact that out-of-network physicians working in in-network hospitals cannot be avoided by patients. The differences in how EmCare and TeamHealth use out-of-network billing to raise revenue are interesting in their own right. In addition, they offer insight into the economics of bargaining between physicians and insurers.

Across our-sample, EmCare-managed hospitals have an average out-of-network ED physician billing rate of 62 percent. Looking at data from 2011 to 2015, we find that after EmCare took over the management of emergency services at hospitals with previously low out-of-network rates, they raised out-of-network rates by over 81 percentage points. In addition, the firm raised its charges by 96 percent relative to the charges billed by the physician groups they succeeded. Some of this increase in physician charges is the result of a 43 percent increase in the rate the company coded for physician services using the highest acuity (highest paying) service code. Ultimately, we observe that the total payments made to EmCare by the insurer who contributed our data increased by 122 percent after EmCare entered a hospital. We also observe that patients faced an 83 percent increase in their cost sharing after the firm entered a hospital. Consistent with predictions from the model we present, we also find evidence that the firm compensated hospitals for allowing them to engage in an out-of-network strategy from inside their facilities. This transfer took the form of an 11 percent increase in facility payments after EmCare entered a hospital, which was driven by increases in the rates patients received imaging studies and were admitted to the hospital by EmCare physicians.

Interestingly, TeamHealth, which has an average out-of-network billing rate of 13 percent, uses the threat of out-of-network billing to secure higher in-network payments. On average, we observe that after TeamHealth entered a hospital, out-of-network rates increased by 33 percentage points. However, in most instances, several months after going out-of-network, TeamHealth physicians rejoined the network and received in-network payment rates that were 68 percent higher than previous in-network rates. This is an example of the firm using a now-credible threat of out-of-network billing to gain bargaining leverage in their negotiations over in-network payments. Consistent with theory and our model, the TeamHealth in-network price is lower than the EmCare out-of-network price. In contrast to what we observed for EmCare, 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 percent increase in the number of cases treated per year in entry hospitals' EDs.

What hospitals would allow physician groups working inside their facilities to engage in and out-of-network billing strategy given that it exposes patients to financial risk? Newhouse (1970) posited that hospitals trade off patient and community benefit with profits. Theory predicts that hospitals that place a lower weight on patient welfare relative to profits will have more out-of-network billing. While there is ambiguity about the objective function of non-profit hospitals, we would expect for-profit firms to be, ceteris paribus, more willing to prioritize profits ahead of community benefit and contract with firms that deliberately go out-of-network. Consistent with these predictions, we find that for-profit hospitals have higher out-of-network billing rates. In addition, whereas 19 percent of hospitals in our sample are for-profit, 56 percent of the hospitals that contract with EmCare are for-profit ventures.

Finally, we use our data to study the impact of a 2014 New York law that was designed to protect fully-insured patients from surprise out-of-network bills. The law requires that patients pay no more than their standard in-network cost sharing rates during an emergency, even if they are treated by an out-of-network provider. The law also prohibits balanced billing. 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 that could not be resolved by the insurers and physicians directly. We find that the New York law lowered the incidence of out-of-network billing by 34 percent. Unfortunately, because states cannot regulate administrative services only (ASO) plans, the New York law applies only to the 40 percent of the privately insured population that is covered by a fully-insured health insurance product. However, the "baseball rules" effectively protect ASO patients, as we show below. Importantly, the law does not fix the underlying problem of ED physicians being shielded from competition. We close the paper by outlining a broader policy solution that would apply to all forms of insurance (fully-insured and administrative-services only products). We propose that either states or the federal government require hospitals to sell and insurers to purchase an "ED package" of emergency medical care that includes both hospital and physician services. This change in contract structure would generate competition in insurance, hospital, and physician markets, eliminate out-of-network billing, and protect consumers

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 approach to identifying hospitals that contracted with EmCare and TeamHealth. 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 and analyze the impact of the entry of EmCare and TeamHealth on out-of-network billing, out-of-pocket costs, and hospital behavior. Section 6 analyzes the impact of a New York State law designed to end out-of-network billing. In Section 7, we 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 States

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 completed residencies in the specialty of emergency medicine and who obtained board-certification in the specialty (Institute of Medicine 2006).[2] At present, there are more than 4,500 EDs in the US and approximately 40,000 physicians who staff them nationwide (Hsia et al. 2011; Morganti et al. 2013). The use of EDs has risen dramatically over time. From 1993 to 2003, the U.S. population grew by 12 percent, hospitalizations increased by 12 percent, and ED visits increased by 26 percent (Institute of Medicine 2006). From 2001 through 2008, the use of EDs increased 1.9 percent each year—60 percent faster than concurrent population growth (Hsia et al. 2011).

Over the last several decades, 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 in which patients were admitted to the hospital via an ED increased from 33.5 percent to 48.3 percent (Schuur and Venkatesh 2012). Over time, as the use of EDs has gone up, waiting times to be treated in EDs have also increased (Hing and Bhuiya 2012). In response to rising waiting times, EDs increasingly are competing on the length of time patients have to wait

[2] 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 higher than 50% (Wadman et al. 2005; Groth et al. 2013; McGirr et al. 1998).

before they are treated (Esposito 2015, Rice 2016). Because EDs have become a major source of patients, hospitals now want to keep their EDs open at all hours and run them efficiently (Institute 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, roughly 65 percent of the physician market is outsourced (Deutsche Bank 2013). Among the hospitals that outsource their services, approximately a third contract with a large, national outsourcing chain and the remainder are outsourced to smaller, local firms (Dalavagas 2014). Two leading national outsourcing firms—EmCare and TeamHealth—collectively capture approximately 30 percent of the physician outsourcing market (Deutsche Bank 2013).

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

2.2 Out-of-Network Surprise Billing

There has been significant coverage of out-of-network billing in the popular press (Rosenthal, 2014a, 2014b, Sanger-Katz and Abelson 2016). However, until recently, there has been no systematic evidence on the frequency that 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 Consumers Union (2015) survey found that 30 percent of privately insured individuals reported receiving a surprise medical bill within the previous year, and Kyanko et al. (2013) found that most instances in which privately insured individuals involuntarily saw out-of-network providers occurred during medical emergencies. In many instances, when patients receive a surprise bill, they simply pay the balance in full (Consumers Union 2015). Likewise, among those who had trouble paying a medical bill, 32 percent 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 medical 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 percent, 56 percent, and 21 percent of their in-network hospitals had *zero* in-network ED physicians (Pogue and Randall 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 percent of in-network ED hospital visits included a primary physician claim from an out-of-network doctor. Using completely different data, Garmon and Chartock (2017) found that 20 percent of ED cases in which care was delivered to privately insured patients at in-network hospitals involved care form an out-of-network physician. As we will show below, knowing the average propensity of receiving an out-of-network bill does not help diagnose the policy problem, which lies in the tail of the distribution of out-of-network billing rates across hospitals.

It is clear that most patients face higher co-insurance rates when they see out-of-network physicians, can be balanced billed, and, in some instances, may be wholly responsible for the cost of their visit. As we show later from our data, these physician bills can be extremely large. Unfortunately, there is no systemic evidence on the frequency that patients are balance billed or exposed to the full costs of an episode of care. However, reports from regulators in Colorado and New York indicate that this practice does occur and can expose patients to significant financial risk (Department of Financial Services 2012, Department of Regulatory Agencies 2010). Likewise, data from the Texas Department of Insurance showed that balance-billing complaints in the state increased 1,000 percent from 2012 to 2015 (Gooch 2016).

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

3.1 Data

Our claims data come from a large commercial insurer that covers tens of millions of lives annually. The data run from January 1, 2011, through December 31, 2015. The data are structured at the 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.[3] We limit our analysis to episodes that occurred at hospitals registered with the American Hospital Association (AHA). Therefore, 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. Thus, the analysis is focused only on hospital-based ED care. This restriction eliminates 1,908,710 episodes. Second, we exclude episodes for which the same physician billed as in-network and out-of-network on separate service lines on the same claim form. This restriction eliminates 264,636 episodes. Third, we exclude episodes with duplicative insurer payments, episodes with insurer payments that were negative, and episodes for which the insurer paid $0 because the claims were denied. This restriction removes 217,267 episodes. Fourth, we exclude episodes for which 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 10 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 individuals who had six months of continuous enrollment before their emergency episode.[4] Having six-months of historical data is necessary to create our Charlson comorbidity scores. This restriction excludes 1,810,245 episodes from our analysis. Finally, we winsorize the top and bottom 1 percent of the prices in our data.[5] We do this to limit the influence of idiosyncratically high- and low-priced episodes.

In our data, we observe the amount the ED physician and hospital submitted as a charge, the amount that the insurer paid, and patients' co-insurance payments, co-payments, and spending under their deductibles. We define the total amount an ED physician was paid as the

[3] 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 a physician service line with an ED code and a facility service line with an ED code.

[4] We did so because we wanted to have the ability to control for patients' historical spending and comorbidity.

[5] Our results are robust to not winsorizing prices, but there are extremely large hospital and physician charges and payments.

sum of the insurer payment, the patient co-insurance payment, the patient co-payment, and the patient deductible on physician service lines that have a CPT code for emergency services.[6] We calculate facility payments as the sum of the insurer payment, patient co-insurance, patient co-payment, and patient spending under her deductible summed across all facilities claims. All prices are put in 2015 dollars using the U.S. Bureau of Labor Statistics Consumer Price Index.

Unfortunately, we do not observe whether patients were balanced billed by physicians. Therefore, it is possible that the physician collects more in total than we can measure. To our knowledge, there are no datasets with information on the balance billing of patients. However, we construct a potential balanced bill measure that is the difference between what the physician charged and the sum of what the physician was paid by patients (in the form of cost-sharing) and by the insurer. We also create a measure of patients' potential total cost exposure, which we calculate as the sum of the potential balanced bill and their out-of-pocket costs.

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.[7] 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.[8]

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 12-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 for an episode back six and 12 months. In addition, we used six and 12 months of claims data to calculate Charlson measures of comorbidity (Charlson et al. 1987).[9]

3.2 Identifying Where EmCare and TeamHealth Have Contracts

The national market for physician outsourcing is dominated by two firms that collectively account for approximately 30 percent of the outsourced physician market. EmCare is publicly

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[6] These are service lines with a CPT code of 99281, 99282, 99283, 99284, 99285, or 99291.

[7] We identified episodes that included imaging studies based on whether or not the facility claims had a service line with the revenue codes 350–352, 610–619, 400–404, or 409.

[8] 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.

[9] We pooled individuals with a Charlson score of 6 and higher.

traded, operates in 45 states, has 23,100 affiliated or employed physicians and health care professionals, and according to their 2016 Form 10-K, delivers more than 18 million emergency episodes per year. More recently, EmCare has partnered with a large, for-profit hospital chain and formed joint ventures where the firm and its hospital partners share in profits from physician bills (Deutsche Bank 2013).

The second firm, TeamHealth, is approximately the same size. According to the firm's 2015 Form 10-K, TeamHealth has more than 18,000 affiliated health professionals and delivers approximately 10 million 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.

EmCare and TeamHealth bill using their contracted physicians' National Provider Identifier (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. We require two independent sources of information to classify a hospital as a facility that outsourced its ED services to EmCare or 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 the company webpage that included the approximate location of each location where EmCare has a contract (see Appendix Figure 1A). The map on the Envision webpage included embedded latitudes 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 (TeamHealth 2009) (see Appendix Figure 1B). To identify hospital locations on the TeamHealth map, we scraped the map using mapping software from ArcGIS.[10]

The second source of information we use to identify hospitals that contract with EmCare and TeamHealth came from job advertisements posted by the firms. Each firm posts job advertisements for physicians on their respective webpages (see an example in Appendix Figure

[10] To obtain the latitudes and longitudes of the 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 within a reasonable range of accuracy.

2). The job advertisements include the name of the hospital where physicians are being recruited and the specialty of the physicians the hospital is looking to hire. We scraped the names of the hospitals and the specialty of the physicians being recruited from all job postings 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 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, in general, these firms wholly take over an ED and participate in exclusive contracts with hospitals (Deutsche Bank 2013).

Using this strategy, we 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 percent outsource their ED to EmCare and 2.8 percent outsource their ED to TeamHealth. Based on investor reports on EmCare and TeamHealth, our sample of hospitals with contracts with EmCare and TeamHealth represents an undercount of the total population of hospitals that have contracts with EmCare and TeamHealth.

We also use the entrance of physician management companies into hospitals to estimate the causal effect the entry of TeamHealth and EmCare had on physician pricing and hospital behavior. To do so, we identify hospitals where these firms entered into an outsourcing contract from 2011 to 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 contract with 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 nine health systems while TeamHealth entered into contracts with 10 hospitals that were part of six systems (see Appendix Table 1).

4. Modeling Surprise Out-of-Network Billing

For it to occur, there are three parties that have to prefer out-of-network billing to an in-network contract: the physician group, the hospital, and the insurer. The physician group and insurer must be unable to come to an agreement on an in-network contract. In addition, the hospital must effectively allow physicians to bill out-of-network from inside their facilities.[11] We discuss each party's incentives in turn.

4.1 Out-of-Network Prices

The physician group and the insurer bargain over the price the insurer will pay the physicians. The revenue component of the disagreement payoff of the physician group should it end up out-of-network is a price limited only by the laws of a state, s. Since state laws differ, this net price will vary by state, and we could think of the price as being a function of that state's institutional environment, e.g. $p = f(law_s)$.[12] However, the model below will focus on agents all in one state and describe the average out-of-network price the group can collect, p^L, as coming from the legal environment, not the market environment in that state. A crucial feature of emergency medicine (that our model exploits) is that the quantity of patients seen by the emergency physician group is invariant to its network status.[13]

4.2 Insurers

We denote the equilibrium negotiated price as p^*. We abstract from all other revenue and costs of the insurer and simply define r to be the insurer's net revenue per patient without any ED physician cost. Thus, the net benefit of a representative enrollee to the plan is r less the cost of the ED physician. If the physician group and the insurer agree to a contract at p^*, the insurer gets:

$$U_{i,IN} = r - p^*. \quad (1)$$

If the two parties do not agree, then the physician group begins billing its charges, which are higher than negotiated network rates. The insurer may take advantage of any state law to reduce those physician charges, but the laws result in an effective price received by the physicians of p^L.

[11] The hospital may not have legal authority to prevent a physician (or physician group) from practicing in the ED just because that physician has failed to come to an agreement with any given insurer or insurers. However, we assume there are so many interactions between the hospital and an ED physician group that if the hospital disapproved of the group's overall strategy, it could make the relationship sufficiently onerous such that the physicians would move in-network.

[12] In Maryland and California, for example, out-of-network physicians cannot bill more than the greatest of either their in-network payments, a fixed percentage of Medicare payments, or physicians' usual and customary charges.

[13] When patients attend a hospital ED, they have no choice over the physician that treats them. As a result, once a patient decides to attend a hospital ED, the patient cannot avoid out-of-network physicians working in that ED. Previous researchers have used this feature of emergency medicine as a source of random variation in physician assignment (see: Barnett, Olenski, and Jena 2017, Chan 2015).

We assume that the insurer ends up paying some fraction γ, less than one of the new out-of-network price p^L. We will treat γ as exogenous in our model.[14] The net insurer payoff under disagreement is thus:

$$U_{i,OUT} = r - \gamma p^L. \quad (2)$$

A second difference under disagreement is that now the physicians also collect the balance of the payment from the patient, who earns a disutility payoff $W\big((1-\gamma)p^L\big) < 0$. The patient blames the hospital for the balance bill so the hospital suffers harm to its reputation of k_h. Throughout the model, when we use the term "out-of-network billing" we are referring to physicians using the deliberate strategy of raising charges by a significant amount in order to earn higher payments. It is perfectly possible for an ED physician group to not have a contract with a patient's insurer (perhaps due to transaction costs) and to charge that patient a typical in-network price. We assume, as is the case in our data, that in this situation the patient and the insurer will share costs in the usual way and there are no disputes. We further assume that in that case there is no reputational cost to the hospital. While this setting is technically also "out-of-network billing," we exclude it from the definition in our discussion below in order to focus on the deliberate strategy of raising prices.

4.3 Hospitals

We assume that hospitals understand when their outsourcing firm will be taking advantage of patients and insurers with an out-of-network billing strategy. Hospitals appreciate that the management company cannot carry out its strategy without access to the ED, and therefore the hospital will be able to bargain to keep a share of the increased profits generated by the outsourcing firm. These profits could take the form of physicians allowing the hospitals to share in the physicians' profits (e.g., with a joint venture), through a reduction in any management fees that a hospital would have to pay a firm to staff their ED. The payment could alternatively be generated by 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.

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[14] It could be that γ is determined by state laws and norms as well as by competition in the insurer market. We assume that frictions in the physician ED market are too small to create any feedback to insurance competition.

Because the hospital can block an out-of-network billing strategy, it must be compensated for the reputational loss it incurs from having this practice occur inside its facility. We assume that an outsourcing firm can pay a fixed amount $c > k_h$ to satisfy the hospital.[15] Physicians also have the ability to generate payment c to the hospital without it coming from the physician's own pocket. This could occur via potentially unnecessary activities A such as ordering additional lab testing, imaging studies, or raising the rates that patients are admitted to the hospital. Increasing these activities does not generate revenue for the physician, but it does generate revenues to the hospital. Engaging in activity A carries with it some legal risk indicated by $R(A)$, (with $R'(A) > 0$, $R(0) = 0$), since it potentially involves giving care to patients who don't need it which could be found to violate laws or regulations. A more complex model could make c endogenous and allow outsourcing firms to compete by increasing it, but we do not take on that topic in this paper.

We also assume the hospital does not face any cost of higher-priced *in-network* billing. We think this is a reasonable assumption because it is hard for patients to observe counterfactual prices and patients perceive they are 'covered' in these circumstances. That is, the level of p^* paid to ED physicians when they participate in an insurer's network does not affect the hospital's payoff. Hospitals value consumer welfare and also profits with weight α_h. If a hospital hires an out-of-network group to staff its ED, hospital utility changes by:

$$\Delta U_h = (c - k_h) + \alpha_h W((1-\gamma)p^L), \tag{3}$$

which represents its incremental financial earnings less the dollar value of the disutility of patients. The hospital will only agree to out-of-network billing if its weight α_h on patients is sufficiently low. Recall that $W < 0$ and $c > k_h$, so α_h will be positive but smaller, all else equal, for hospital willing to engage in out-of-network billing:

$$\alpha_h < (c - k_h)/(-W\big((1-\gamma)p^L\big)). \tag{4}$$

If a hospital experiences a very high reputational or other cost to hosting a physician group engaged in an out-of-network billing strategy, physician groups will find it expensive to locate their strategy in that hospital and will tend to locate elsewhere. In the empirical section of

[15] We recognize a possible role for asymmetric information. A hospital may not realize the strategy of the outsourcing firm *ex ante*. An uniformed hospital may sign a contract that is later terminated when the hospital realizes its patients are receiving balance bills and the reputational cost is high. For example, the Los Alamos Medical Center began contracting with EmCare in 2012 (DeRoma 2012). Several years later, the hospital ended their contract with the hospital over concerns about out-of-network billing and coding practices.

the paper we will identify the characteristics of hospitals that have high out-of-network rates and contract with firms that engage in an out-of-network billing strategy.

4.4 Physicians

A physician group faces a tradeoff between exercising its threat of going out-of-network and collecting p^L while compensating the hospital c (or engaging in A) and having a disutility from financially harming patients, or joining the network for p^*. Consumer welfare, W, is constant at zero across in-network prices because we assume the impact of out-of-network billing on premiums takes place slowly over time and is not perceived by consumers within our game. Out-of-network billing from a patient's doctor results in disutility to that patient of $W\big((1-\gamma)p^L\big)$ which the physicians also take into account with a weight α_p.

Physicians value profits, consumer welfare, and legal risk with weights as noted below. Profit is the negotiated price times a fixed quantity of patients less any financial costs due to the physician group's choice. If out-of-network status is chosen, the group must either pay the hospital the financial cost c or bear risk $R(A)$, which is a decrement to the physicians' utility weighted by β_p. Physician per patient utility (the number of patients is fixed) when bargaining fails is:

(5) $$U_{p,OUT}(\pi, W, A) = p^L + \alpha_p W\big((1-\gamma)p^L\big) - \min\{c, \beta_p R(A)\}.$$

We assume that everywhere physicians' gain from an additional dollar increase in p^L is larger than their utility loss from the harm to consumers. Physicians' increased utility from income can be offset by harm to consumers, but not reversed. This is particularly plausible when γ is large, which is the case in our setting.[16] We therefore assume $\left|\alpha_p W'\right| < 1$.

When bargaining succeeds and the physician group is in-network at the hospital, its utility is:

(6) $$U_{p,IN}(\pi, W, A) = p^*.$$

We assume equal bargaining power for the two parties. The Nash bargaining expression is therefore the product of the gains from agreement for both parties:

(7) $$\left[U_{p,OUT} - U_{p,IN}\right] * \left[U_{i,IN} - U_{i,OUT}\right].$$

[16] Few consumers have savings to pay a large medical bill and therefore the fraction of it that can be actually collected by physicians is relatively small.

Which can equivalently be written:

(8) $$\left[p^* - p^L + \alpha_p W\big((1-\gamma)p^L\big) - \min\{c, \beta_p R(A)\}\right] * [\gamma p^L - p^*].$$

We assume bargaining strengths are equal and therefore p^* will split any difference between the two outside options. If the following holds:

(9) $$U_{p,OUT}(\pi, W, A) = p^L + \alpha_p W\big((1-\gamma)p^L\big) - \min\{c, \beta_p R(A)\} \geq \gamma p^L,$$

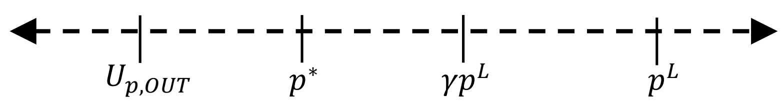
then there are no gains from a contract and the physician group will stay out-of-network. On the other hand, if:

(10) $$U_{p,OUT}(\pi, W, A) = p^L + \alpha_p W\big((1-\gamma)p^L\big) - \min\{c, \beta_p R(A)\} < \gamma p^L,$$

then we expect an equilibrium p^*:

(11) $$p^* = [p^L + \alpha_p W\big((1-\gamma)p^L\big) - \min\{c, \beta_p R(A)\} - \gamma p^L]/2$$

The intuition for the case where an in-network price is possible is graphed below. The key is that the physician's net utility for being out-of-network is low, either because of concern for patient welfare or because the hospital's reputational cost, and therefore transfer, is high. Alternatively, if $U_{p,OUT}$ (measured in dollars) lies above γp^L on the line below, either because physicians are not concerned about putting patients in a bad situation or hospital reputation costs are low, then there is no scope for agreement.



The insurer's outside option (γp^L) is not specific to an insurer but is constant across all insurers due to state law. Equilibrium p^* will fall in between the two outside options when $U_{p,OUT}$ is low enough. In the case when there is possibility of an agreement, if the law or other forces raise the insurer's out-of-network payment, the equilibrium negotiated price will increase. We can check if an increase in p^L will raise the equilibrium negotiated rate by taking the derivative of the expression for p^* with respect to p^L and asking if it is positive.

(12) $$1 - \gamma + (1-\gamma)\alpha_p W' > 0$$

We know W' is negative (a higher payment paid by consumers makes their utility more negative) and we also know $|\alpha_p W'| < 1$ by our assumption above. Since $(1-\gamma)$ is positive, the derivative is therefore positive.

Take the case where physicians put no weight on legal risk or patient disutility. In that case the physician payoff is p^L (they choose activity A and do not pay c) and there is nothing the insurer can offer as an in-network price that will be attractive. The physicians will stay out of the network, insurers will pay γp^L and patients will pay the balance. As physicians' disutility for risk, c, and weight on patients all rise, the outside option for the physician group becomes worse and eventually will fall below γp^L whereupon there is scope for an in-network rate that benefits both sides.

Out-of-network physician groups will choose between paying c or engaging in activity A according to whichever is cheaper, which will depend on their risk tolerance β_p. Physician groups with low α_p and high β_p want to choose the out-of-network strategy but do not want the risk of activity A and therefore must pay the hospital directly. Physician groups with low α_p and low will β_p choose the out-of-network billing strategy for the additional profit, and pay the hospital through activity A which they find relatively cheap compared to giving up profit.

Much of the empirical analysis in our paper concerns the change when the outsourcing firm takes over the ED group. This can be incorporated into the model in two ways. First, we could think of the management company causing an increase in the effective bargaining power of the physician group. Instead of each having 0.5 weight, we could model the company as making take-it-or-leave it offers to the insurer. Alternatively, the outsourcing company could improve the information of the physicians by, for example, providing data on how large out-of-network bills can be under the law. Out-of-network billing was always an option in this scenario, but the prior physician group may not have been aware of its profitability. This might be because before the outsourcing firm arrived, the physician group lacked professional management, felt excessive concern that the group could be easily replaced by the hospital, had a lack of knowledge of the cost of collecting and litigating large bills, lack of knowledge of state law and regulation, and so forth. We can think of the outsourcing firm as bringing to bear its knowledge of "best practices" in terms of out-of-network billing, its costs, collection procedures, relevant state law, etc. This kind of change in information would raise the p^L perceived by the physician group and change the game that way.

We take the model above to the data as follows. We expect to see that for-profit hospitals have a higher level of out-of-network billing and a higher propensity to contract with EmCare than non-profit hospitals because their weight on patient welfare is lower. We also expect that in-network prices for ED physicians will be higher relative to in-network rates in other specialties where out-of-network billing is not an option. And further, we expect that in-network prices will be higher when the threat of moving out-of-network is credible, which occurs when the ED physicians are managed by an outsourcing company. Lastly, the out-of-network payment to ED physicians who remain out-of-network will be higher than all types of in-network prices.

5. Out-of-Network Billing, Physician Prices, and Hospital Outsourcing

5.1 Descriptive statistics on ED Physician Payments and Out-of-Network Billing Rates

Our final dataset is composed of 8,913,196 ED episodes delivered between January 1, 2011 and December 31, 2015 (see Table 1).[17] This represents nearly $28 billion in emergency spending. Over 99 percent of ED cases in our data occurred at an in-network hospital. As we illustrate in Table 1, the average in-network ED physician payment across our sample period was $325.91 (266 percent of what the Medicare paid for the same services). The amount ED physicians were paid increased as a percentage of Medicare over our time period. During this period patient out-of-pocket costs for emergency care also steadily increased and the average total out-of-pocket cost for an emergency episode (combining the physician and facility component) was $467.75. Appendix Table 2 includes descriptive statistics for our analytic sample of ED episodes.

At the average in-network hospital in our data, 25.8 percent of patients treaded in the ED were treated by an out-of-network ED physician (Table 1). The frequency that patients at in-network hospitals were treated by out-of-network ED physicians has declined over time from 28.6 percent in 2011 to 21.9 percent in 2015. However, this average masks significant heterogeneity in out-of-network billing rates across hospitals and is somewhat misleading. Figure 1 shows the distribution of out-of-network billing rates across hospitals in our data in 2015 and summary statistics for that year. It illustrates that out-of-network billing is highly concentrated in a small group of hospitals. As we illustrate, 50 percent of hospitals have out-of-network billing rates below two percent. In contrast, the out-of-network billing rate for hospitals in the 75th percentile of the distribution of out-of-network billing rates was 28 percent and 15 percent of hospitals have out-of-network rates of higher than 80 percent. This skewed distribution is evident in 2011, 2013, and 2015 (see Appendix Figure 3).

5.2 Cross-Sectional Analysis of Hospitals' Out-of-Network Billing Rates

[17] Seventy-seven percent of individuals with an ED episode had insurance from an administrative services only (ASO) insurance product and the balance had coverage from fully insured plans.

To assess the factors associated with the variation in hospitals' out-of-network billing rates, we follow the approach of Finkelstein et al. (2016) and run a least absolute shrinkage and selection operator (Lasso) regression on a range of hospital, local area, physician market, and hospital market characteristics (a complete list and descriptions of the 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 in 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 where we determine their correlation with hospital out-of-network billing rates.

Figure 2 presents our conditional correlations between the variables selected using the Lasso regression and the share of patients per hospital that saw out-of-network physicians between 2011 and 2015 during an emergency. We also included several variables, which were not selected by the Lasso regression, but which our model indicates should be relevant. These variables include a measure of physicians per capita, and hospital, physician, and insurer HHIs.[18] The results in Figure 2 are correlates of hospital-level out-of-network billing rates and should not be interpreted causally. However, several of the correlations are consistent with the equilibrium described by our model.

As Figure 2 shows, the presence of EmCare at a hospital is positively correlated with the hospital's out-of-network billing rate. In contrast, outsourcing a hospital's ED to TeamHealth is negatively correlated with the hospital's out-of-network billing rate. In addition, we find that non-profit hospitals, teaching hospitals, and government-owned hospitals have lower rates of out-of-network billing; for-profit hospitals have higher out-of-network billing rates. Larger hospitals and hospitals with better technology have lower rates of out-of-network billing. The share of total discharges funded by Medicare is positively correlated with out-of-network billing

[18] We created a hospital HHI for each hospital registered with the AHA. For each hospital, we drew a circle with a radius of 15 miles around the 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 the firm's 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 markets. A firm's market share was its share of the total lives in that county in the small and large group markets. 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 capita using physician information from the SK&A database and population data from the U.S. Census Bureau.

rates. Finally, we find that areas with a higher fraction of married adults and low inequality have low out-of-network rates.

5.3 Causal Estimates of the Effect of EmCare and TeamHealth on Hospital OON Rates

Our cross-sectional results featured in Figure 2 suggest that out-of-network billing is significantly higher at hospitals that outsource their ED to EmCare. In this section, we estimate the causal effect that the entry of EmCare and TeamHealth had on the likelihood patients were treated by out-of-network physicians working inside in-network hospitals. To do so, 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. We then compare outcomes immediately before and immediately after EmCare and TeamHealth entered 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 into management contracts. We follow that up with a regression-based analysis.

Because EmCare and TeamHealth appear to have different strategies, we separately test the impact of their entries on billing practices and hospital and physician behavior. To do so, we estimate a hospital fixed effects model with an indicator variable ($EmCare_{i,t}$ or $TeamHealth_{i,t}$) that takes a value of 1 on and after the date that EmCare (or, in separate regressions, TeamHealth) entered a hospital and returns to zero on the dates that the firm exited hospitals if the firm lost a contract.[19] Our estimation takes the form:

(13a) $$Y_{i,j,t} = \beta_0 + \beta_1 EmCare_{i,t} + \delta_j + \theta_t + \varepsilon_{i,j,t},$$

and

(13b) $$Y_{i,j,t} = \beta_0 + \beta_1 TeamHealth_{i,t} + \delta_j + \theta_t + \varepsilon_{i,j,t},$$

where we estimate the outcomes for episode i that occurred at hospital j at time t. We also include a vector of hospital fixed effects δ_j and a 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

[19] We can estimate the impact of EmCare and TeamHealth entry in the same estimator, and we get nearly identical results.

entered to outcomes at three sets of control hospitals: 1) all hospitals nationally that 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, and 3) hospitals that were not managed by EmCare or TeamHealth that we matched to entry hospitals using propensity scores.[20] One obvious concern with our identification strategy is that treated and untreated hospitals may have differences in their trends in out-of-network billing rates, physician pricing, or hospital behavior prior to the entry of EmCare or TeamHealth. However, as we illustrate, when we plot the raw data from our treated hospitals, there do not appear to be any changes in behavior prior to the entry of those firms.

EmCare enters two types of hospitals (Appendix Figure 4A). The first group of hospitals has out-of-network rates over 97 percent. The second group has out-of-network rates below 10.1 percent. In Figure 3, we present a smoothed average using a local polynomial regression of the monthly hospital-level out-of-network ED physician billing rates from one year before EmCare (Panel A) and TeamHealth (Panel B) entered a hospital until one year after entry. In Panel A of Figure 3, the raw data show a clear increase in out-of-network billing rates at hospitals immediately after EmCare entered. For interested readers we present the raw, quarterly average out-of-network rates by hospital at each of the 16 hospitals that EmCare entered in Appendix Figure 5.[21] None of these graphs show marked changes in out-of-network billing rates before EmCare entered a hospital.

We repeat this analysis using regression analysis Equation (13a) and report the results in Table 2. The indicator variable on entry identifies the causal impact that the entry of EmCare had on the prevalence of out-of-network billing. In Column (1) of Table 2, we focus on changes in out-of-network billing rates at hospitals that EmCare entered that previously had high out-of-network billing rates. After EmCare entered, there is no statistically significant change in the

[20] 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.

[21] For nearly all hospitals that had previously high out-of-network billing rates (Panels I, J, K, L, M, N, O, and P of Appendix Figure 5), when EmCare entered, out-of-network billing rates remained high. In contrast, after EmCare entered hospitals that previously had low out-of-network billing rates, the likelihood a patient was treated by an out-of-network physician increased to nearly 100% immediately after EmCare entered the hospital (Panels A, B, C, D, E, F, G, H, of Appendix Figure 5).

likelihood a patient was treated by an out-of-network physician. In Column (2), we estimate the impact of the entry of EmCare into hospitals with previously low out-of-network rates (the half of hospitals where the firm entered with OON rates below 10.1 percent). These results mirror what we observe in the raw data. We observe that the entry of EmCare into these hospitals raised out-of-network rates by 81.5 percentage points.[22] In Appendix Table 3, we show that these results are robust to using alternative control groups.

TeamHealth appears to pursue a different out-of-network strategy. The raw data from Panel B of Figure 3 shows that out-of-network billing rates increased immediately after the firm took over management of hospital EDs. However, four months after entry and the spike in out-of-network billing, there was a noticeable drop in out-of-network billing rates. These changes are visible in the raw data, presented hospital by hospital in Appendix Figure 6. In Column (3) of Table 2, we again use an entry regression to identify the effect of TeamHealth entry on hospitals' out-of-network billing. 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. As we illustrate in Appendix Table 3, this estimate is robust to using alternative control groups.

5.4. The Impact of Out-of-Network Strategies on Payment Rates

These results suggest that EmCare does not negotiate with insurers and instead utilizes its outside option and bills its charges. In Panel A of Figure 4, we show that immediately after entry, EmCare raised its charges significantly. In Column (1) of Table 3, we quantify these changes and show that after EmCare entered, it increased its physician charges, on average, by $556.84 (96 percent). This increase in charges was driven, in part, by a 14.8 percentage point (43 percent) increase in the rate that physicians working for the firm billed patients for ED services using the highest-intensity CPT code (Column (7) in Table 3). This increase in the use of high severity coding occurred immediately after the firm entered (Panel G of Figure 4). It is unlikely that hospitals would have experienced a sharp and immediate change in their mix of patients immediately after EmCare entered that would have precipitated such a large change in coding

[22] This result is robust to estimating Equation (13a) using logistic regression.

practice.[23] Indeed, as we discuss and illustrate in Panels A and B of Appendix Figure 7, there were no immediate and observable changes in the case mix of patients at hospitals after EmCare entered. We have further discussion of the impact of the entry of physician management companies on hospitals' casemix in Section 5.7

As we predicted in Section 4.4, this increase in out-of-network billing and physician charges generated large increases in revenue for EmCare physicians. Likewise, it also exposed patients to increased cost sharing and financial risk. Our data contributor paid most of physicians' out-of-network bills. As a result, after EmCare entered, we observe that the insurer payments to ED physicians increased by $402.67 (122 percent). Because patients typically have out-of-pocket costs that are set via co-insurance that pays a fixed percentage of the total cost of care, patient payments (e.g. cost-sharing payments) to ED physicians increased by $45.23 (83 percent). Collectively, we observe that the total payments to ED physicians increased by $447.90 after EmCare entered a hospital. This is a 117 percent increase in ED physician payments. Notably, these changes occurred immediately after EmCare entered a hospital (Figure 4).

While our data contributor covered most of physicians' out-of-network charges, we still observe a difference between EmCare physicians' charges and the total payments the firm received from the insurer and patients. We classify the difference between physician charges and their total payments as the potential balanced bill patients could face. In our data, we observe that patients' potential balanced bills were, on average, $195.30. We estimate that after EmCare entered a hospital, the potential balanced bill patients faced increased by $108.94 (56 percent). Note that these are lower-bound estimates of the impact of EmCare entry on patients' out-of-pocket costs. In many instances, patients who are treated by out-of-network physicians are liable for the entirety of their physicians' charges, since insurers will not cover out-of-network care. We show in Table 3 that average physician charges were $578.95 across our sample and they nearly doubled, increasing by $556.84 after EmCare entered a hospital. As a result, a patient whose insurer did not cover out-of-network physician care would face a bill from EmCare physicians of, on average, $1,135.79 (= $556.84 + $578.95). Given that nearly half of individuals in the US do not have the liquidity to pay an unexpected $400.00 expense without taking on debt, bills of this magnitude can be financially devastating to a large share of the population (Board of the Governors of the Federal Reserve System 2016).

[23] As we illustrate in Appendix Table 4 and 5, these results are robust when we use alternative control groups.

That TeamHealth exits networks and then rejoins them suggests that the firm exercises the threat of exit to credibly negotiate higher in-network payment rates. Consistent with theory, in Panels B and C of Figure 5, we observe an increase in the in-network and out-of-network payments to TeamHealth from insurers after the firm enters a hospital. In Column (1) of Table 4, we do not observe a precisely estimated increase in charges by physicians after TeamHealth entered a hospital. However, we observe that insurer payments for in-network physician care increased by $236.56 (90 percent) after the firm entered. We also observe a $21.85 (39 percent) increase in patient cost-sharing paid to physicians after TeamHealth entered. While this is a large increase in physician payments, the increase is approximately 60 percent of the size of the gain in physician payments experienced by physicians after EmCare entered a hospital.[24]

In Section 4.4, we posited that having the ability to go out-of-network without seeing a reduction in the number of patients they treat gave ED physicians a stronger outside option in negotiations with insurers. We argued that this stronger outside option would allow them to negotiate higher in-network payments. In Table 5, we show the average in-network payments in our data made to internists for performing standard office visits and orthopedists for performing hip replacement. We observe that, on average, internists are paid 158 percent of Medicare rates (Column (2)) and orthopedists are paid 178 percent of Medicare rates (Column (1)). In contrast, the average in-network ED physician in our data is paid 266 percent of Medicare rates (Column (3)). We posited that firms that credibly threaten to go out-of-network could negotiate higher payments. Indeed, we observe that TeamHealth, who appears to go out-of-network and then rejoin the insurer's network, earn on average, 364 percent of Medicare rates (Column (4)). Likewise, we observe that the average payment in our data to EmCare ED physicians (who, for the most part, do not participate in networks) is 536 percent of Medicare rates (Column (5)).[25]

5.5 Transfers to Hospitals To Permit Out-of-Network Billing

We posited that when physicians bill out-of-network, it creates costs for the hospital where they work. In Section 4.3, we hypothesized that physician management firms that used out-of-network billing as a strategy would have to offer transfers to hospitals to offset these costs. These costs could take the form of direct payments or reductions in subsidies (which we cannot

[24] As we illustrate in Appendix Tables 6 and 7, these results are robust to using other control groups.
[25] Appendix Table 8 provides detailed summary statistics of ED physicians' prices and charges.

observe) or changes in physician behavior that benefits hospitals (which we can observe). Our results presented in Table 6 are consistent with our predictions. We estimate Equation (13a) and find that after EmCare entered a hospital and began billing out-of-network for ED services, facility charges at the hospitals where they worked increased by $1,683.63 (27 percent) and facilities' total payments increased by $294.58 (11 percent). As we illustrate in Table 6, this increase in facility payments was driven, in part, by a 1.4 percentage point (5 percent) increase in the probability that a patient received an imaging procedure (Column (5)) and a 2.1 percentage point (23 percent) increase in the likelihood that a patient was admitted to the hospital.[26] As we illustrate in Panel F of Figure 6, this increase in admissions is visible in the raw data and occurred immediately after EmCare entered a hospital.

Because TeamHealth does not remain out-of-network, we would not expect the firm to make transfers to the hospitals where they work. Consistent with these predictions, as we illustrate in Table 7, unlike what we observed following the entry of EmCare, after TeamHealth enters hospitals, we do not observe an increase in facility charges (Column (1)) or total payments (Column (4)). Likewise, we observe that patients treated by TeamHealth physicians after the firm entered a hospital were slightly less likely to have an imaging study and be admitted to the hospital (Columns (5) and (6)). Although facility payments do not increase, as we illustrate in Column (7), we observe a 515.4 person (30 percent) increase in the number of patients treated in the ED after the firm entered a hospital.[27] Notably, these changes in admissions rates and activity are evident immediately after TeamHealth enters a hospital (Panels F and G of Figure 7).

5.6 Contracting with EmCare and TeamHealth

Hospitals that knowingly allow an ED staffing company like EmCare to bill out-of-network from their facility in exchange for a transfer (e.g. higher admission rates or a reduction in subsidies to physician groups) are explicitly weighting immediate profits over patient and community benefits. As a result, we would expect that for-profit hospitals to be more likely to contract with EmCare. In Table 8, we present the characteristics of hospitals in our sample that did and did not contract with EmCare and TeamHealth. We find that across all hospitals that meet our sample restrictions, 66 percent are non-profit, 19 percent are for-profit, and 15 percent are government

[26] As we illustrate in Appendix Tables 9 and 10, these results are robust against other control groups.
[27] As we illustrate in Appendix Tables 11 and 12, these results are robust against other control groups.

owned. Consistent with our predictions, 56 percent of hospitals where EmCare has a contract are for-profit. Hospitals in areas with lower numbers of physicians per capita are also more likely to contract with EmCare. In contrast, whereas TeamHealth has a higher share of for-profit hospitals than we observe across the universe of hospitals in our data, the majority of TeamHealth contracts occur at non-profit hospitals.[28]

5.7 Robustness Checks

It is possible that the entry of EmCare and TeamHealth led to subsequent changes in the case mix of patients that the 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 EmCare's webpage, EmCare has highlighted its excellence in improving the treatment of complex cases, such as stroke care (EmCare 2014). To the extent that this improves a hospital's reputation, advertising and improvements in quality 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, the rates of hospital admissions, the rates of imaging tests, and the rates at which physicians coded for the most intensive services increased.

In Appendix Table 15, 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 Columns 1 and 2, we show that after EmCare entered a hospital, the six-month historical spending of the hospital's patients increased by $916.02 (15 percent) and the 12-month historical spending increased by $1,306.16 (11 percent). 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 comorbidity score measured using six months of patient history and 3.6 percent more likely to have a non-zero Charlson comorbidity 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

[28] In Appendix Table 13, we present conditional correlates of whether a hospital is managed by either EmCare or TeamHealth using logistic regression. These results are qualitatively similar to the above. As we show in Appendix Table 14, hospitals that contract with EmCare or TeamHealth before 2011 have similar characteristics to hospitals where we observe the entry of EmCare or TeamHealth between 2011 and 2014.

percent) less in the six months preceding an episode and $783.08 (6.8 percent) less in the 12 months preceding an episode. In Appendix Figure 7, we show the average Charlson co-morbidity score and six-month historical spending levels of patients, by month, at hospitals where EmCare and TeamHealth entered. There is no evidence of immediate changes in these outcomes after a change in management.

Crucially, however, we find the same discrete changes in hospital and physician activity appearing across all health severity groups of patients, including patients in the least severe group. In Appendix Table 16, we estimate Equation (13a) 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 CPT code for the most intensive emergency. 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 highest intensity CPT code. In Column 1, we estimate Equation (13a) with no patient controls; in Column 2, we re-estimate Equation (13a) controlling for patients' age, sex, and race; and in Column 3, we control for patients' age, sex, race, and their Charlson comorbidity score. Across all three estimates, the point estimate on the impact of entry on the rate of using the highest-intensity CPT code for emergency physician visits is consistent and ranges from 0.148 to 0.151. In Column 4, we estimate Equation (13a) and limit our analysis to patients throughout our sample who have a Charlson comorbidity score of 0 (e.g., patients who have no comorbidities). In Column 5, we estimate Equation (13a) 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 CPT code for the most intensive emergency after EmCare entered a hospital. Likewise, in Columns 6, 7, and 8, we estimate Equation (13a) on the samples of patients in the lower third ($0 to $279.67), the middle-third ($279.68 to $2,033.59), and the top-third ($2,033.60 to $115,499.30) 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 CPT code for the most severe emergency.

In Appendix Table 17, 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 18, we see similarly robust findings for imaging studies. After the entry of EmCare into a hospital, patients with no comorbidities are 4.9 percent more likely to receive an imaging study.

Finally, in Appendix Table 19, 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 percent 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 percent more likely to be admitted to the hospital after EmCare took over the management of the hospital ED.

5.8 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 mean out-of-network rates we observe to the mean out-of-network rates presented in Garmon and Chartock (2017) (the only other study that examines out-of-network rates nationally).[29] Garmon and Chartock (2017) 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 (2017) 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 percent of cases. These results are fairly similar to our descriptive finding concerning the average prevalence of out-of-network billing. Likewise, Garmon and Chartock (2017) present a map of the variation in out-of-network billing rates across states. Their results are similar to the national variation Cooper and Scott Morton (2016) observed using a sample of the data used in this analysis.

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

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

6.1 Background on the New York Law

On April 1, 2014, New York State passed a law designed to protect patients who receive emergency care from out-of-network physicians. The law has two components. The first is a hold harmless provision, which requires that if a patient sees an out-of-network ED physician, they pay no more in cost sharing than they would pay if they were treated by an in-network physician. The second component is an arbitration process to determine what providers are paid when they treat a patient and do not participate in the patient's insurer's network. Ultimately, 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]

In practice, under this law in New York, when a patient is seen out-of-network, the insurer makes its payment to the provider. If the out-of-network provider does not accept the payer's offer, the provider can initiate an independent dispute resolution process. The independent dispute resolution process is judged by practicing physicians who use baseball rules arbitration: the arbitrator can stipulate that the provider will be paid the insurer's original payment or alternatively the provider's original charge. Ultimately, this policy disadvantages providers that bill for unreasonably high charges and punishes insurers that offer unreasonably low initial payments. The law also encourages physicians and payers to negotiate independently and avoid arbitration. Technically, the law applies only to fully insured insurance products, as states cannot regulate ASO plans (which account for the majority of privately insured products in the US) (Kaiser Family Foundation 2017). However, because most providers are unaware of a patient's plan funding, their bill is likely chosen to reflect the possibility of arbitration.

6.2 Analyzing the Impact of New York State's Law

As Appendix Table 20 shows, our data include 323,936 ED episodes delivered at New York hospitals between 2011 and 2015, which captures approximately $1 billion in emergency health care spending. In addition, 90.2 percent of the patients in our data in New York are in ASO

[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.[31] To test the impact of the 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:

$$Y_{i,h,t} = \beta_0 + \beta_1 NY_h + \beta_2 Post_t + \beta_3 NY_h Post_t + \gamma_h + \mu_t + \varepsilon_{i,h,t}, \quad (14)$$

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 it takes a value of 1 for all time periods if a hospital is located in New York (e.g. is in our treated group). $Post_t$ takes value of 1 for all periods from April 1, 2014, onward, 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 (14) where our treatment variable is interacted with dummy variables for each quarter. This allows us to illustrate graphically the parallel trends between New York and other the control states before the passage of the New York State law.

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

Table 9 presents least-squares estimates of Equation (14) and shows the impact of the New York State law on hospitals' out-of-network rates, physician charges and payments, and hospital 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 8 presents non-parametric estimates of Equation (14) graphically. 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 9 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 percent. Two

[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.

years later, the rate was 6.4 percent, 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 in Table 9 show that although the law applied only 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. If physicians cannot infer whether a patient has an ASO or fully insured insurance product before sending a bill, they will want to charge a moderate amount in order to win in any arbitration. Columns 2 through 5 in Table 9 illustrate the impact of the law on physician charges and payments and facility charges and payments. As we illustrate in Column 3, the law lowered average physician payments by $43.74 (13 percent). We do not find that the law had a precisely estimated impact on facility payments.

7. A Policy to Address Out-of-Network Billing: Regulating Hospital/Insurer Contracts

Out-of-network ED bills arise from a very specific market failure. Unlike most doctors, ED physicians are not chosen and cannot be avoided by patients. As a result, ED physicians can move out-of-network without reducing the quantity of patients they treat. This, in turn, significantly reduces the pressure ED physicians face to negotiate prices with insurers. Without a negotiated reimbursement rate in a contract between insurers and physicians, physicians bill their charges which has the harmful effects documented above. In addition, having the ability to go out-of-network raises the disagreement payoff of the physicians which allows them to raise their negotiated in-network rates.

At present, about a quarter of states have laws aimed at addressing out-of-network billing. Most states' surprise billing laws include a hold harmless provision to protect patients from financial risks (e.g., these laws stipulate that patients cannot be charged more than their usual in-network cost sharing during emergencies). The harder problem for the state is choosing the "missing" price when there is no contract between physicians and insurers. To do this, most states' laws set out-of-network provider payment rates via regulation as the greatest of either a fixed percentage of Medicare payment rates or usual and customary payment rates, which are themselves set as a fixed percentage of average charges. However, it is extremely unlikely that a regulated price of this sort will match the market price for any given insurer–physician pair in a particular year. As soon as the regulated price set by states 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).

Alternatively, states could require arbitration between physicians and insurers to settle out-of-network bills as New York does. New York State's laws are the most ambitious in the nation to date, and our results suggest the law has been effective at lowering out-of-network rates. However, the New York State law is administratively complex and potentially costly. 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. Likewise, the state has to fund and administer the arbitration process in perpetuity. Moreover, because states cannot regulate ASO products, the New York protections only offer formal protection to individuals covered by fully insured insurance products.

Going forward, policy-makers should have two objectives when they seek to address out-of-network ED billing. The first is to protect consumers from large, unexpected bills. The second is to establish an environment in which the price that insurers pay out-of-network physicians for their services generates a price that is either competitively set or is as close to the competitively set price as possible.

One might imagine the solution is to require physicians to participate in the same insurance networks as the hospitals where they work. Although this strategy would protect consumers from surprise bills by eliminating the possibility of attending an in-network hospital and being treated by an out-of-network physician, it would give significant bargaining leverage to insurers in their negotiations with physicians. Insurers would be aware that physicians would be required by law to enter into a contract with them in order to be able to practice in a hospital; this could allow insurers to drive down payment rates below what would occur in a competitive equilibrium.

In our view, the best option for addressing out-of-network billing is not for the state to try to regulate the missing price, but instead to regulate the ***form*** of the contract, so that the resulting physician payment is generated by market forces. When patients choose an ED, they are choosing a package of emergency services that includes the services of the hospital and physicians. Under our preferred policy, states could require hospitals to sell, and insurers to contract, for an ED service package that includes physician and facility services. Hospitals would purchase the inputs for ED services the way they purchase other labor inputs, such as nursing care and non-labor inputs, such as bandages and needles. All care provided in the ED would be included when the hospital contracted to be "in-network" with an insurer. This type of policy would require the hospital to buy ED physician services in a local labor market, which would expose hospitals and physicians to competitive forces and produce a market price for ED physician services. Hospitals would then submit a single bill to insurers.

With this type of policy in place, patients consuming emergency services would be protected from surprise bills as long as the patients chose in-network facilities. More subtly, this policy is also likely to lower the equilibrium prices for in-network ED physicians. At present, ED physicians can opt to exit insurer networks without a loss of revenue – indeed, they likely see an increase in revenue when they do so. This is a very strong outside option that increases physicians' bargaining leverage when they negotiate in-network payments. Thus, absent intervention, in-network payments will tend to display the effects of out-of-network billing and are likely to be above competitive levels.

This policy also solves the inability of states to regulate ASO products. Rather than regulating insurance, this would be a form of hospital regulation. As a result, it would apply to all patients in a state regardless of the type of insurance they have. Further, the law could be implemented by a state or at the federal level. For example, the federal government could require these combined physician/facility ED payments be a requirement for a hospital receiving Medicare payments.

In what follows, we produce back-of-the-envelope calculations of the savings from our policy. To do so, we compare ED physician payment rates to payment rates for orthopedic surgeons. Orthopedic surgeons form an interesting comparison group because, according to a recent survey, they have the highest salaries among physicians in the US (Grisham 2017). However, whereas the average in-network ED physician payment was 266 percent of the Medicare payment rates (and the average out-of-network payment was 637 percent of the Medicare payment rates), within our data, the average in-network payments to orthopedic surgeons for performing knee replacements during our sample period was 178 percent of the Medicare payment rates. If we assumed our policy proposal would generate competition that lowered ED physicians' payment levels to approximate the payment rate of orthopedic surgeons in our data (178 percent of the Medicare payment rates), this would lower total ED physician spending by 46 percent. If we assume that private spending is one-third of total health spending in the US and ED physicians are about 1 percent of total private spending, a reasonable back of the envelope calculation would suggest that addressing this issue would produce savings in the range of $5 billion annually.[33]

8. Conclusions

Each year, one in five people in the US visits an ED for medical care (Morganti et al., 2013). What most patients with private health insurance do not realize is that the physicians working in 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. Moreover, when physicians and physician groups can bill out-of-network without seeing a reduction in the number of patients they treat, it undercuts the functioning of health care markets by changing the outside option physicians face when negotiating with insurers over their prices.

In this paper, we find that approximately 15 percent of U.S. hospitals have extremely high out-of-network billing rates. Moreover, we observe that two leading ED physician outsourcing firms – EmCare and TeamHealth - use out-of-network billing to significantly raise the amounts they are paid, although each utilize a distinct strategy. These two examples are instructive in their differences and provide a nice illustration of the economics of bargaining.

We find that after EmCare takes over the management of ED services at a hospital, it raises out-of-network billing rates by over 80 percentage points. This allows the firm to collect higher payments from insurers and from patients. We calculate that the payments they received from insurers increased by 122 percent and patient cost sharing increased by 83 percent. Crucially, this increase in patient costs represents a lower bound of the cost exposure patients could face when they are treated by an out-of-network ED physician. The insurer supplying our data, in most instances, pays out-of-network physicians their charges. However, in practice, many insurers either do not pay out-of-network physicians anything (leaving the patient to pay their physicians themselves) or they only pay standard in-network rates (leaving patients to pay the difference between the physician’s charges and the insurer’s payments).

[33] These numbers are from Morganti et al. (2013) and Hartman et al. (2017).

When ED physicians bill out-of-network, it likely creates reputational harm for the in-network hospitals where they work. We find evidence that EmCare offsets the costs of harm for hospitals by providing transfers. Such transfers takes the form of EmCare-affiliated physicians engaging in clinical behavior leading to increased hospital billing, such as increasing imaging rates and rates patients are admitted to the hospital, which generate additional revenue for the hospitals.

TeamHealth pursues a different strategy. When TeamHealth enters a hospital, they also increase out-of-network rates significantly. However, after several months, TeamHealth returns in-network. Notably, when TeamHealth goes back in-network, their in-network payment amounts are 68 percent higher than they were before the firm entered the hospital. We posit that TeamHealth uses its stronger outside option to negotiate higher in-network payments. Interestingly, the number of patients seen in the TeamHealth ED increases, which may be a sign of efficiencies.

Ultimately, this paper shows that outsourcing in emergency medicine per se is not the problem. The problem is that emergency physicians working inside in-network hospitals face inelastic demand. There are many healthcare markets that have pockets of inelastic demand, which can be exploited by providers (for example, the demand for air ambulances in emergencies or the demand for neonatologists following a premature baby delivery). Our analysis shows that providers with less concern for patient welfare can take advantage of that inelasticity and dramatically increase their prices.

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 policies was introduced in New York. In 2014, the state passed a law that banned balanced billing and required insurers and physicians to enter into binding arbitration to settle disputed bills. We assessed the impact of this law and found that it reduced out-of-network billing. However, the law still bases out-of-network ED payments on physicians' charges, which are not competitively set, and its arbitration provision has high transaction costs. Additionally, the law cannot formally protect individuals enrolled in ASO insurance products, who account for approximately half of individuals with private insurance in the US.

The limits of the New York law have helped motivate our policy proposal to require hospitals to sell an "ED package" to insurers that includes both physician and hospital services.

Thus far, most states have tried to address out-of-network billing by regulating the missing price for emergency physician services. Ultimately, a regulated price will, in general, not be equal to a market-determined price. We argue that mandating the right contract structure will generate competitive prices, and thus generate higher welfare relative to regulated prices.

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Table 1: ED Episodes Per Year

	Emergency Episodes	Total Facility Spending (millions)	Total Physician Spending (millions)	Mean Physician In-Network Payment (% Medicare)	Pat. Cost-Sharing on Physicians	Pat. Cost-Sharing Hospitals	Hospital Out-of-Network Frequency
2011	1,699,451	$4,291	$572	$278.70 (228%)	$43.58	$347.41	28.6%
2012	1,899,513	$4,856	$696	$293.62 (245%)	$49.85	$368.17	28.0%
2013	1,820,059	$5,010	$741	$324.91 (269%)	$59.17	$416.61	26.1%
2014	1,745,100	$5,037	$751	$348.98 (284%)	$67.60	$451.80	24.2%
2015	1,749,073	$5,262	$779	$383.33 (303%)	$70.40	$464.16	21.9%
Total	8,913,196	$24,458	$3,538	$325.91(266%)	$58.12	$409.63	25.8%

Notes: The table shows episodes per year, facility spending per year, physician spending per year, the mean payment to an in-network ED physician (and the mean expressed as a percentage of Medicare payments), patient payments for physician fees, patient payments for hospital fees, and yearly out-of-network rates. The physician payment is the sum of the insurer and patient contribution. All dollar amounts are in 2015 dollars. We observe that over 99% of ED care occurred at in-network hospitals.

Table 2: The Impact of EmCare and TeamHealth Entry on Hospitals' Out-of-Network Rates

	(1)	(2)	(3)
	Hospitals with OON Rates Above 97% Prior to Entry	Hospitals with OON Rates Below 97% Prior to Entry	All Hospitals
	EmCare Entry		TeamHealth Entry
	OON Indicator		OON Indicator
Management Company Entry	-0.030 (0.044)	0.815*** (0.061)	0.326*** (0.030)
Hospital FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Mean	0.209	0.204	0.226
SD	0.407	0.403	0.419
Observations	8,401,884	8,351,799	8,661,796
Control	All Non-Entry Hospitals	All Non-Entry Hospitals	All Non-Entry Hospitals

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equations (13a) and (13b). In Column (1), we focus on hospitals that EmCare entered that had out-of-network rates prior to entry that were above 97%. In Column (2), we focus on hospitals that had out-of-network rates prior to entry below 97% (in practice, all hospitals with out-of-network rates below 97% had out-of-network rates below 11%). In Column (3), we focus on the sample of all hospitals where TeamHealth entered. 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 are all hospitals in the US that did not outsource their ED management to EmCare or TeamHealth. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Mean and standard deviation are drawn from the analytic sample population underlying the regression. In Appendix Table 3, we show these estimates using alternative control groups.

Table 3: The Impact of the Entry of EmCare on Physician Charges, Payments, and Coding

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Physician Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Potential Balanced Bill	Total Patient Cost Exposure	CPT Severity
EmCare Entry	556.84***	402.67***	45.23***	447.90***	108.94***	154.17***	0.148***
	(62.12)	(54.52)	(4.38)	(55.16)	(38.71)	(35.12)	(0.030)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	578.95	329.17	54.47	383.64	195.32	249.79	0.347
SD	364.61	290.13	108.72	297.99	225.12	243.57	0.476
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars. In Appendix Table 4 and Appendix Table 5, we show these estimates using alternative control groups.

Table 4: The Impact of the Entry of TeamHealth on Physician Charges, Payments, and Coding

	(1)	(2)	(3)	(4)	(5)	(6)
	Physician Charge	Insurer Payment (In-network)	Insurer Payment (Out-of-network)	Patient Cost Sharing	Total Payment	CPT Severity
TeamHealth Entry	52.49	236.56***	203.09***	21.85***	269.01***	0.016
	(35.90)	(12.87)	(73.66)	(3.43)	(19.06)	(0.015)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	589.58	263.95	597.44	55.92	395.38	0.346
SD	374.63	226.87	371.14	110.54	310.46	0.476
Observations	8,661,796	6,700,621	1,961,175	8,661,796	8,661,796	8,661,796
Control	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 (13b). 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars. In Appendix Table 6 and Appendix Table 7, we show these estimates using alternative control groups.

Table 5: Comparison of Physician Payments as a Percent of Medicare

(1)	(2)	(3)	(4)	(5)
Orthopedist Hip Replacement Payment Rate	Internist Office Visit Payment Rate	ED Physician Standard Visit Rate (In-network)	TeamHealth ED Physician Standard Visit Rate	EmCare ED Physician Standard Visit Rate
		(% of Medicare)		
178%	158%	266%	364%	536%

Notes: This table shows physician payments as a percentage of Medicare based on speciality. Columns (3,4,5) are derived from our analytic sample of ED episodes. Columns (4,5) include all physician payments to physicians working in Emcare and TeamHealth hospitals identified in our data. Columns (1) and (2) are based on claims from the same period as the ED claims and were paid by the same payer.

Table 6: The Impact of the Entry of EmCare on Hospital Charges, Payments, and Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
EmCare Entry	1683.63***	240.70**	53.88***	294.58***	0.014***	0.021***	-104.0
	(401.04)	(98.68)	(17.91)	(113.64)	(0.005)	(0.006)	(218.1)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	6,304.63	2,350.46	393.81	2,744.27	0.278	0.090	1,695.5
SD	12,415.53	4,885.15	561.89	5,034.47	0.448	0.286	1,566.5
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). 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. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars. In Appendix Table 9 and Appendix Table 10, we show these estimates using alternative control groups.

Table 7: The Impact of the Entry of TeamHealth on Hospital Charges, Payments, and Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
TeamHealth Entry	170.17	-76.61	24.42**	-52.19	-0.008**	-0.006**	515.4***
	(174.03)	(76.82)	(12.41)	(82.70)	(0.003)	(0.002)	(182.8)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	6,400.68	2,355.70	394.19	2,749.89	0.279	0.091	1,692.1
SD	12,555.33	4,891.99	561.51	5,041.25	0.448	0.287	1,557.4
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13b). 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. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars. In Appendix Table 11 and Appendix Table 12, we show these estimates using alternative control groups.

Table 8: Comparison EmCare and TeamHealth Hospital Characteristics

	All Hospitals	EmCare Hospitals	P-value from two-sided t-test	All Hospitals	TeamHealth Hospitals	P-value from two-sided t-test
Hospital Characteristics						
For-profit	0.19	0.56	0.00	0.21	0.29	0.09
Non-profit	0.66	0.26	0.00	0.63	0.57	0.28
Government	0.15	0.17	0.50	0.15	0.13	0.63
Teaching	0.09	0.05	0.06	0.09	0.04	0.09
Hospital Beds	227.32	185.43	0.01	225.74	197.63	0.21
Technologies	55.26	44.38	0.00	54.84	47.79	0.04
Hospital HHI	0.55	0.57	0.57	0.55	0.59	0.35
Proportion Medicare	47.45	48.04	0.56	47.36	51.42	0.00
Proportion Medicaid	19.88	19.14	0.39	19.83	20.15	0.78
ED Physicians per Capita (per 10,000)	0.77	0.66	0.00	0.77	0.70	0.04
Physicians per Capita (per 10,000)	22.11	21.21	0.01	22.04	22.66	0.23
Physician HHI	0.43	0.41	0.37	0.43	0.41	0.39
Insurer HHI	0.38	0.36	0.32	0.38	0.36	0.23
Household Income ($)	36,862.23	37,277.03	0.41	36,904.38	36,287.42	0.38
Gini Coefficient	0.32	0.33	0.00	0.32	0.33	0.04

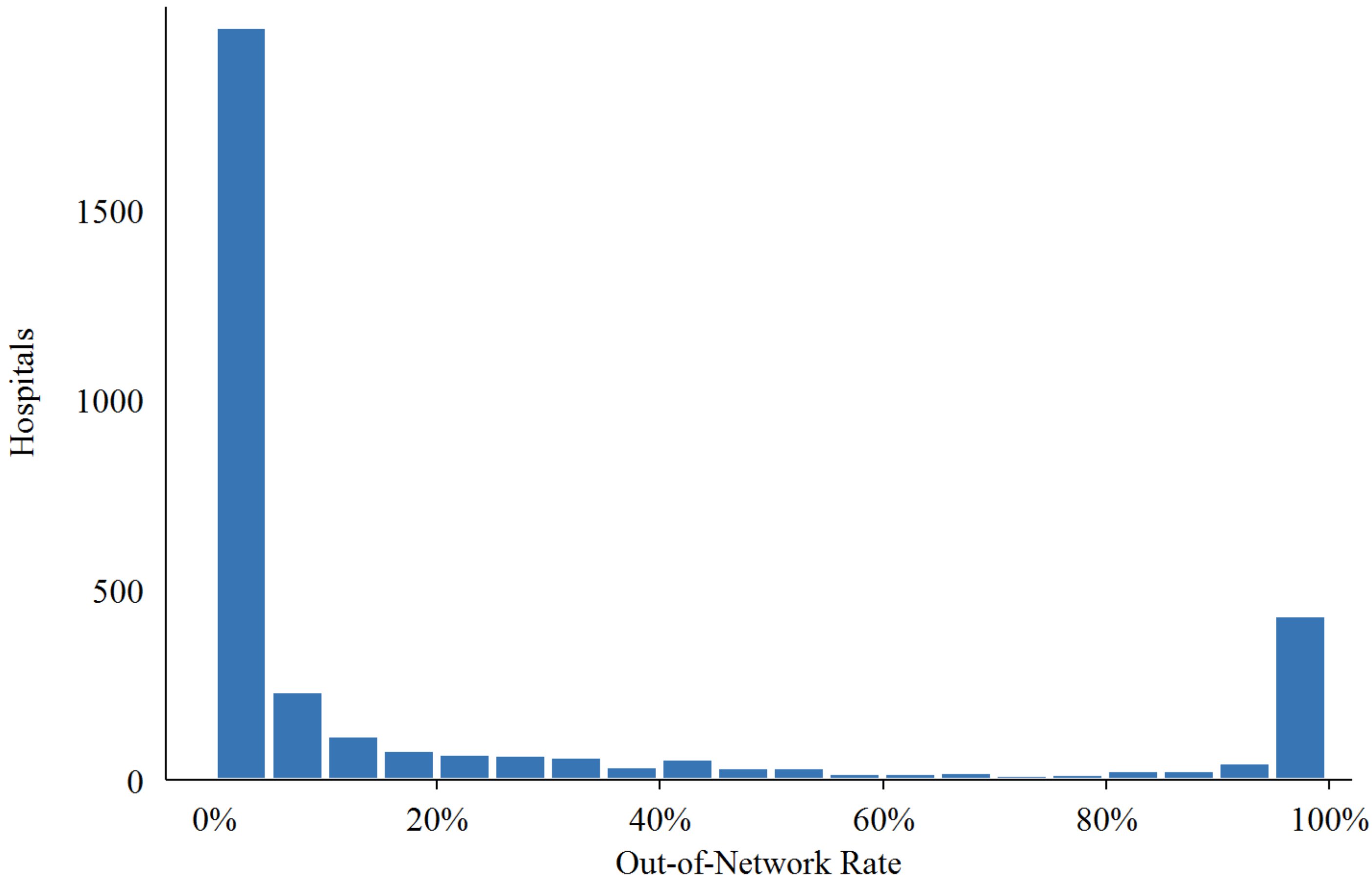
Notes: The table compares characteristics of identified EmCare and Teamhealth hospitals to the entire sample of hospitals. Identified Emcare and TeamHealth hospitals are excluded from all hospitals. The p-value is reported from a two-sided t-test comparing the difference in means between all hospitals and identified EmCare and Teamhealth hospitals.

Table 9: Estimating the Impact of the New York State 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	-0.068**	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	6,100.52	2,571.28	0.198	0.227
SD	0.401	313.11	251.95	12,693.62	5,122.37	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 (14). All regressions are run at the patient level. Each regression 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

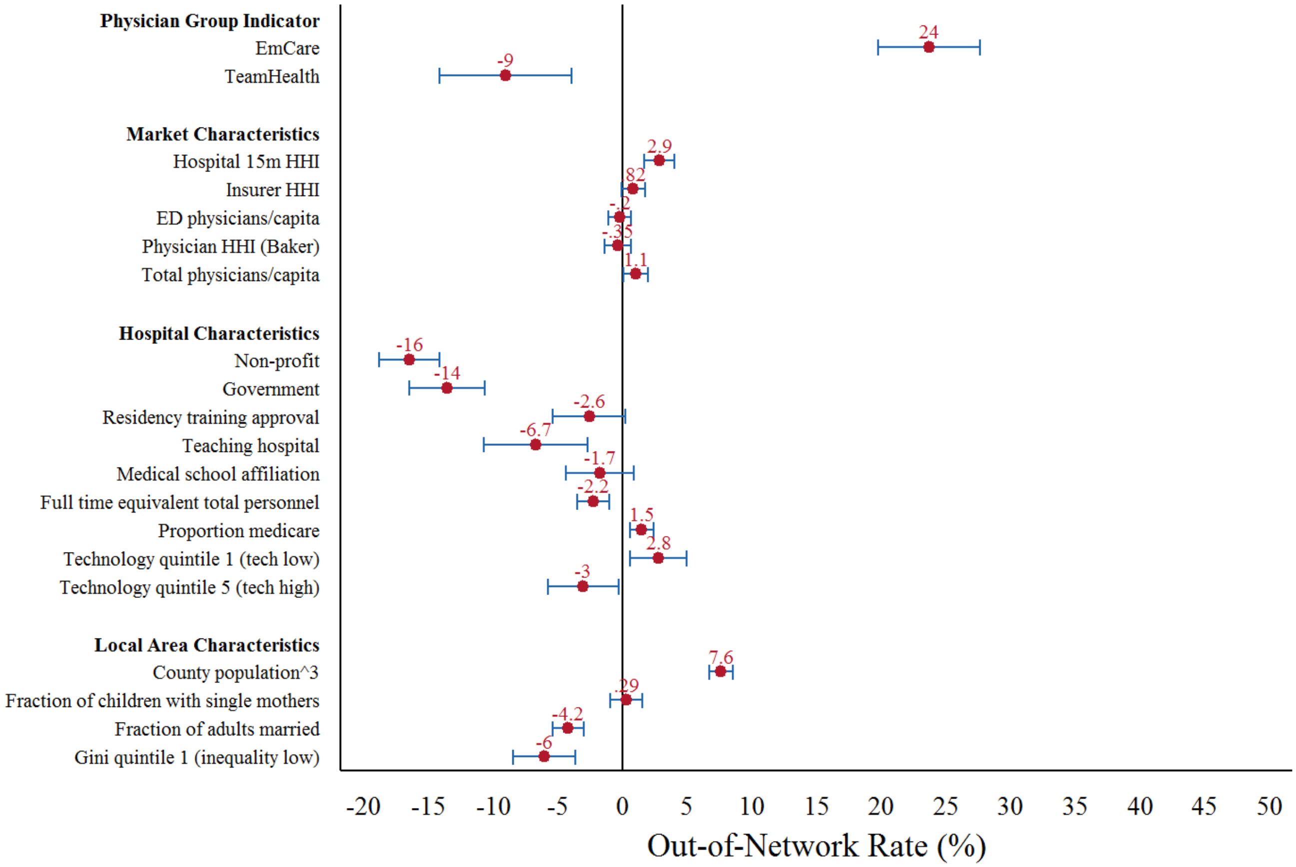
Figure 1: The Distribution of Hospital Out-of-Network Billing Rates in 2015



	10th Perc.	25th Perc.	50th Perc.	75th Perc.	90th Perc.
Out-of-Network Rate	0	0	0.011	0.278	0.990

Notes: The figure shows the distribution of ED physicians out-of-network rates across hospitals in 2015.

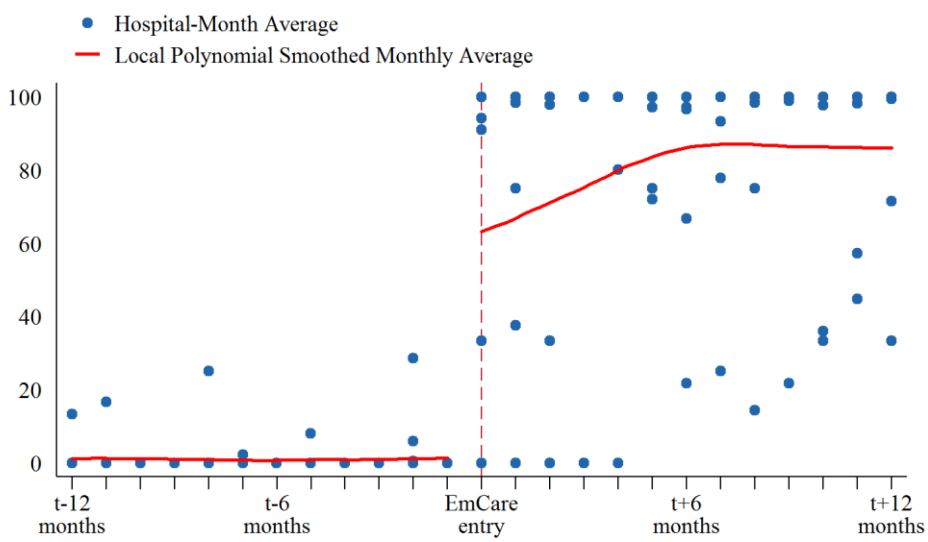
Figure 2: Conditional Correlates of Hospital Out-of-Network Billing



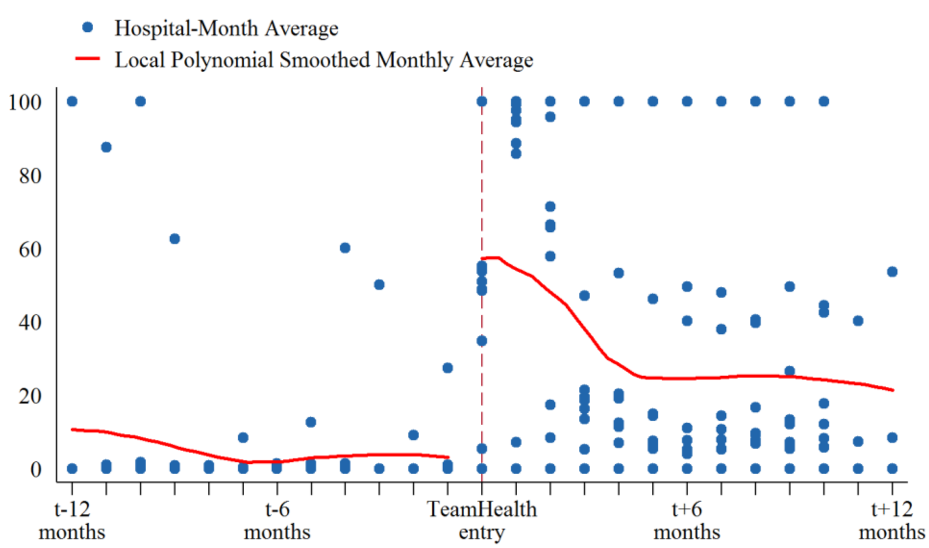
Notes: The figure shows the point estimates from a least-squared regression of hospital out-of-network rates on variables chosen from our Lasso. We used data from 2011 through 2015. Each observation is a hospital-year rate of out-of-network billing. The regression includes year fixed-effects. For continuous 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: Discontinuity Analysis of Out-of-Network Rates at Hospitals Where EmCare and TeamHealth Took Over Management of ED Services

Panel A: EmCare Out-of-Network Physician Rate (%)

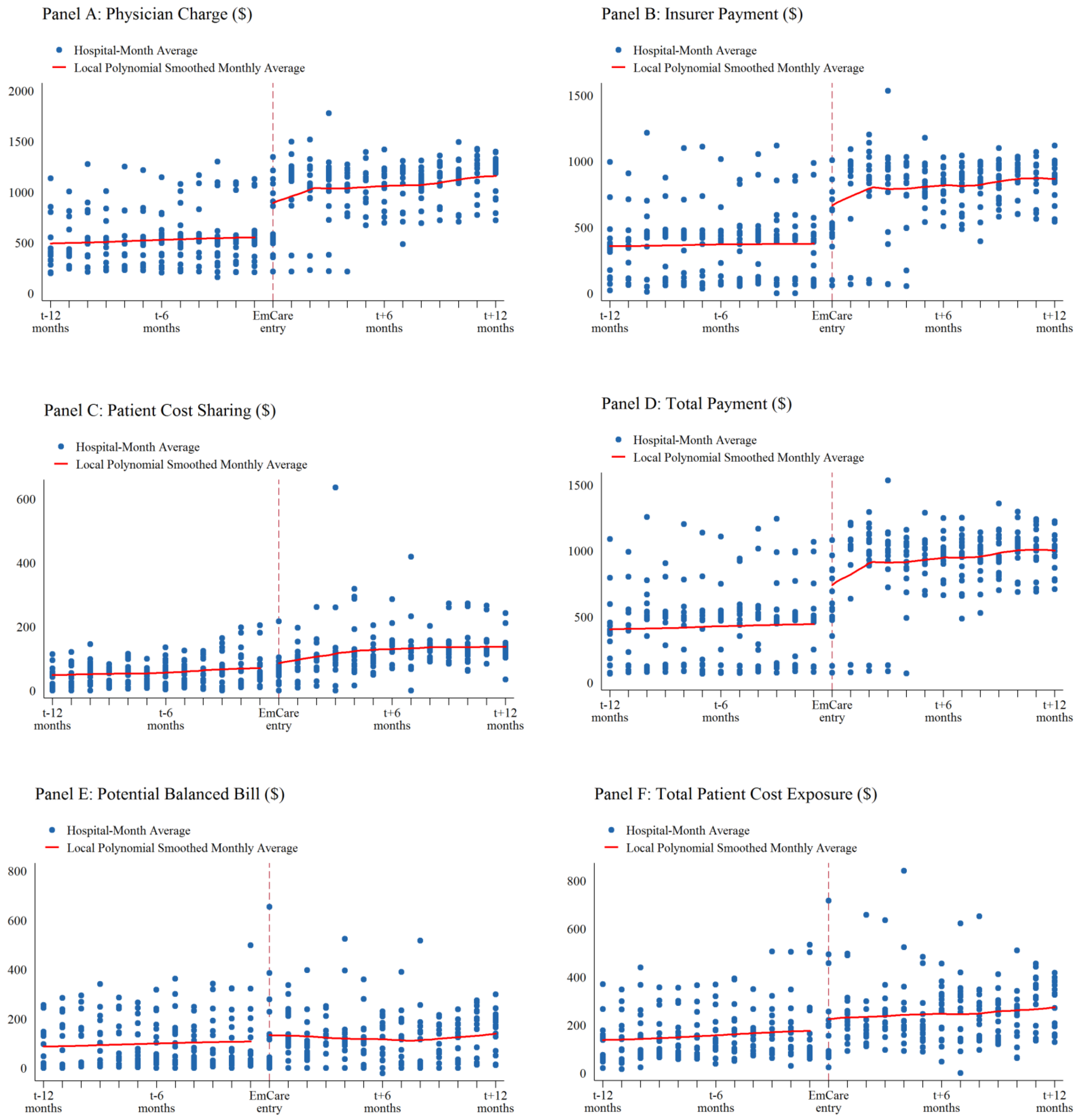


Panel B: TeamHealth Out-of-Network Physician Rate (%)

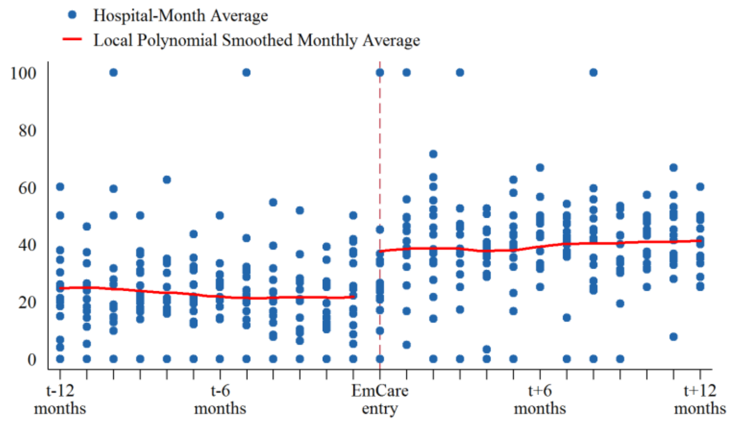


Notes: The panels plot the monthly average by hospital from 12 months before to 12 months after EmCare or TeamHealth entered the hospital. For Panel A, we limit our analysis to hospitals with out-of-network rates below 97% in 2011.

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

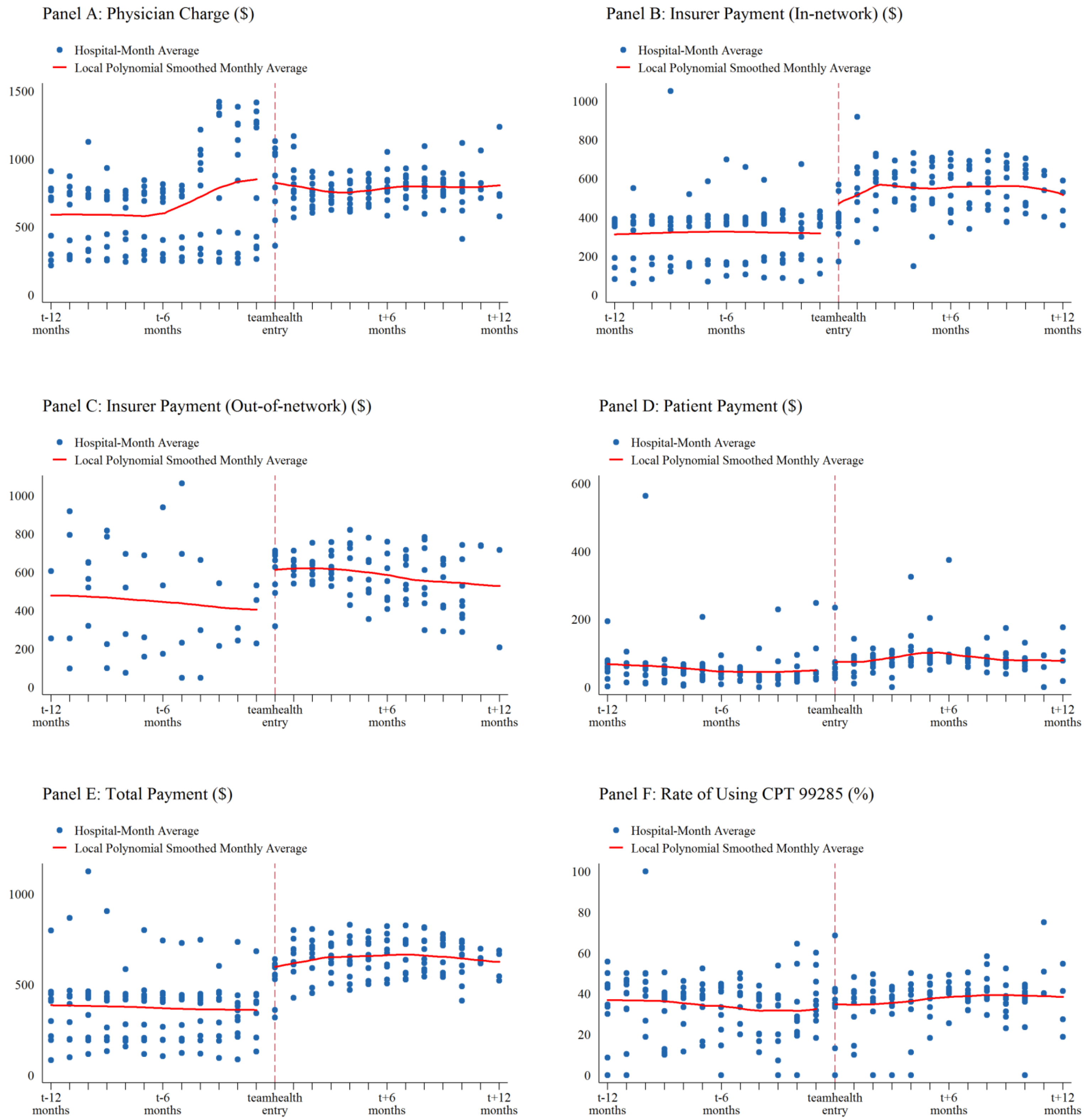


Panel G: Rate of Using CPT 99285 (%)



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

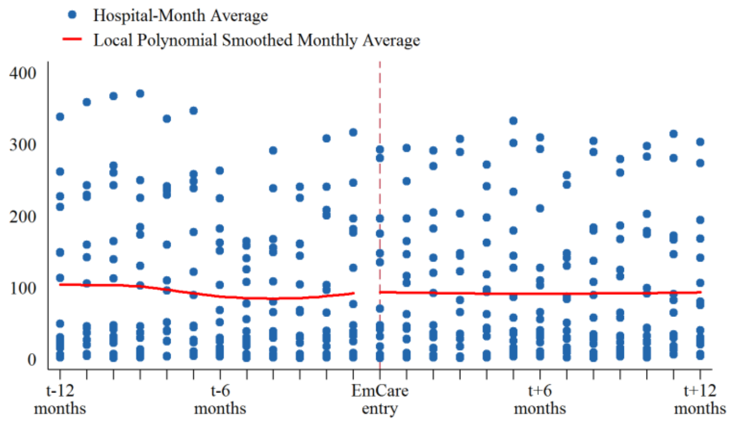
Figure 5: Discontinuity Analysis of Physician Billing at Hospitals Where TeamHealth Took Over Management of ED Services



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

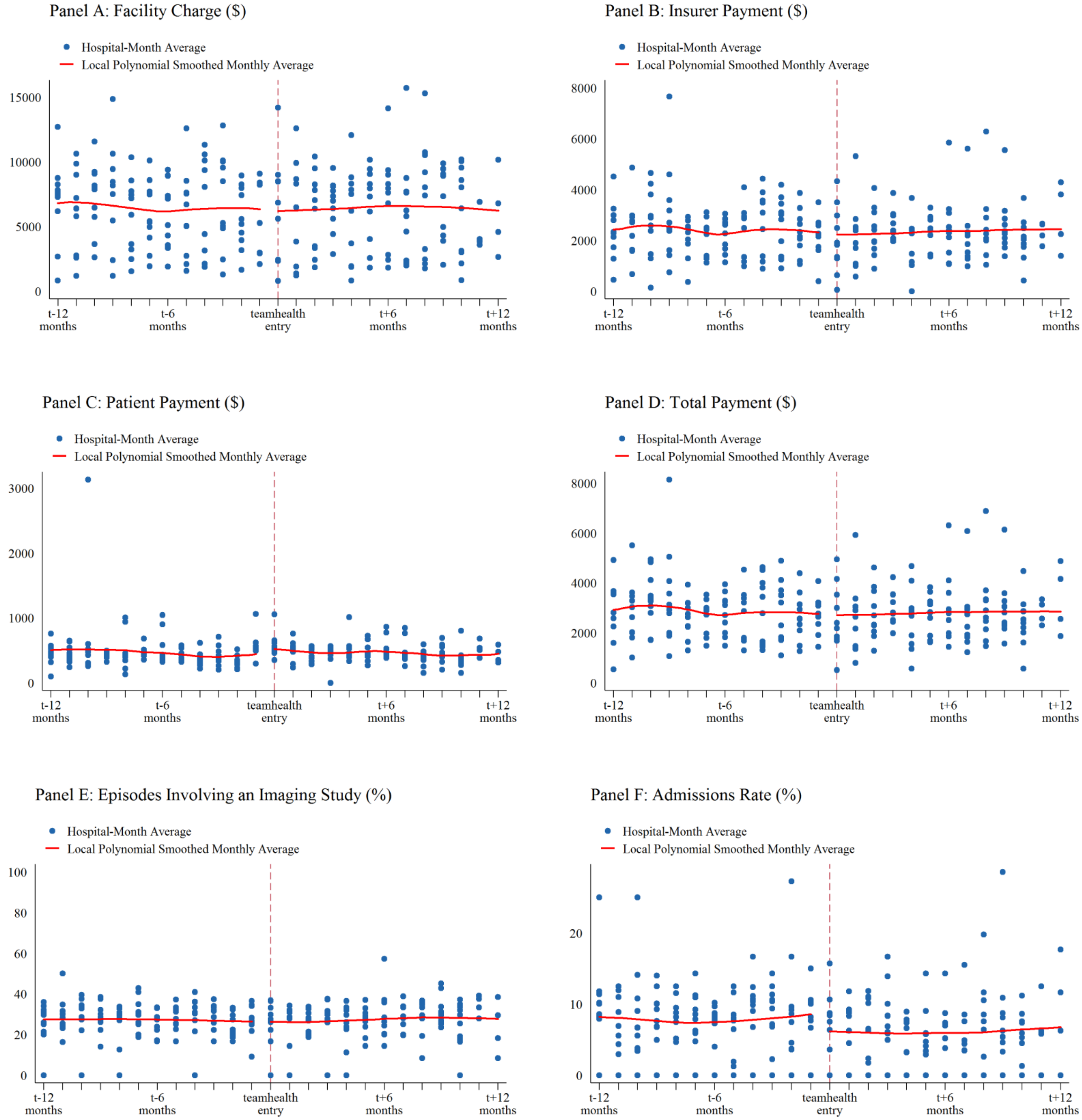
Figure 6: Discontinuity Analysis of Hospital Activity at Hospitals Where EmCare Took Over Management of ED Services

Panel G: Total Episodes

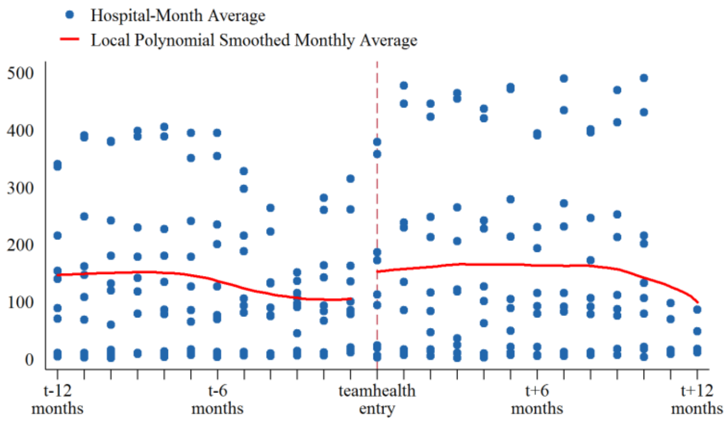


Notes: The panels plot the monthly average by hospital from 12 months before to 12 months after EmCare entered the hospital.

Figure 7: Discontinuity Analysis of Hospital Activity at Hospitals Where TeamHealth Took Over Management of ED Services

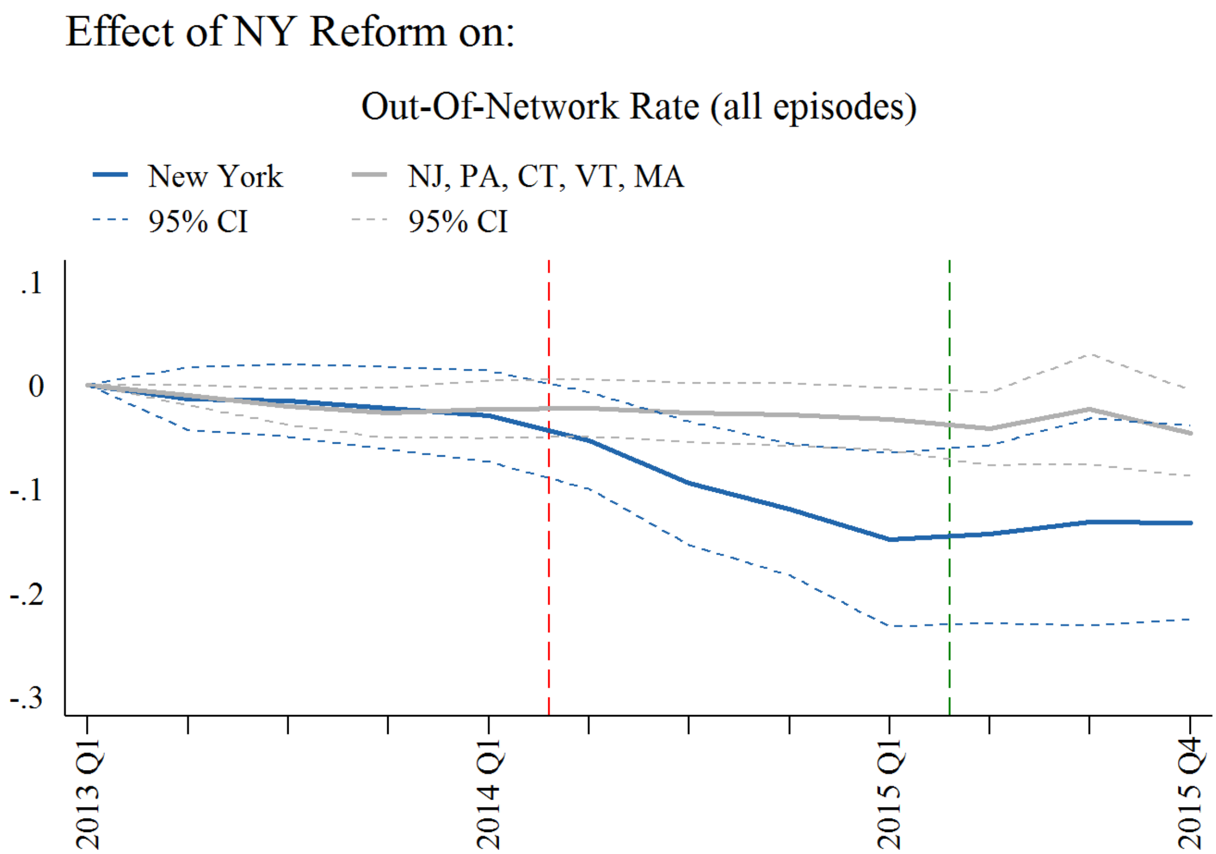


Panel G: Total Episodes



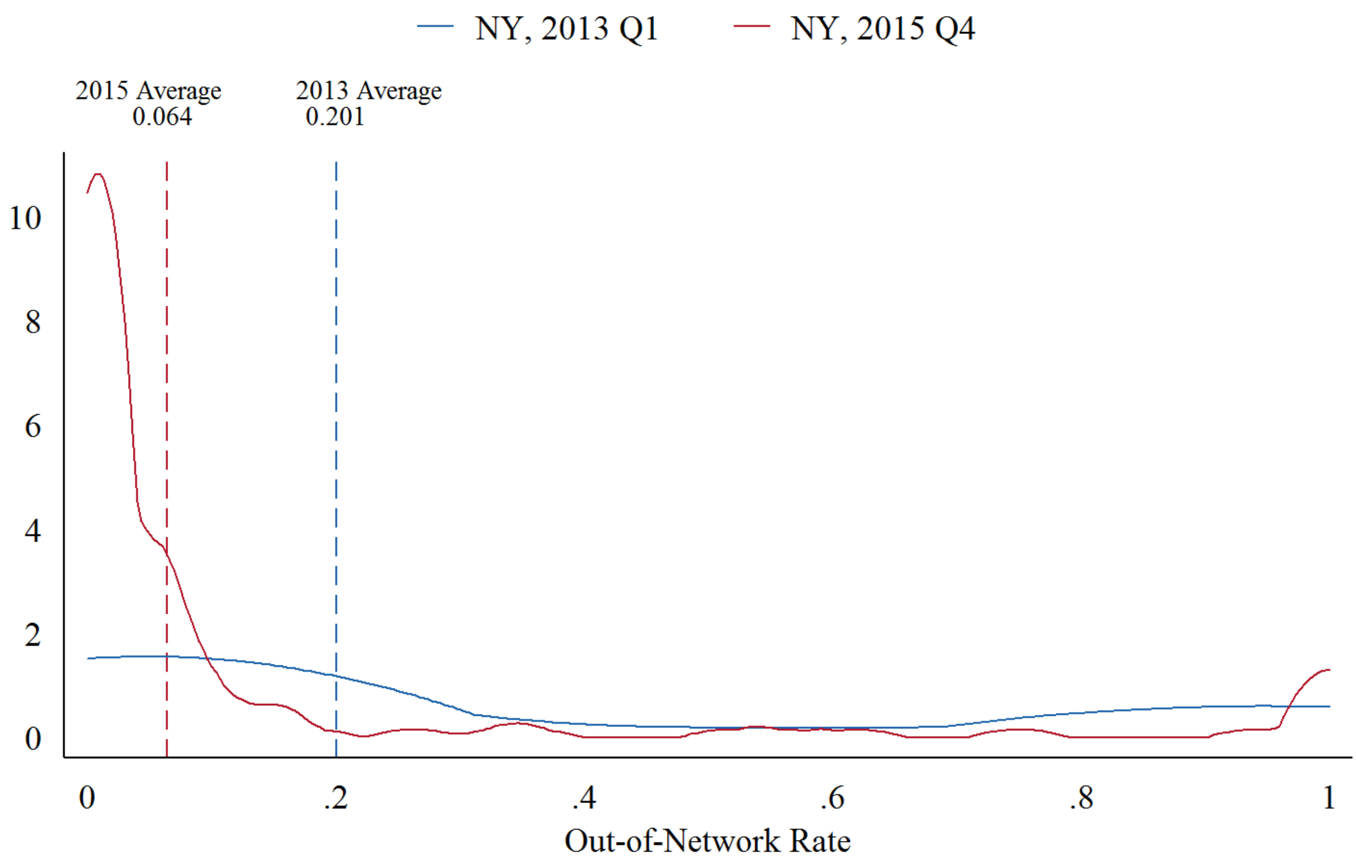
Notes: The panels plot the monthly average by hospital from 12 months before to 12 months after TeamHealth entered the hospital.

Figure 8: 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 a 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 2013. 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 9: The Distribution of Out-of-Network Billing in New York in 2013 and 2015



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

Appendix – For Online Publication

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 Entry from EmCare and TeamHealth

	EmCare	TeamHealth
2012	3 Hospitals	1 Hospital
2013	1 System (8 hospitals); 1Hospital	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 2: ED Episode Descriptives

	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
Physician Insurer Payment	354.02	310.78	0.00	45.01	135.23	271.20	483.00	789.36	1,642.45
Physician Patient Payment	58.07	114.61	0.00	0.00	0.00	0.00	65.31	185.17	679.45
Potential Balance Bill	202.90	237.04	0.00	0.00	41.68	135.66	274.96	484.55	2,067.52
Patient Cost Exposure	260.94	256.20	0.00	0.00	87.40	190.90	352.26	592.98	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
Facility Insurer Payment	2,441.31	5,063.87	0.00	0.00	367.69	862.51	2,001.42	5,629.37	36,286.11
Facility Patient Payment	409.31	581.84	0.00	0.00	104.00	200.96	444.60	1,081.61	3,352.42
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 3: The Impact of the Entry of EmCare and TeamHealth on Hospital Out-of-Network Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Hospitals with Out-of-Network Rates Above 97% Prior to Entry			Hospitals with Out-of-Network Rates Below 97% Prior to Entry			All Hospitals Where TeamHealth Entered		
	OON Indicator			OON Indicator			OON Indicator		
Management Company Entry	-0.030	0.035	-0.032	0.815***	0.846***	0.896***	0.326***	0.376***	0.261***
	(0.044)	(0.048)	(0.060)	(0.061)	0.073	(0.156)	(0.03)	(0.034)	0.082
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.209	0.392	0.896	0.204	0.372	0.549	0.226	0.305	0.232
SD	0.407	0.488	0.306	0.403	0.483	0.498	0.419	0.460	0.422
Observations	8,401,884	1,704,541	85,741	8,351,799	1,654,456	34,876	8,661,796	2,118,144	132,549
Control	All Non-Entry Hospitals	Hospitals in Same State	Propensity Score Match	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 (13a) separately on hospitals with out-of-network (OON) rates below 11% (Columns 1-3) and above 97% (Columns 4-6). We also estimate Equation (13b) for hospitals with TeamHealth entry in Columns (7-9). 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 (1,4,7) are all hospitals in the US that did not outsource their ED management to EmCare or TeamHealth. The control groups for Columns (2,5,8) are all hospitals in same states as the treated hospitals, excluding hospitals that outsourced their ED services to EmCare or TeamHealth The control groups in Columns (3,6,9) 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. Mean and standard deviation are drawn from the analytic sample population underlying the regression.

Appendix Table 4: The Impact of the Entry of EmCare on Physician Charges, Payments, and Coding Same-State Hospitals Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Physician Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Potential Balanced Bill	Total Patient Cost Exposure	CPT Severity
EmCare Entry	548.40***	396.98***	46.23***	443.22***	105.18***	151.42***	0.148***
	(62.97)	(55.28)	(4.53)	(56.13)	(38.86)	(35.28)	(0.030)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	615.73	409.62	61.68	471.30	144.42	206.11	0.357
SD	386.33	327.27	111.05	340.41	215.56	236.11	0.479
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). Each observation is a patient episode. The control group includes hospitals in the same states as the treated hospitals. 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollars amounts are adjusted into 2015 dollars.

Appendix Table 5: The Impact of the Entry of EmCare on Physician Charges, Payments, and Coding Propensity Score Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Physician Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Potential Balanced Bill	Total Patient Cost Exposure	CPT Severity
EmCare Entry	478.19***	390.28***	42.21***	432.50***	45.69	87.90**	0.144***
	(77.87)	(62.71)	(5.51)	(64.73)	(38.02)	(38.39)	(0.034)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	817.20	578.37	83.43	661.80	155.40	238.83	0.357
SD	485.98	427.60	130.57	452.12	313.02	325.70	0.479
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). Each observation is a patient episode. The control groups 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollars amounts are adjusted into 2015 dollars.

Appendix Table 6: The Impact of the Entry of TeamHealth on Physician Charges, Payments, and Coding Same-State Hospitals Control Group

	(1)	(2)	(3)	(4)	(5)
	Physician Charge	Insurer Payment	Patient Cost Sharing	Total Payment	CPT Severity
TeamHealth Entry	13.63	230.63***	18.45***	249.08***	0.0225
	(37.39)	(17.79)	(3.71)	(20.91)	(0.015)
Hospital FE	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Mean	635.76	389.46	62.21	451.66	0.362
SD	397.92	327.93	112.14	342.54	0.481
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13b). Each observation is a patient episode. The control group includes hospitals in the same states as the treated hospitals. 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 7: The Impact of the Entry of TeamHealth on Physician Charges, Payments, and Coding Propensity Score Control Group

	(1)	(2)	(3)	(4)	(5)
	Physician Charge	Insurer Payment	Patient Cost Sharing	Total Payment	CPT Severity
TeamHealth Entry	-28.41	215.21***	18.82***	234.04***	0.0267
	(44.01)	(24.77)	(6.53)	(27.91)	(0.024)
Hospital FE	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Mean	705.85	442.41	61.54	503.96	0.387
SD	372.52	296.61	108.89	304.59	0.487
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13b). Each observation is a patient episode. The control groups 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. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 8: Physician Payment Rates for ED Visits

	Mean	S.D.	P25	P50	P75	Max
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%)					

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.

Appendix Table 9: The Impact of the Entry of EmCare on Hospital Charges, Payments, and Activity

Same-State Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
EmCare Entry	1522.14***	191.94*	45.47**	237.41**	0.012***	0.017***	-188.98
	(395.07)	(98.48)	(17.79)	(112.91)	(0.005)	0.0062	(219.4)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	6,304.63	2,350.46	393.81	2,744.271	0.278	0.090	1,695.5
SD	12,415.53	4,885.15	561.89	5,034.470	0.448	0.286	1,566.5
Observations	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226	8,418,226
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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). Each observation is a patient episode. The control group includes hospitals in the same states as the treated hospitals. We windsorized the top and bottom percentile of hospital and physician payments. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 10: The Impact of the Entry of EmCare on Hospital Charges, Payments, and Activity
Propensity Score Match Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
EmCare Entry	1238.37***	88.38	32.52	120.90	0.018	0.011	-58.62
	(412.95)	(114.20)	(19.32)	(129.20)	(0.010)	0.0103	(211.7)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	8,396.29	2,614.88	483.73	3,098.618	0.304	0.095	1797.0
SD	14,579.69	4,781.73	609.50	4,938.139	0.460	0.294	1,021.8
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). Each observation is a patient episode. The control groups 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. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 11: The Impact of the Entry of TeamHealth on Hospital Charges, Payments, and Activity

Same-State Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
TeamHealth Entry	112.10	-109.47	13.23	-96.24	-0.008**	-0.008***	507.3***
	(179.33)	(78.38)	(12.81)	(84.41)	(0.004)	0.0026	(188.0)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	6248.05	2435.69	426.91	2862.60	0.280	0.082	1984.0
SD	12156.69	4832.48	573.76	4983.91	0.449	0.274	1563.2
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13b). Each observation is a patient episode. The control group includes hospitals in the same states as the treated hospitals. We windsorized the top and bottom percentile of hospital and physician payments. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 12: The Impact of the Entry of TeamHealth on Hospital Charges, Payments, and Activity
Propensity Score Match Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Facility Charge	Insurer Payment	Patient Cost Sharing	Total Payment	Imaging	Admission to Hospital	Episode Count
TeamHealth Entry	-153.30	-276.64**	-8.50	-285.14**	-0.008	-0.010	340.8*
	(270.94)	(109.79)	(32.65)	(132.72)	(0.010)	0.0068	(181.8)
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean	7,396.29	2,546.26	425.88	2,972.141	0.304	0.083	2,587.3
SD	12,920.69	4,871.93	558.87	5,045.284	0.460	0.275	1458.9
Observations	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

Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13b). Each observation is a patient episode. The control groups 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. Imaging is an indicator variable capturing whether a patient had an imaging study performed during an ED visit. Admissions to hospital is an indicator variable that captures whether a patient was admitted to the hospital after an ED visit. Each regression includes controls for patient age, gender, race, and Charlson score. Standard errors are clustered around hospitals. Means and standard deviation are drawn from the analytic sample population underlying the regression. All dollar amounts are inflation adjusted into 2015 dollars.

Appendix Table 13: Hospital Characteristics Associated with EmCare and TeamHealth

	(1)	(2)	(3)	(4)
	EmCare	EmCare	TeamHealth	TeamHealth
For-profit	0.1063***	0.1206***	0.011	0.011
	(0.013)	(0.012)	(0.010)	(0.009)
Government	0.0464***	0.0440***	0.005	0.002
	(0.015)	(0.014)	(0.011)	(0.010)
Teaching Hospital	-0.007	-0.008	-0.017	-0.016
	(0.019)	(0.019)	(0.014)	(0.014)
Hospital Beds	0.003	0.000	0.004	0.0108*
	(0.009)	(0.008)	(0.007)	(0.006)
Technologies	0.006	-0.001	-0.008	-0.011
	(0.019)	(0.018)	(0.013)	(0.013)
Hospital HHI	0.0187*	0.0184**	0.001	0.0138**
	(0.011)	(0.008)	(0.008)	(0.006)
Proportion Medicare	0.014	0.001	0.014	0.0245**
	(0.017)	(0.016)	(0.012)	(0.012)
Proportion Medicaid	0.004	-0.003	0.005	0.007
	(0.008)	(0.008)	(0.006)	(0.006)
ED Physicians per Capita	11.510	-0.0433***	-22.9726***	-0.0197**
	(9.167)	(0.011)	(6.637)	(0.008)
Physicians per Capita	-14.979	-0.004	29.3776***	0.0506***
	(13.582)	(0.023)	(9.833)	(0.017)
Physician HHI	0.016	0.011	-0.008	-0.003
	(0.020)	(0.016)	(0.014)	(0.012)
Insurer HHI	0.021	-0.008	0.002	-0.0148*
	(0.019)	(0.011)	(0.014)	(0.008)
Household Income	0.0893**	0.0951***	0.0517*	-0.025
	(0.042)	(0.030)	(0.030)	(0.021)
Gini Coefficient	-0.1182**	0.0697***	0.026	0.028
	(0.052)	(0.026)	(0.038)	(0.019)
HRR FE	Yes	No	Yes	No
Mean	0.0581	0.0581	0.0285	0.0285
SD	0.2340	0.2340	0.1663	0.1663
Observations	3,345	3,345	3,345	3,345

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each observation is a hospital. The table presents a logit regression of an indicator for EmCare or TeamHealth hospitals on the hospital characteristics in the table. Means and standard deviation are drawn from the analytic sample population underlying the regression.

Appendix Table 14: Comparison of Entry 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						
For-profit	0.55	0.57	0.87	0.29	0.30	0.96
Non-profit	0.27	0.21	0.65	0.57	0.70	0.45
Government	0.18	0.21	0.76	0.13	0.00	0.22
Teaching	0.04	0.00	0.44	0.04	0.00	0.54
Hospital Beds	173.97	266.50	0.03	197.63	227.40	0.50
Technologies	43.10	57.79	0.06	47.79	54.80	0.45
Hospital HHI	0.57	0.58	0.98	0.59	0.66	0.48
Proportion Medicare	48.31	43.58	0.12	51.42	44.43	0.03
Proportion Medicaid	18.97	24.18	0.15	20.15	18.14	0.48
ED Physicians per Capita (per 10,000)	0.65	0.61	0.58	0.70	1.06	0.00
Physicians per Capita (per 10,000)	21.64	19.01	0.06	22.82	25.52	0.09
Physician HHI	0.41	0.59	0.02	0.41	0.65	0.13
Insurer HHI	0.36	0.35	0.75	0.35	0.40	0.31
Household Income	38,146.20	35,404.44	0.22	36,849.58	38,080.67	0.59
Gini Coefficient	0.34	0.34	0.61	0.33	0.31	0.19

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. The p-value is reported from a two-sided t-test comparing the difference in means between hospitals and hospitals with entry.

Appendix Table 15: 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	6,247.15	11,476.89	0.326	0.449	6,266.03	11,512.46	0.326	0.450
SD	1,7201.02	27,910.51	0.919	1.056	17,236.61	27,971.30	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 Equations (13a) and (13b). 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.

Appendix Table 16: 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 (13a). 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: 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	2,744.27	2,744.27	2,744.27	2,417.80	4,303.16	2,353.30	2,355.26	3,524.26
SD	5,034.47	5,034.47	5,034.47	4,418.88	7,084.79	4,492.45	4,350.98	6,001.00
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 (13a). 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 18: 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 (13a). 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 19: 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

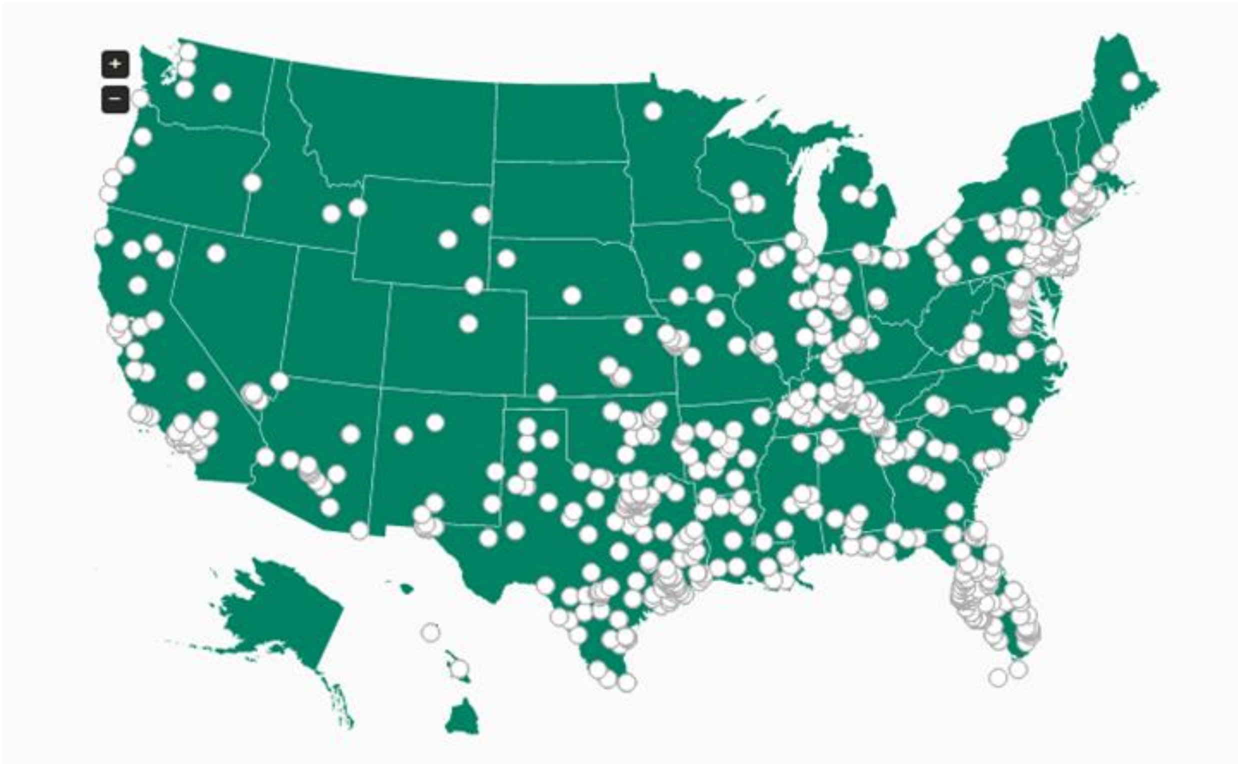
Notes: * p<0.10, ** p<0.05, *** p<0.01. This table presents least-squares estimates of Equation (13a). Each observation is a patient episode. The control group in all regressions is all hospitals in the US exclusive of those that outsourced their ED services to EmCare. We windsorized the top and bottom 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 20: 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%

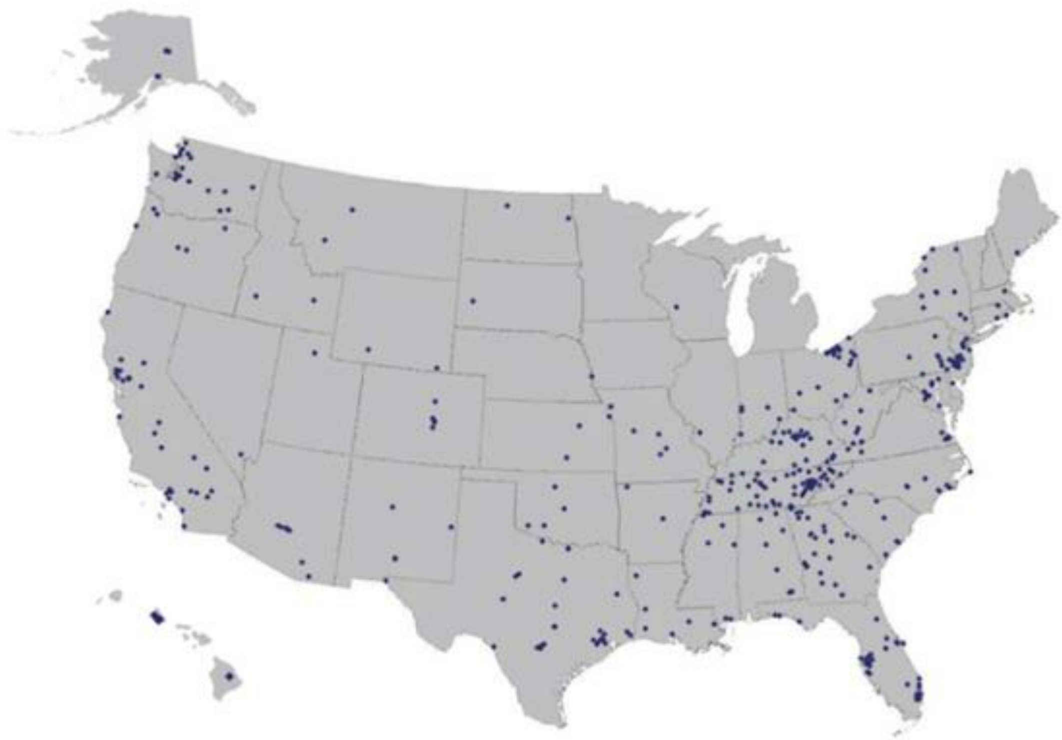
Notes: The table shows summary statistics for our data in New York State. Only episodes that occur in an in-network hospital are included. There are a small percentage of episodes (> 0.5%) that are missing a label for ASO or fully-insured.

Appendix Figure 1A: Map of EmCare Locations



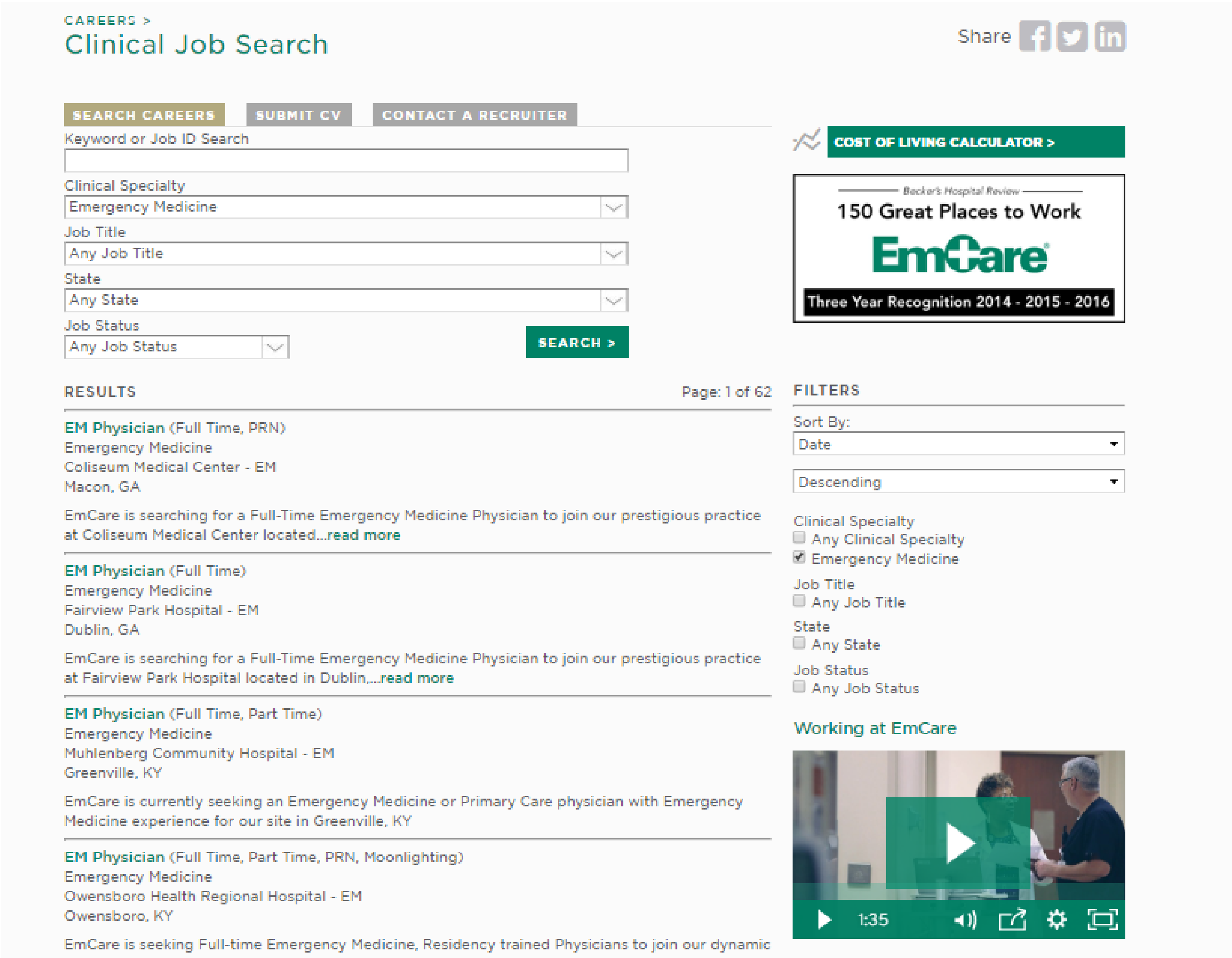
Notes: This map was taken from the webpage of EmCare's parent company Envision Healthcare (https://www.evhc.net/vision/emcare). The underlying HTML source code from the web page contains the latitude and longitude coordinates of each white point displayed. We calculate each coordinate pair's distance to AHA-registered hospital coordinates, and keep hospitals that are within only 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



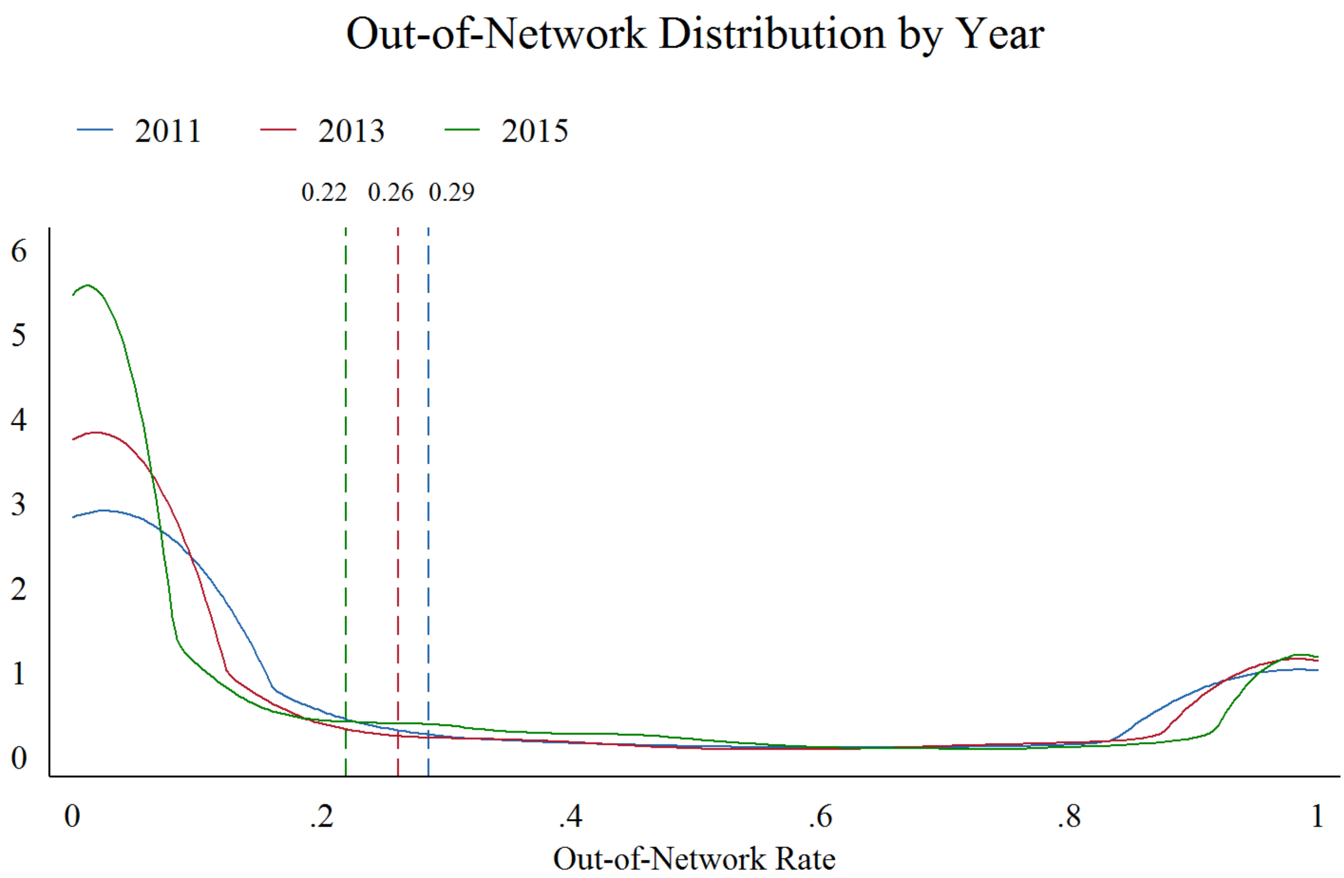
Notes: This is a map from a 2009 Morgan Stanley report on TeamHealth. To determine the hospital locations shown on this map, we used georeferencing in ArcGIS. Georeferencing takes an image or scanned photo without spatial reference information and aligns it to a map with a known coordinate system. In 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 keep hospitals that are within only 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.

<u>**Appendix Figure 2: Example of EmCare Job Listing**</u>



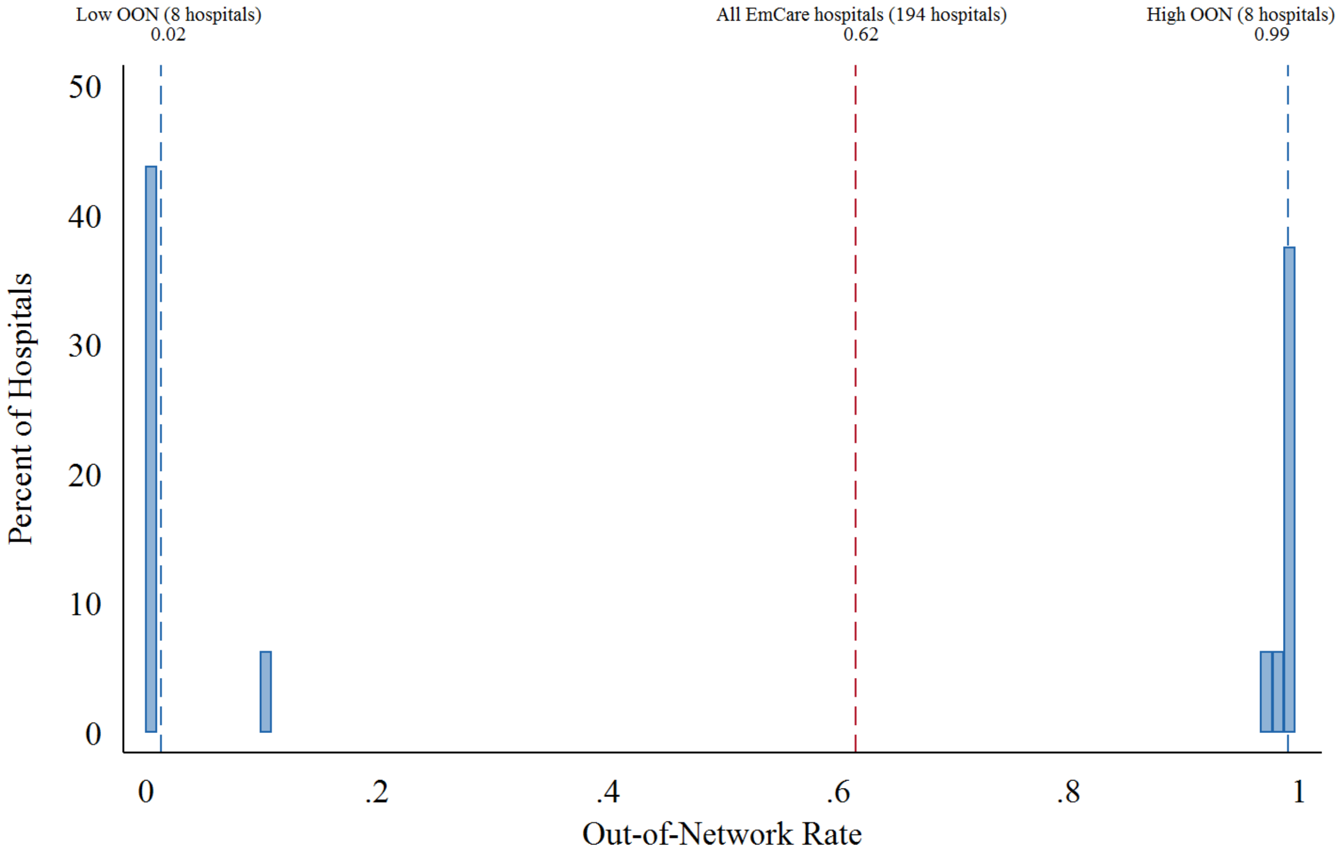
Notes: This screen grab is taken from EmCare's job hiring page. (https://www.emcare.com/careers/clinical-job-search).

Appendix Figure 3: The Distribution of Hospital Out-of-Network Rates, 2011, 2013, and 2015



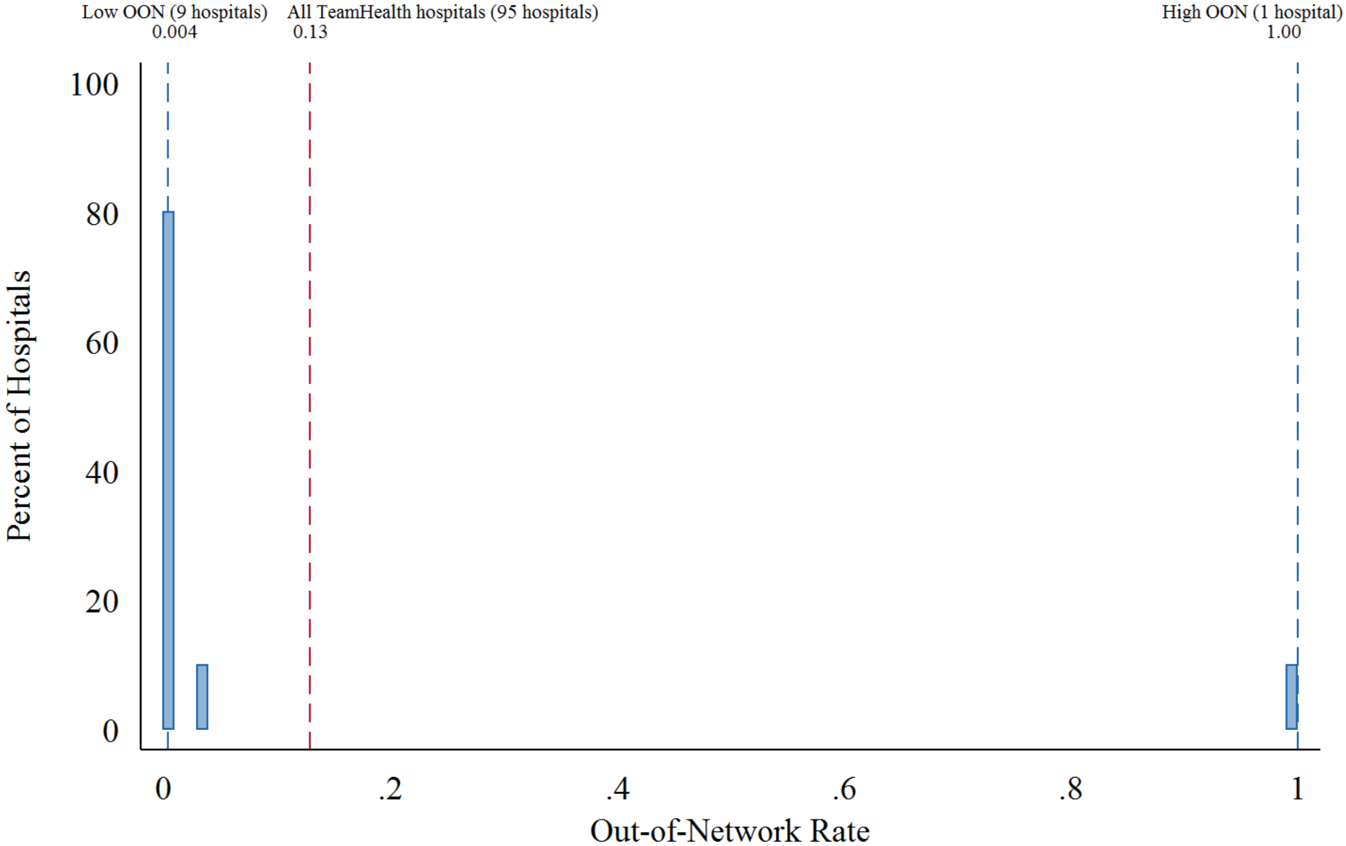
Notes: The figure shows the distribution of hospital out-of-network rates in years 2011, 2013, and 2015. There are 3,345 hospitals that appear in each year of the data.

Appendix Figure 4A: The Distribution of Out-of-Network Rates at Hospitals where EmCare Enters, 2011



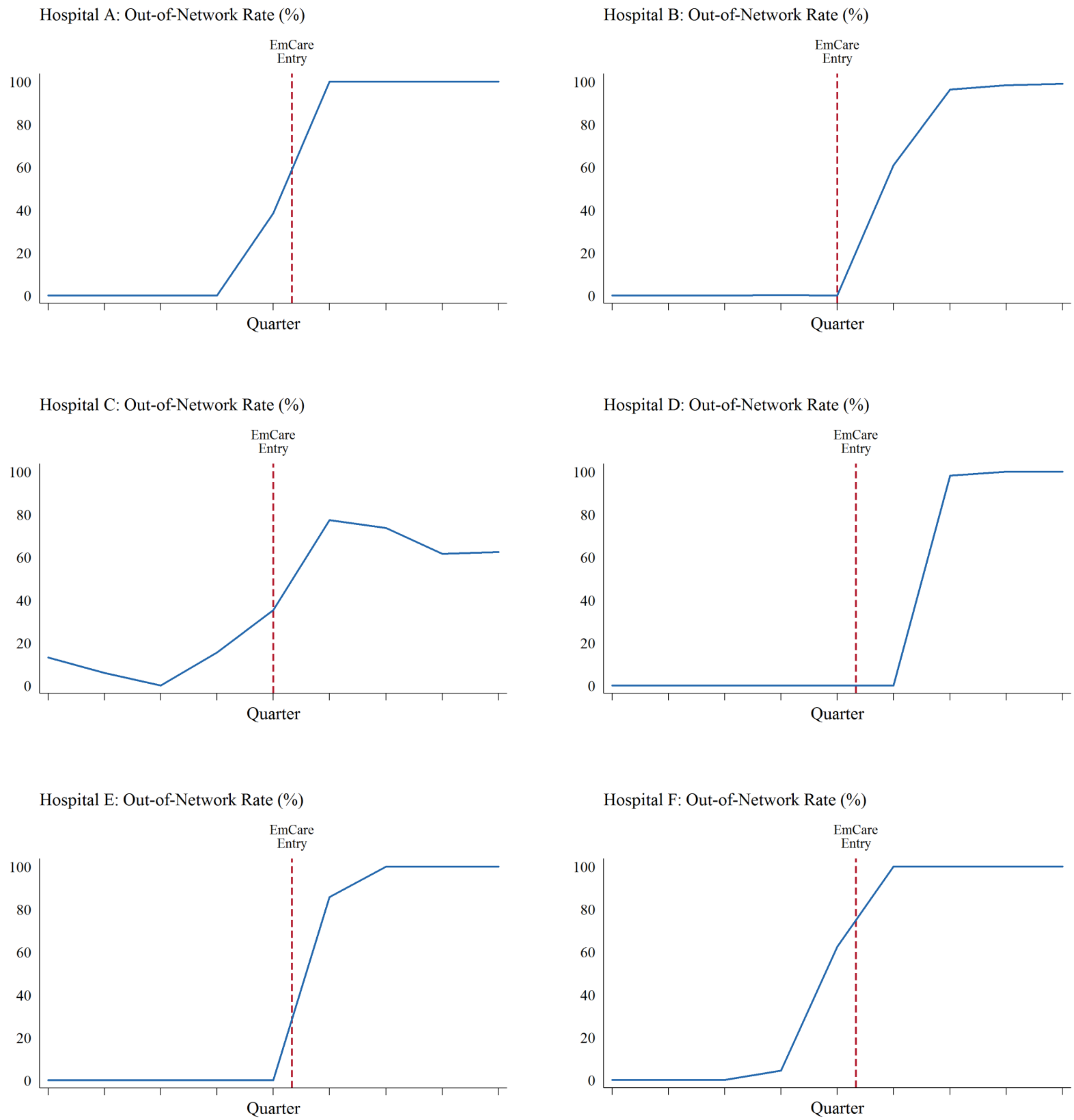
Notes: The figure shows a histogram of out-of-network rates for hospitals prior to EmCare entry in 2011. There are a total of 16 EmCare entry hospitals. Each bar shows the percent of hospitals falling into a given out-of-network rate. The red vertical line is the average of all EmCare hospitals from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

Appendix Figure 4B: The Distribution of Out-of-Network Rates at Hospitals Where TeamHealth Enters, 2011

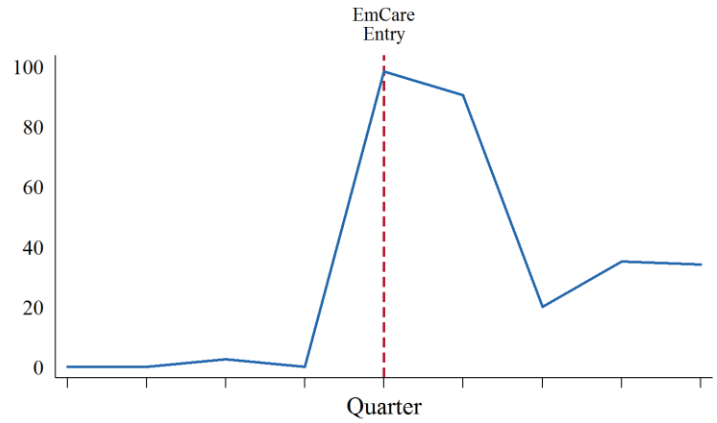


Notes: The figure shows a histogram of out-of-network rates for hospitals prior to TeamHealth entry in 2011. There are a total of 10 TeamHealth entry hospitals. Each bar shows the percent of hospitals falling into a given out-of-network rate. The red vertical line is the average of all TeamHealth hospitals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

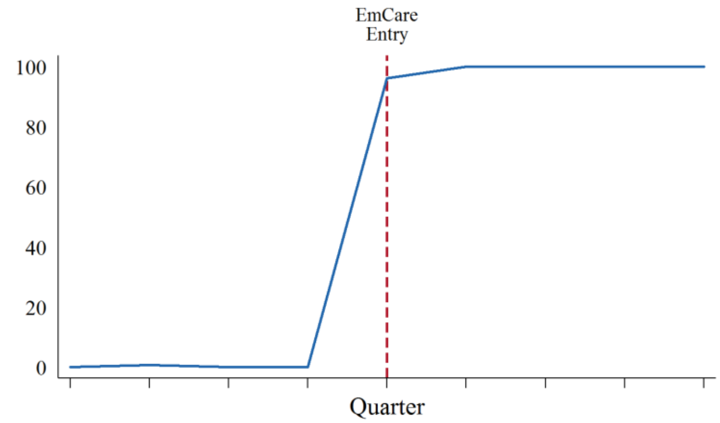
Appendix Figure 5: Out-of-Network Rates at Hospitals Where EmCare Entered



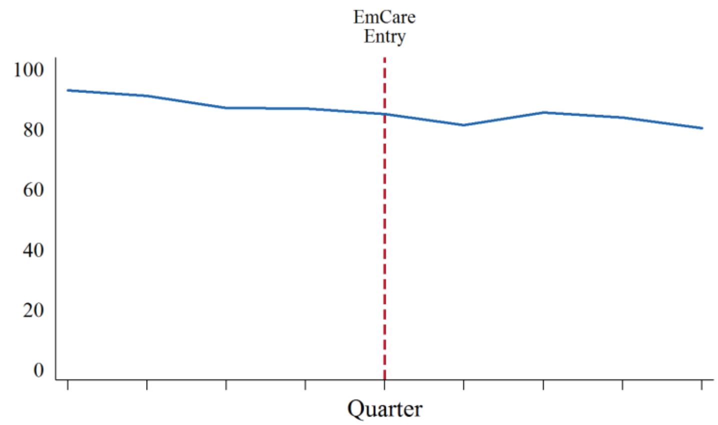
Hospital G: Out-of-Network Rate (%)



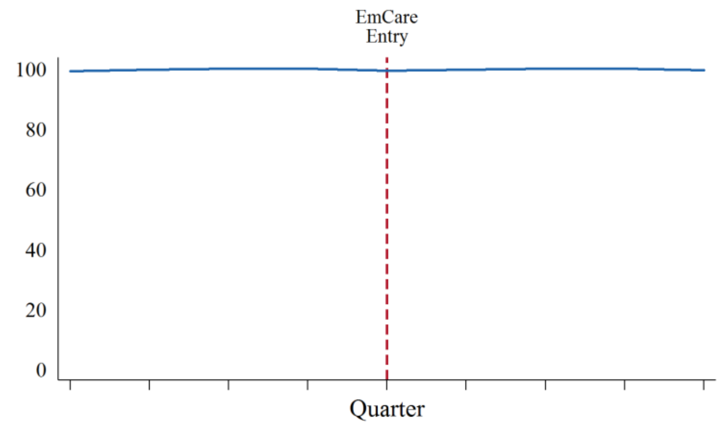
Hospital H: Out-of-Network Rate (%)



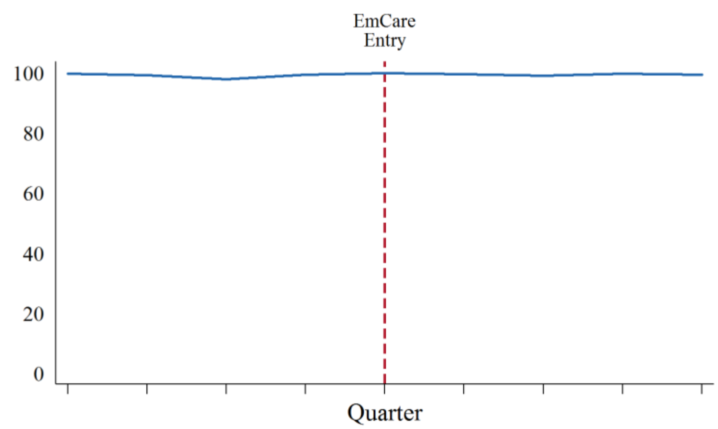
Hospital I: Out-of-Network Rate (%)



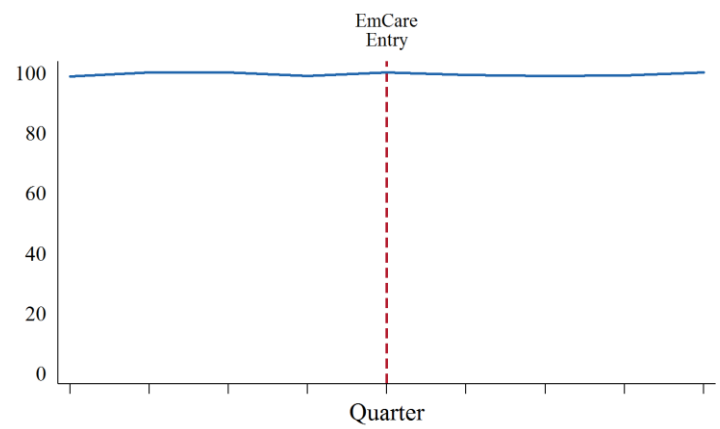
Hospital J: Out-of-Network Rate (%)

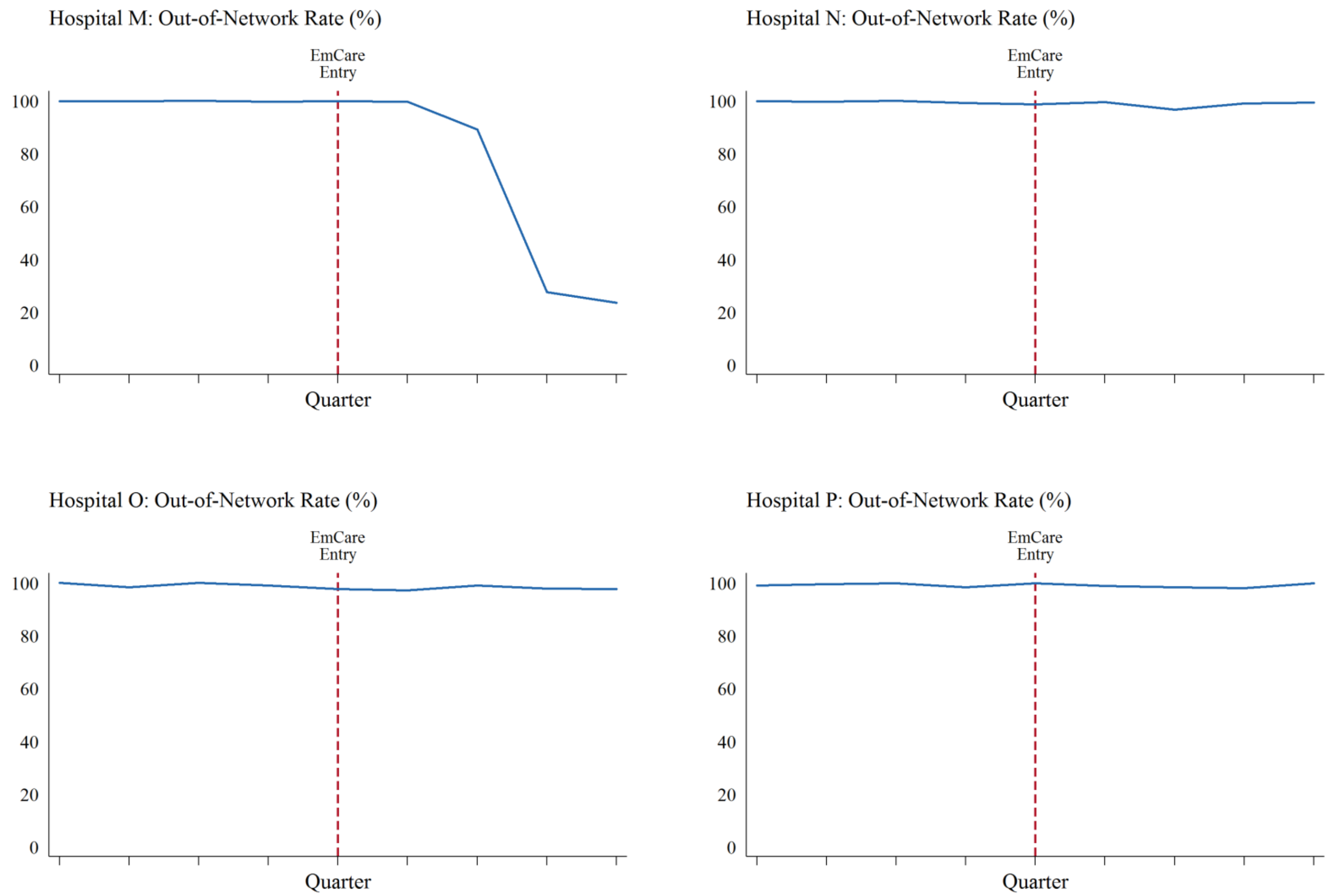


Hospital K: Out-of-Network Rate (%)



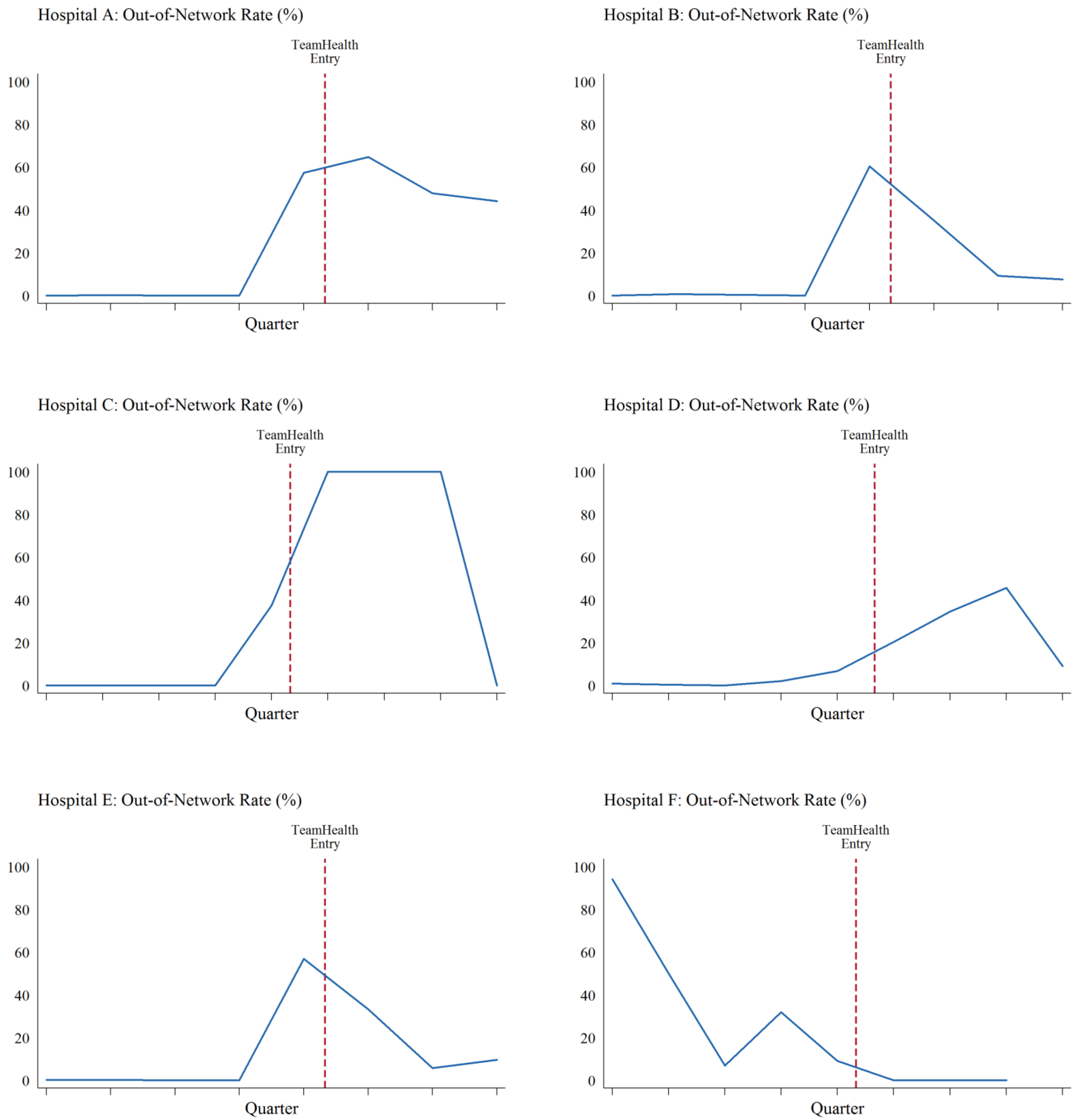
Hospital L: Out-of-Network Rate (%)

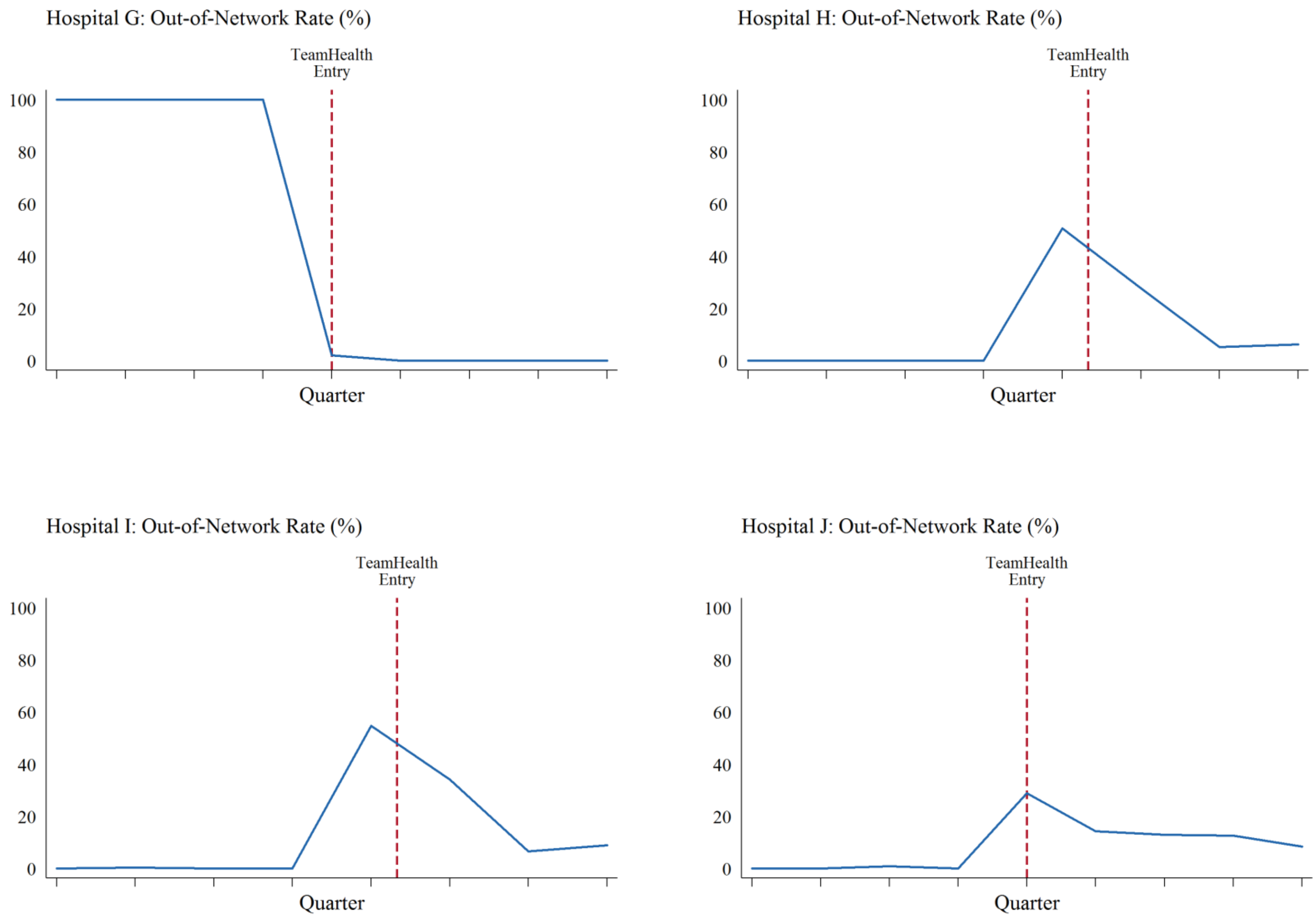




Notes: This figure plots the average quarterly out-of-network rates at hospitals where EmCare entered. We present data from the four quarters before and the four quarters after EmCare took over the management of each hospital's ED.

<u>**Appendix Figure 6: Out-of-Network Rates at Hospitals Where TeamHealth Entered**</u>

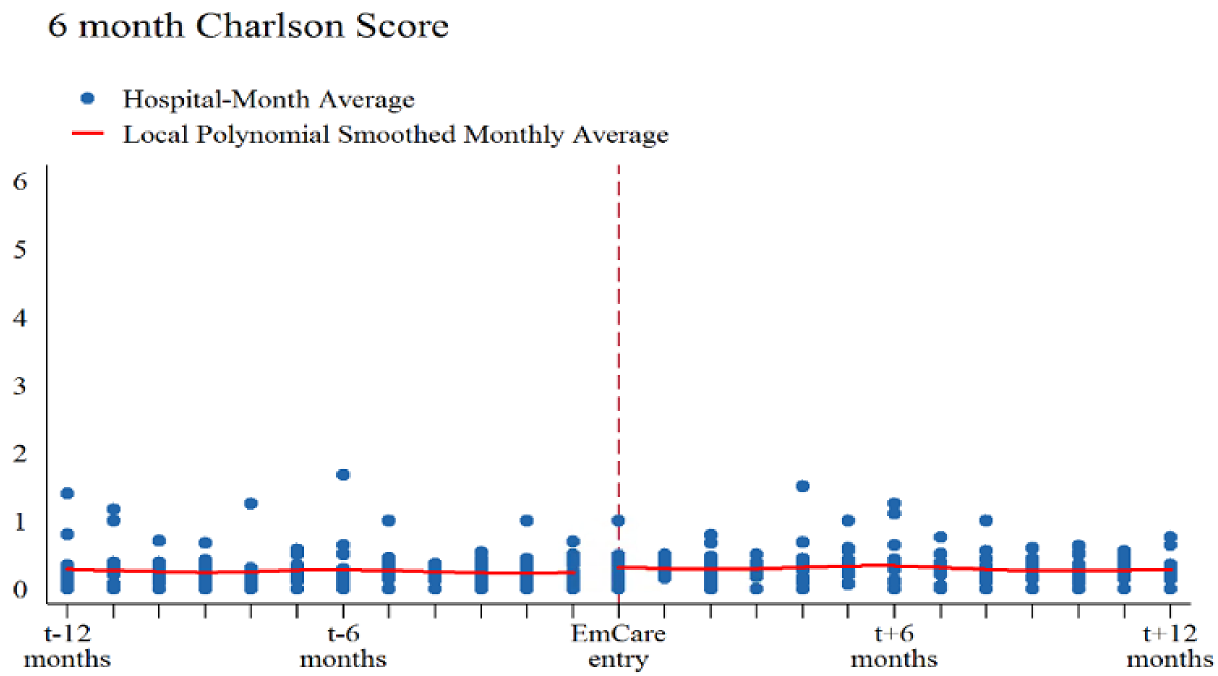




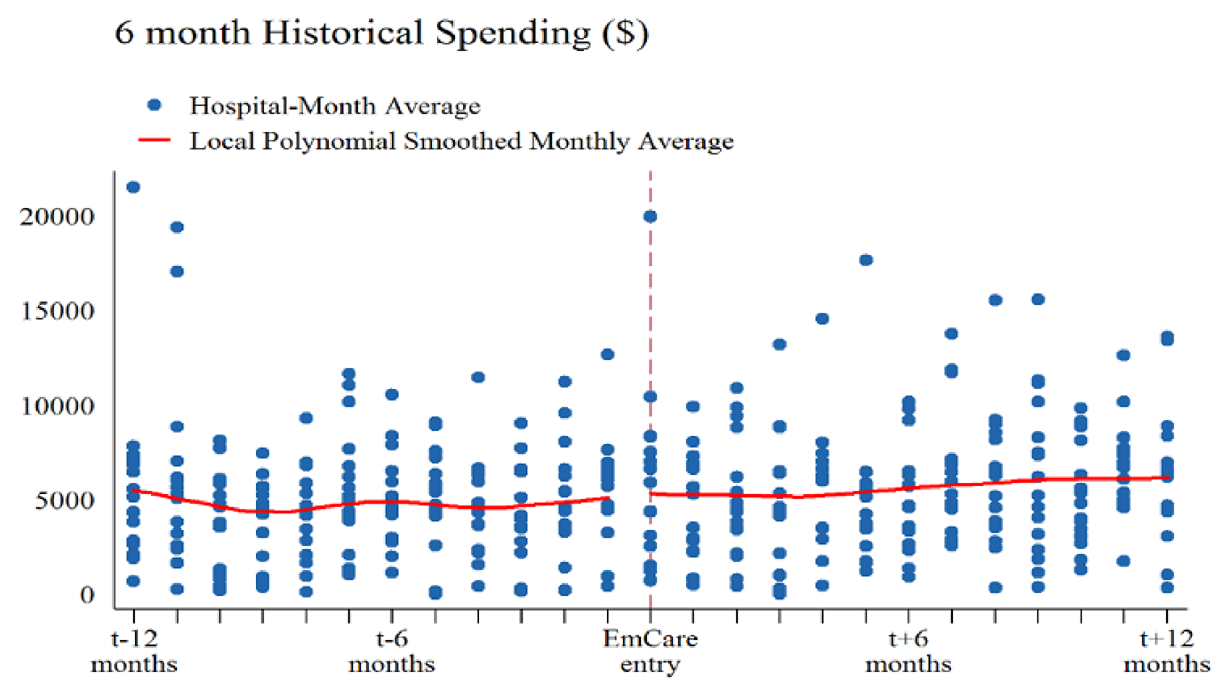
Notes: This figure plots the average quarterly out-of-network rates at hospitals where TeamHealth entered. We present data from the four quarters before and the four quarters after TeamHealth took over the management of each hospital's ED.

Appendix Figure 7: EmCare and TeamHealth Entry on Patient Characteristics

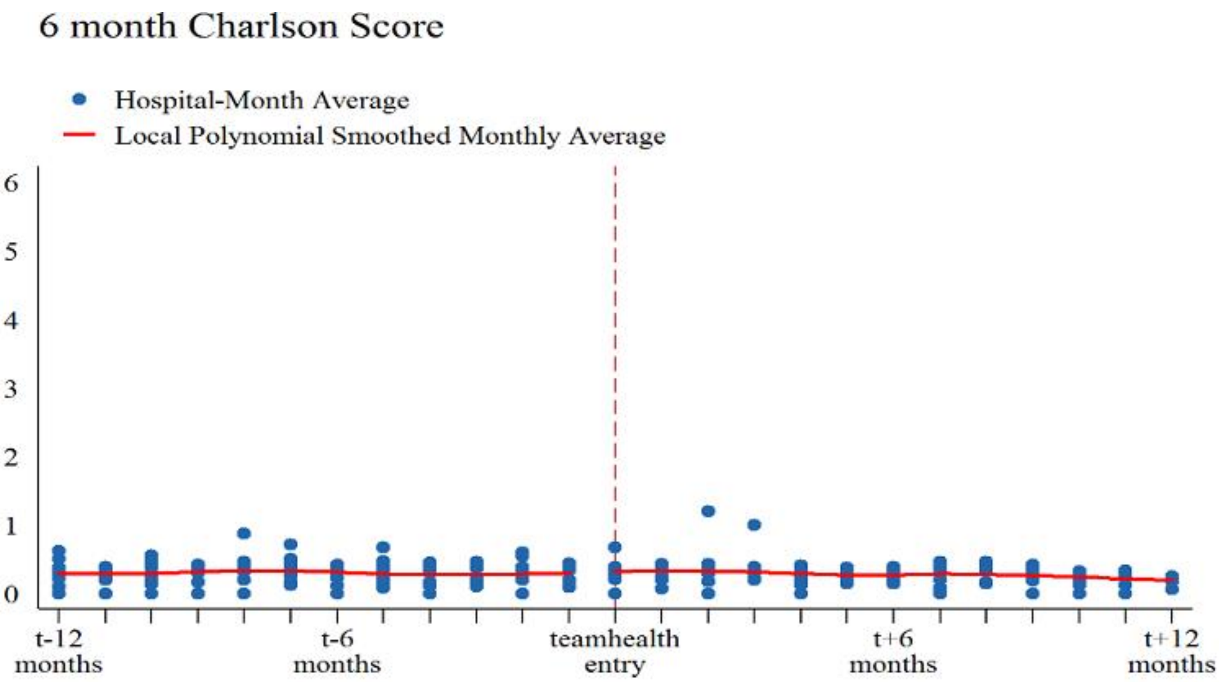
Panel A: EmCare Entry on Hospitals' Averate Charlson Score of Patients



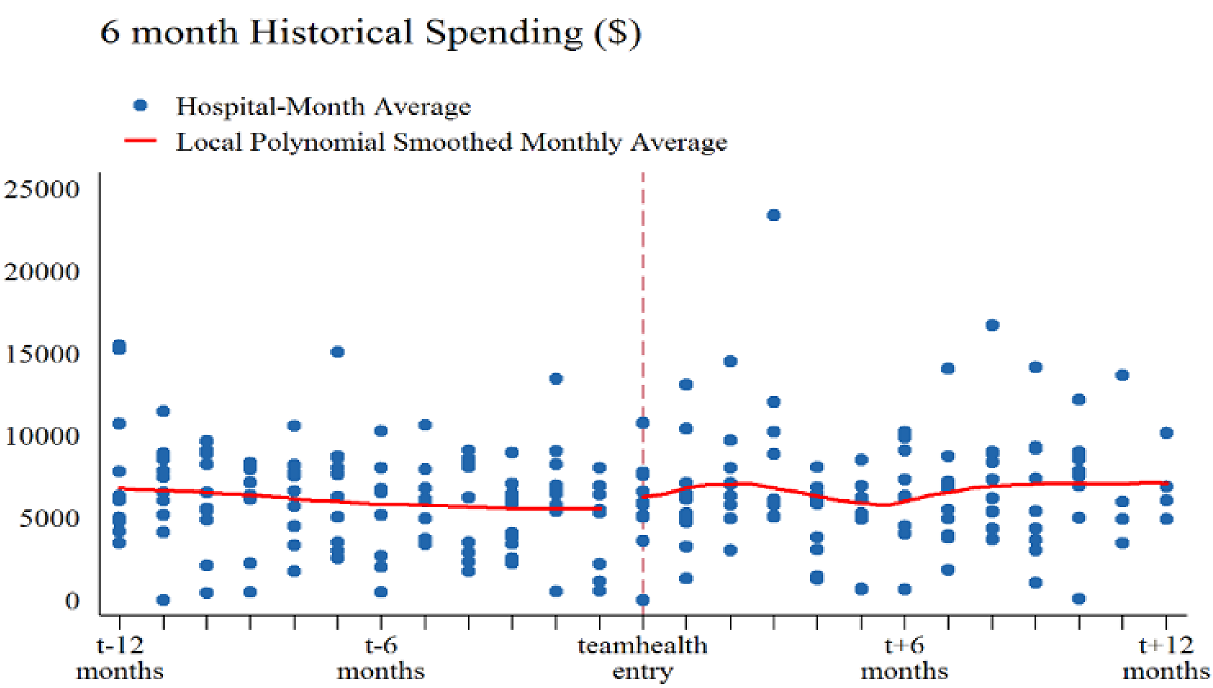
Panel B: EmCare Entry on Hospitals' Average Patient 6-Month Spending



Panel C: TeamHealth Entry on Hospitals' Average Charlson Score of Patients



Panel D: TeamHealth Entry on Hospitals' Patients 6-Month Spending History



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