Federal Trade Commission

*Re: Federal Trade Commission Hearing on Competition and Consumer Protection in the 21st Century – **Project Number P181201** – Comments from the American Hospital Association on Defects in the Models Used for Evaluating Hospital Transactions*

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December 14, 2018

The American Hospital Association ("AHA") is pleased to participate in the series of public hearings the Federal Trade Commission ("FTC" or "Commission") is holding to "examine whether broad-based changes in the economy, evolving business practices, new technologies or international developments might require adjustments to competition and consumer protection law, enforcement priorities and policy" by submitting this analysis and commentary. The AHA represents nearly 5,000 hospitals, health systems, and other health care organizations and their clinician partners – including more than 270,000 affiliated physicians, two million nurses and other caregivers – as well as 43,000 health care leaders who belong to our professional membership groups.

We appreciate the FTC's pivotal role in ensuring that there is a competitive health care marketplace. Hospital mergers in particular are a major focus for the Commission. The AHA understands that not every transaction in any field will survive FTC scrutiny. However, we respectfully submit that the Commission's approach to reviewing hospital transactions is overbroad, does not properly credit the many pro-consumer benefits of hospital transactions, and ignores key realities of the marketplace.

The Commission's approach has substantial negative ramifications for U.S. consumers. These include impeding the ability of hospitals and health care systems to develop more efficient platforms to care for tens of millions of Americans. The FTC's approach also is placing hospitals at a serious disadvantage relative to the many new entrants to health care. Health insurance companies are vertically integrating by acquiring thousands of physician practices along with other health care providers, while technology firms – including behemoths such as Amazon, Apple, and Google – are entering and substantially transforming the health care marketplace.

Limitations in the Commission's current approach include failing to adequately account for how patients, in consultation with their doctors, select the hospitals at which they will receive their care. This and other errors in the Commission's approach to analyzing hospital transactions are reflected in a flawed economic model that unfortunately serves as the foundation of the FTC hospital merger enforcement program. The following analysis, performed for the AHA by Charles River Associates in conjunction with antitrust counsel at Wilson Sonsini Goodrich & Rosati, describes these flaws in much greater detail.

To summarize, there are serious defects in the supply and demand models that the FTC uses to evaluate the competitive effects of hospital transactions.

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Demand Model Inadequacies

The current demand model does, at best, a poor job of predicting what hospitals' consumers view as alternatives to merging hospitals. Predicting consumers' substitution preferences and patterns is one of the keys to determining the competitive potential of any hospital transaction. Relying on a flawed model to make those predictions, not surprisingly, produces flawed conclusions. To highlight just a few examples:

- One paper found that the demand model the FTC uses implies that the value patients place on the time it takes to travel to a hospital exceeds $10,000 an hour, clearly an implausible result.
- Another study found that the demand model the FTC uses to determine consumer preferences among hospitals yields faulty results when applied to an industry where consumer preferences can be verified. Specifically, it found the most likely alternative choice for owners of a Geo Metro, Toyota pickup truck, or luxury Lexus automobile would always be a minivan.
- Other serious drawbacks of the FTC's demand model are that it fails to account for some of the most fundamental predictors of consumer preference, such as physician admitting privileges and the role that a physician plays in referring patients to a hospital.

Supply Model Inadequacies

In addition to the significant problems created by flawed input from these demand models, the FTC's supply-side model suffers from other critical drawbacks. Among them is that one of the favored measures used to determine the likely pricing power gained from a merger was developed for industries where the prices are set, such as a grocery store, rather than where prices are negotiated, such as between a hospital and a commercial insurer.

A second supply-side measure favored by the FTC (willingness to pay) fares no better than the first, as there is no research that connects the willingness to pay measure to higher prices post-merger. Additionally, there are research findings that indicate that this measure is not a reliable indicator.

Opportunity to Re-evaluate the Current Models

The FTC's hearings to determine whether there should be adjustments to current policy offer an excellent opportunity for the Commission to re-evaluate the economic models that it uses to analyze hospital mergers and other transactions. The current models are simply not up to the task and will likely be increasingly detrimental to the hospital field's ability to keep pace with current and future entrants in the health care sector.

We would welcome the opportunity to discuss these issues with you in more detail and work to find better ways to predict the pro-competitive potential of hospital transactions. Please feel to contact me at *mhatton@aha.org* or (202) 626-2336.

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Hospital Mergers: FTC's Flawed Analysis

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Introduction

After a string of unsuccessful challenges to hospital mergers in the 1990s, the Federal Trade Commission ("FTC" or "Commission") developed new economic models for hospital merger investigations. These models have significant limitations that can result in inaccurate forecasts about the effects of a hospital merger on consumers. Deciding to prevent a hospital merger based on flawed economic models can harm consumers, for example, by preventing a transaction that would enable a hospital to provide care for patients more cost-effectively or to improve quality.

The FTC's models have two components: a demand model, which the FTC uses to attempt to predict how many patients view the merging hospitals as their top two choices, and a supply model, which attempts to predict whether a merger will allow merging hospitals to negotiate higher prices from insurers. As we show, these tools, which are the foundation of the FTC's analysis, have important limitations that can cause them to make inaccurate predictions about the effects of hospital transactions.

The FTC tries to use its demand models to determine how many patients view the merging hospitals as good alternatives to each other.[1] Unfortunately, the FTC's demand models often do a poor job of predicting consumers' preferences for hospitals, because the demand models are based on assumptions that are often too simple or incomplete. Most notably, the demand models overemphasize how much value patients assign to travel times and ignore other important considerations that affect how consumers select a hospital, such as where their physicians have privileges.

As the FTC is aware, economists have understood for many years that incorrect assumptions result in counterintuitive demand predictions. For example, one paper, which was co-authored by the former chief economist of the Antitrust Division of the U.S. Department of Justice, found that the FTC's models find that patients place a value on their travel time to hospitals that exceeds $10,000 an hour.[2] Another paper, which was co-authored by the former chief economist of the FTC, found that the FTC's models imply that cardiac surgery patients would not travel a few additional minutes to reduce their risk of death.[3] Still another paper uses data following hospital closures resulting from natural disasters to test the predictions of hospital demand models, finding that none of the demand models studied reliably and consistently predicted patients' observed second-choice hospital preferences.[4] In short, several studies by prominent economists cast significant doubt on the accuracy of the FTC's models for forecasting patients' demand for hospitals.

This is not surprising, since the FTC's demand models fail to account for some of the most fundamental predictors of consumer preference, such as physician admitting privileges and the role the physician plays in referring to a hospital.

Supply models allow economists to predict how hospital prices are determined in negotiations between hospitals and insurers and how those negotiated prices might be affected by a hospital merger. If the models

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of hospital demand are unreliable as described above, so, too, are models of hospital supply. However, the FTC's supply models also have significant defects on their own.

The FTC's supply models are also problematic because of limitations in the models themselves. First, when the FTC analyzes hospital mergers, it uses a one-size-fits-all framework known as "upward pricing pressure" ("UPP") from the Horizontal Merger Guidelines. A core problem with the use of the UPP framework in the context of hospital mergers is that it was not developed to model marketplaces in which prices are negotiated – as hospital prices are – but rather to model marketplaces in which the seller sets its price as, for example, a grocery store would. This is an important difference that can and does reduce the accuracy of pricing estimates when the UPP framework is applied to the hospital sector.

Furthermore, to use the UPP framework requires accurate measurement of a hospital's economic margins (i.e., the difference between the revenue a hospital receives from treating one additional patient and its marginal costs of providing that care). While such margins are more readily available for a number of industries, they are difficult to measure using hospitals' financial records, particularly given the uncertain classification of fixed and variable costs due to factors such as, for example, how hospital staffing must adjust in response to changes in the number of admissions. Given that the UPP model depends heavily on accurate margin calculations, these data limitations can produce flawed results.

These models also fail to consider how competing hospitals or insurers will respond to changes in hospitals' prices – a significant omission. For example, insurers may attempt to steer patients to lower-cost hospitals through financial incentives or by shifting payment mechanisms to require hospitals to share risk, while competing hospitals have greater incentives to make themselves more attractive to patients of the merging hospitals.

Second, the FTC relies on the concept of willingness to pay ("WTP") in its supply models in order to try to measure how much consumers value access to a hospital. These supply models estimate the relationship between WTP and negotiated prices and how the WTP for the merging hospitals will change as a result of the merger. The flaw in this approach is that an observation that high-WTP hospitals have higher prices does not imply that a projected merger-induced increase in the WTP for a combined hospital will allow it to negotiate even higher prices post-merger. Some hospitals have a reputation for clinical quality that both allows them to negotiate higher prices and leads to higher measured WTP. But there is nothing anticompetitive about excellent hospitals negotiating higher prices, and there is no reason to conclude that any acquisition that leads to an increase in WTP will cause prices to increase. The findings of a recent retrospective study of hospital mergers, which found no significant relationship between changes in WTP and changes in prices for a sample of 26 mergers, is consistent with a lack of causation between changes in WTP and price changes.[5]

In summary, the limitations of both the demand and supply models that the FTC uses to evaluate the competitive effects of hospital mergers indicate that these tools may not produce accurate forecasts in many circumstances.

Before discussing the limitations of these models in more detail, we first provide a brief background on hospital merger enforcement and the conceptual underpinnings of the hospital-insurer bargaining framework on which the demand and supply models are based.

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Hospital Merger Enforcement

The cornerstone of the FTC's approach to modeling hospital transactions is a two-stage model of competition, in which hospitals compete for two interrelated sets of customers: patients and the managed care organizations that insure them.[6] Notably, the FTC does not focus on the choices of patients – many of whom choose hospitals based on factors other than price – but instead focuses on the choices that insurers make as customers of hospitals. This focus on insurers inevitably limits the inclusion of patient-centric predictors of hospital choice, such as physician referrals.

In the first stage of the FTC's models, the FTC tries to map how hospitals compete for health insurer customers by negotiating contracts to become in-network hospitals. The price that the insurer will pay the hospital for providing care is determined in these negotiations. If the hospital and insurer reach an agreement, the hospital agrees to discount its charges to the negotiated rates and the insurer agrees to create incentives for its members to receive care at the in-network hospital (e.g., by decreasing the amount that the patient would have to pay out-of-pocket relative to an out-of-network hospital). In the second stage, in-network hospitals compete to attract patients, primarily based on considerations other than price, such as reputation, clinical quality, location, amenities, medical staff, and so on.[7]

Within this two-stage framework, prospectively evaluating the competitive effects of a hospital merger involves answering two related questions. First, what is patients' demand for hospitals and to what extent do patients view the merging hospitals as close substitutes? To try to answer this question, the FTC uses an economic model of patients' demand for hospital services (the "demand side"). Second, given patients' demand for hospital services, to what extent would a merger allow the hospitals to negotiate higher prices? The FTC tries to answer this question with an economic model of bargaining between hospitals and insurers, where the relative bargaining positions of the parties will be affected by patients' demand (the "supply side").

The reliability of this approach critically depends on accurately modeling both the demand and supply sides of the hospital-insurer marketplace, which the FTC's models can fail to do. In what follows, we explain important considerations in assessing the reliability of the models commonly used by the FTC. Before turning to a discussion of the limitations of these models, for context we first introduce the framework of the economic models used by the FTC to analyze negotiations between hospitals and insurers in the first stage of competition.

Hospital-Insurer Bargaining Framework

In the first stage of competition, the FTC tries to model the prices that the insurer pays a hospital as a result of bilateral negotiations between the insurer and the hospital. The FTC's model of this bilateral negotiation predicts that the outcome will be affected by what would happen to the insurer and the hospital if they failed to reach an agreement. That is, in the negotiations, each party compares how it would fare financially if it came to an agreement with how it would fare in the absence of an agreement. Economists refer to the position of the parties should they fail to reach an agreement as the parties' "outside options." In these models, the more attractive one party's outside option, the more bargaining leverage the party has in negotiations. Intuitively, this is because if one of the parties has a more attractive outside option, it is less important to that party that an agreement is reached.

The FTC's analysis of the competitive effects of hospital mergers begins by assuming that an insurer's

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bargaining leverage may be affected by the presence (or absence) of other hospitals that the insurer could contract with should it fail to reach an agreement. Starting from this premise, the FTC uses econometric models to try to quantify the change in the insurer's bargaining leverage following a hospital merger. The first category of models – demand-side models – are used to try to evaluate the extent to which the merging hospitals are viewed by consumers as substitutes and whether consumers view other hospitals in the area as attractive alternatives. The second category of models – the supply-side models – are then used to try to evaluate the extent to which the merger affects the insurer's bargaining leverage, thereby potentially allowing the hospitals to negotiate higher reimbursement rates following the merger. These supply-side models rely on and are dependent on the predictions of the demand-side models as inputs: they translate demand-side estimates of closeness of substitution between the merging hospitals into estimated increases in prices. If the demand-side model predicts that two merging hospitals are close substitutes from the perspective of an insurer's members, under the FTC's models the predicted price effects from the merger will be large. Because they are so closely linked, flaws in the predictions of the demand-side models can detrimentally affect the predictions of the supply-side models. The FTC's supply models are also beset by additional problems, which we discuss later.

In the next section, we describe the FTC's demand-side models used to evaluate the competitive effects of hospital mergers and detail the material limitations and drawbacks of those models. We then turn to the supply-side models used to predict how mergers might affect the outcomes of bargaining between the hospitals and insurers and describe how the application of these models can lead to inaccurate predictions of how a hospital merger will affect consumers.

The FTC's Demand-Side Models Yield Unreliable Predictions of Substitution Patterns

The FTC's demand-side models attempt to determine the economic value that an insurer's customers place on each of the hospitals around them. The hospital with the greatest value represents the customer's first choice (given a medical condition), the hospital with the second-highest value represents the customer's second choice hospital, and so on.[8] By generating these measures of hospital demand, these models try to predict the substitutability of any two hospitals from the perspective of an insurer's enrollee. If the model predicts that enrollees view the merging hospitals as close substitutes and there are no good alternatives, then the model will predict that the merger will result in higher prices.

Using an econometric model to estimate patient demand for hospitals is necessary because of limitations in what is observable in the data. It is generally only possible to directly observe from the data itself, rather than using a model, what any consumer's preferred/first-choice hospital is: it is simply the hospital at which the consumer received care when they were hospitalized. We rarely directly observe patients having to choose where to receive care if their preferred hospital is not available, nor are surveys of patients asking them to rank their hospital choice common. Thus, to infer what consumers may have chosen in other circumstances, the FTC uses econometric models that make use of available first-choice information.

Specifically, the FTC typically uses a logit model, which is estimated using inpatient discharge data.[9] This data contains information on the hospital chosen by a patient, the ZIP Code of the patient's residence, the patient's demographic characteristics, the patient's medical conditions, and the type of service that the patient received at the hospital. Logit models use the information contained in this data to estimate how a patient's demand for a hospital depends on the patient's demographics, the type of inpatient care the patient is receiving,[10] the

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characteristics of the hospital,[11] and/or the distance from the patient's residence to the hospital.[12] However, as we discuss later, the logit demand models often used by the FTC omit other important factors that affect patients' demand for hospitals (e.g., information on where a patient's physician has admitting privileges). Research has shown that omission of this information leads to a "home bias," in which patients seem to strongly prefer nearby hospitals,[13] implying that logit demand models find that hospitals that are near to each other are closer competitors in the eyes of consumers than they may, in fact, be.

In addition to accounting for these observable factors that affect patients' demand for hospitals, logit demand models try to account for unobserved heterogeneity across patients and hospitals. Doing so is important because no model can capture all the salient determinants of consumers' demand. For example, inpatient discharge data lack important information that affects patients' hospital choices, including patients' income, the hospital at which each patient's primary care physician has privileges, whether the patient relies on public transportation, whether the patient or his/her family has received care at the hospital in the past, and so on. To attempt to account for these deficiencies, logit demand models include a random component of patients' demand, known as the error term, which essentially captures background "noise" not reflected in the model. Although useful in principle, this random component of patients' demand places important (and sometimes unrealistic) limitations on estimated substitution patterns among hospitals that are, for the reasons outlined earlier, critical for evaluating how a merger might affect bargaining leverage with insurers.[14,15]

These limitations on the FTC's ability to evaluate the factors that affect patients' hospital choices can lead to inaccuracies when the Commission uses logit demand-side models to predict the competitive effects of hospital mergers. Predicting the competitive effects of hospital mergers requires making inferences about the extent to which the merging hospitals are the first and second choices for consumers. Since it is not possible to directly observe consumers' second choices, the FTC relies on first-choice data (i.e., the hospitals that consumers chose) and models to make these inferences. That is, the FTC is forced to use imperfect information to infer how patients value receiving care at hospitals they have never actually chosen. But making this inference reliably is difficult because of the restrictions on substitution patterns across hospitals that are built into logit demand models. Consequentially, logit demand models do not always model consumer's choices accurately.

Intuitively, logit demand models predict patients' second-choice hospitals by looking at which hospitals "similar" patients – based on the observed characteristics in the inpatient claims data – have chosen. So, for example, if half the pregnant women in a ZIP Code chose to deliver their babies at hospital A, one quarter chose hospital B, and one quarter chose hospital C, the model would predict that if the women who had chosen hospital A could no longer do so, one half would choose hospital B as their second choice and one half would choose hospital C as their second choice. While this approach may have intuitive appeal, it is well understood by economists that the reliability of the predictions of patients' second-choice hospitals depends critically on how "similar" patients are defined.

A clear example of the unreliability of second-choice predictions from logit demand models is contained in a seminal paper that proposed refinements to these models by Berry et al. (2004).[16] In the paper, the authors use a database containing information on consumers' characteristics and the automobiles purchased by those consumers to estimate a logit model of demand for automobiles. When the authors use these data to estimate a logit demand model that includes observable consumer characteristics, automobile fixed effects, and the random component of consumers' demand – that is, a model that is analogous to hospital demand models used to predict the competitive effects of mergers – they obtain counterintuitive second-choice predictions. Regardless of whether a consumer's first-choice car was a Geo Metro (a relatively inexpensive

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compact car), Toyota pickup, or Lexus LS400 (a luxury car), the logit model predicted that every consumer's second-choice car was a minivan.[17] The authors proposed a refinement of the logit demand model to use information on consumers' second-choice automobiles that was recorded in the database. (Consumers were asked what they would have purchased had they not chosen their current automobile.) Incorporating this information on consumers' second-choice automobiles (and random coefficients) into the demand model,[18] the authors' model predicted Geo Metro drivers' second-choice automobile was the Toyota Tercel (another compact) car, Toyota pickup drivers' second-choice automobile was the Ford Ranger, and Lexus LS400 drivers' second-choice automobile was a Mercedes 300.

Consider the implications of the use of a logit demand model in evaluating a merger of automobile manufacturers.[19] The FTC's use of the logit demand model without second-choice data would identify the acquisition of Dodge minivans by Lexus as potentially anticompetitive (because Dodge minivans were predicted to be the second-choice automobile for Lexus luxury sedan buyers), but would find no potential competitive problems with Ford acquiring Toyota's pickup truck division (because Ford pickup truck buyers' second choices were minivans, not other pickup trucks). The same is true in evaluating the competitive effects of hospital mergers: logit demand models may screen competitively benign mergers as anticompetitive and fail to identify anticompetitive mergers.[20] Intuitively, Berry et al. (2004) demonstrated that to use the types of demand models that the FTC uses to make accurate predictions of the competitive effects of hospital mergers requires, at a minimum, the use of data on actual second choices in estimating the model.[21] In such circumstances, the substitution patterns predicted by the model become less dependent on the random portion of consumer demand and more reliable as a result. While such an approach would, in theory, lead to more accurate predictions regarding the competitive effects of hospital mergers, to our knowledge, data on patients' second-choice hospitals are generally unavailable and have never been used to estimate a model of hospital demand.

Proponents of the logit models for hospital demand have stated that the availability of individual-level detailed micro data on patient and hospital characteristics helps improve prediction, because more data exist to define "similar" patients. Recall from the example of women giving birth that the logit model uses choices made by similar-looking patients from the same ZIP Code to determine how patients will choose their second-choice hospital once their preferred hospital is no longer available. In the case of the women seeking hospitals for their delivery, ideal data would include the identity of their obstetricians, their typical commuting patterns, whether there were risk factors in their pregnancies, where the women or their friends or family members delivered their babies, and so on. These data would reduce the reliance on the random portion of demand. However, such data relevant to how patients choose hospitals are limited in availability. Inevitably, logit demand models must rely upon incomplete data for their estimates of hospital demand, which can lead to inaccurate predictions. The only way to assess a model's accuracy in forecasting substitution patterns is through second-choice data.

Given the significant data limitations for modeling demand, economists sometimes try to use sudden and unexpected hospital closures as a way to observe second-choices. Consequently, in the remainder of this section, we assess the reliability of logit demand models' second-choice predictions based on two other considerations. First, how is the model specified and how well does it predict patients' first choices? Second, are there "natural experiments" that allow direct assessment of the model's second-choice predictions in settings where there have been hospital closures?

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We turn first to an assessment of the how well logit demand models predict first-choice hospitals. The evidence shows that logit demand models of patients' hospital actual choices often have very little predictive power. For example, May (2013) compares the predictions of two models of hospital demand: one that was richly specified with a large set of patient and hospital characteristics[22] and one in which patients' demand depended only on travel time, travel time squared, and hospital fixed effects. He finds that both models do just as well – which may not be well at all – in terms of predictive power, suggesting that the only important determinants of demand for hospitals are travel time and, in essence, a fixed component of demand that it is the same for all patients and invariant over time (that is, something akin to a hospital's general reputation or "brand"). The consequence of this result is that even the richly specified hospital demand model predicts that all patients residing in the same ZIP Code will have largely identical demand for hospitals (including second-choice hospitals), regardless of their demographics, medical conditions, or insurance coverage. This is akin to predicting minivans as every auto buyer's second-choice vehicle despite having included details on his or her preference in luxury class, size, or number of seats. In other words, there are serious implications for estimation of patients' second-choice hospitals, as the result does not accord with the highly differentiated nature of competition between hospitals and the wide range of variables that affect patients' hospital selections within a ZIP Code.

Another indicator that logit models perform poorly in predicting patients' hospital choices is that these models can yield unreasonable predictions regarding patients' willingness to travel when seeking hospital care, even when traveling longer distances would give those patients access to hospitals with lower mortality rates or higher quality.[23] These results also cast strong doubt on the reliability of their predictions regarding patients' second-choice hospitals. For example, May (2013) shows that a logit model of hospital demand predicts a one-minute increase in travel time would lead to a decrease of 10 to 14 percent in predicted admissions at five Chicago hospitals and that a five-minute increase in travel time would lead to a decrease of 43 to 52 percent in predicted admissions.[24] These results suggest that patients put an improbably high value on their own time, which again casts doubt on the accuracy of the FTC's demand-side models. Other papers find consistent results. Gowrisankaran et al. (2015), which is co-authored by the former chief economist of the Antitrust Division in the Obama Administration, determines that decreasing a patient's travel time to all hospitals by one minute is worth $167 to the patient, suggesting an implicit value of consumers' time of more than $10,000 an hour.[25] Using a sample of Philadelphia hospitals, Doane et al. (2012) also find patients are extremely unwilling to travel for hospital care.[26] The authors calculate the willingness to travel for an absolute risk reduction of 1 percent in mortality for cardiac catheterization procedures as between 0.68 and 2.6 minutes of travel time depending on the specification. If the value of a life is assumed to be $5 million dollars, the authors' results imply patients are willing to travel only 0.68 to 2.6 minutes in exchange for $50,000 (which, by assumption, is the value of a 1 percentage point decrease in mortality risk). To put this in perspective, the authors note that Lipitor, a prescription drug, for which people willingly pay $9 for the generic version, out-of-pocket (without insurance), reduces the absolute risk of a heart attack by the same 1 percent.[27] The clear implication is that logit models of hospital demand predict that consumers place a value on their own time that is implausibly high. As a result, these models typically predict that patients' second-choice hospitals will be whatever hospital is closest to the patient, regardless of the patient's demographics, the patient's medical condition, or the hospital's quality and reputation. This, in turn, can lead to highly inaccurate predictions of a merger's impact on competition.

These results show that, in practice, the FTC's logit demand model of hospital choice is likely omitting important factors that affect patients' choices of hospitals. For example, models of hospital choice do not incorporate the role patients' physicians play in referring them to hospitals. Raval and Rosenbaum (2017)

conclude this omission leads to a strong "home bias" effect, in which patients seemingly ignore hospitals outside of their immediate vicinity. After controlling for this "home bias," the authors find patients are more willing to travel for hospital care. In other words, they find that patients' second-choice hospitals are farther away after correcting the model of hospital choice.[28] These types of omissions will lead to unreliable predictions about patients' second-choice hospitals. Because patients from the same ZIP Codes will likely have different doctors and possess different information about hospitals, those patients should have different first- and second-choice hospitals. A hospital demand model that predicts otherwise – for example, finding that distance is the dispositive predictor of demand as was found in May (2013) – cannot accurately predict the competitive effects of a hospital merger.

The FTC's models of patients' hospital choice also generally fail to account for differences in patients' hospital networks (i.e., which hospitals are in-network for each patient) and differences in patients' cost-sharing across hospitals. In practice, these models assume patients can receive care at any hospital in their area and there are no differences in patient cost-sharing across hospitals. These are strong assumptions, which often are not supported by the facts, as patients typically avoid using out-of-network providers, except in the case of emergencies, due to the significantly increased costs and previous studies of hospital demand have found that choices are affected by patients' out-of-pocket costs.[29] These omissions are important, because the substitution patterns predicted by a hospital choice model that does not incorporate these effects may reflect how patients' networks are constructed rather than patients' underlying demand for hospitals.

Despite the potential for the FTC's logit models of hospital demand to yield unreliable predictions, few studies have attempted to directly assess the reliability of these models. One approach was proposed in Raval et al. (2016), in which the authors identified four natural disasters that led to hospital closures (e.g., Hurricane Sandy closed three hospitals in New York – NYU Langone, Bellevue Hospital Center, and Coney Island Hospital). Because the natural disaster led to the closure of hospitals, patients' actual substitution patterns following the closure could be compared to their predicted substitution patterns using logit demand models. Accurately predicting substitution patterns after a hospital closure is analogous to accurately predicting the second choices of the closed hospitals' patients. Suppose, for example, a natural disaster closes hospital A. If the majority of hospital A's patients view hospital B as their second-choice, then a well-specified hospital choice model will accurately predict a large increase in B's admissions while hospital A is closed.[30] Instead, the authors found that – consistent with the findings of Berry et al. (2004) in their study of demand for automobiles – none of the hospital demand models they studied could reliably and consistently forecast the second-choice hospitals for patients whose preferred hospital closed.[31] In other words, if any of the hospitals involved in the study were involved in a merger, the logit models of hospital choice that the FTC uses to assess hospital mergers would not correctly predict the competitive effects of the merger for a significant number of individuals.

The Use of Supply-Side Models to Predict Post-Merger Price Increases is Problematic

An additional limitation of the FTC's logit demand model is that it does not analyze or project how prices are determined in negotiations between hospitals and insurers. To address this question, an economic model of the first stage of competition that is compatible with the bargaining framework described earlier (i.e., one in which hospitals and insurers negotiate over network status and prices) is required. Intuitively, the demand model informs us whether the merger potentially eliminates competition between hospitals that

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are close substitutes, and a model of insurer-hospital negotiations (the supply-side model) predicts effects on prices resulting from this potential reduction in competition. But if the hospital choice model generates unreliable predictions about patients' second-choice hospitals, as may be the case with the FTC's model, the predicted effects on the prices that hospitals charge insurers generated by any supply-side model will also be unreliable.

There are additional problems with the FTC's supply-side models. Economists studying hospital mergers primarily use two frameworks to estimate the post-merger price increases that will emerge from the first stage of competition. First, economists use the demand model to calculate diversion ratios, which serve as inputs for measures of the "gross upward pricing pressure index" ("GUPPI"). While GUPPIs may be widely used by antitrust agencies in reviews of horizontal mergers, they are developed using an economic model in which a seller sets its prices rather than negotiating them and that does not explicitly model negotiations like those that occur between insurers and hospitals. Second, economists use the demand model to estimate how the merger will change insurers' WTP for the merging hospitals. Using this measure of value, the change in WTP resulting from the merger can be translated into estimates of predicted price changes. While the WTP framework is specifically designed to model insurer-hospital bargaining, the model has important limitations. Importantly, there is scant empirical evidence to connect merger-related changes in WTP to hospitals' ability to negotiate higher prices.

To expand on the first flaw, traditional measures of upward pricing pressure (e.g., GUPPIs) are designed to be applied to industries where firms set price and buyers purchase some quantity that depends on the price set by the firm. In the context of hospitals, the equivalent would be a world in which competing hospitals set price and patients choose hospitals based upon that price. The higher the price a hospital sets – a price that currently is largely borne by insurers, not consumers – the fewer the number of patients who choose to receive care at the hospital. In such a world, insurers constrain a hospital's prices by steering their members to other lower-priced hospitals, rather than by threatening to exclude the hospital from the insurer's network in an all-or-nothing negotiation.[32] In this framework, the merger-related upward pressure on a hospital's price is the product of (1) the rate of diversion to the hospital's merging partner (calculated using the demand-side model) and (2) the merging hospital's economic profit margin. This is the case because the diversion ratio represents the fraction of lost patient volume following a price increase that would go to the hospital's merging partner. When these patients are admitted to the merging partner, that hospital will earn profits based on its economic profit margin. So the GUPPI can be thought of as the per-patient profits that a hospital retains after it raises prices and patients choose the merging partner hospital instead. The result is a measure of the incremental profits (due to the merger) that the hospital will receive if it increases its price post-merger.[33] The larger the GUPPI, the larger the predicted price increases post-merger.[34]

However, the use of these types of traditional measures of "upward pricing pressure" in hospital settings can produce inaccurate results. First, as described earlier, GUPPIs were developed using economic models in which firms set prices, and that dynamic is different from a marketplace in which prices are negotiated. Because of this difference, models used to gauge pricing incentives in price-setting markets can yield different estimates of the magnitude of post-merger price changes than models used to gauge pricing incentives in bargaining markets.[35] Second, the diversion ratios used to calculate the GUPPI are based on the problematic hospital demand model, and measure patients' responses to a hospital becoming completely unavailable (i.e., the price to receive care at the hospital would be infinite), whereas traditional diversion measures marginal consumers' responses to small changes in price. The second-choice hospitals of these marginal patients may differ from the second-choice hospitals of all patients, potentially leading to different

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conclusions regarding the merging hospitals' incentives toraise prices. Third, GUPPIs do not incorporate second-order effects from mergers, such as repositioning by competing hospitals or responses by insurance companies (e.g., steering patients away from the merging hospitals), an important part of mergers analysis.[36] Lastly, GUPPIs require accurate estimates of economic margins, which often are not available.[37]

The second framework for modeling the supply-side of hospital mergers relies on the concept of willingness to pay.[38] WTP is a measure of how much an insurer's members value having in-network access to a hospital or, alternatively, how costly it would be for an insurer not to include a hospital in its network. A hospital's WTP increases when an insurer's "outside option" (of not contracting with the hospital) becomes less attractive, which allows the hospital to potentially negotiate higher prices. Below we explain in more detail how WTP is calculated and how merger-related changes in WTP are translated into predicted post-merger price increases. In addition to its use in the FTC's analyses of hospital mergers, the WTP framework has been adopted in several papers studying competition in the hospital industry.[39]

Like GUPPIs, WTP is calculated from using a model of hospital demand. Recall that demand-side models yield estimates of how much each patient values each hospital in an area. In the same way, the demand model can be used to calculate the value that patients place on having access to a broad network that includes all the hospitals in their area. To estimate the WTP for a hospital, economists calculate the value that patients would place on having access to a slightly narrower network that includes all the hospitals in their area except for that one. The second value (i.e., for the network that excludes one hospital) will be lower than the first if the excluded hospital was some patients' most preferred hospital, since these patients would now have to receive care at their second-choice hospital. The difference between these two values – the value for the broad network and the value for the network excluding one hospital – represents patients' WTP for the hospital.[40] If a hospital is many patients' first choice and these patients strongly prefer the hospital to their second choice, the WTP for the hospital will be correspondingly high.

Within the WTP framework, hospitals with higher WTPs negotiate higher prices with insurers because the insurer's outside option absent a contract with a desirable (i.e., high WTP) hospital is relatively poor. When two hospitals merge, they can theoretically negotiate higher prices to the extent that their WTP increases, which happens if the hospitals are the first- and second-choices for many patients.[41] WTP has an intuitive appeal in the context of the first-stage negotiations between insurers and hospitals. Indeed, economists have derived bargaining models in which the negotiated price is a function of WTP; in these bargaining models, hospitals and insurers negotiate to include the hospital in the network and they agree on a price so that the profits that come from reaching an agreement are shared by the parties. The model implies that hospitals' prices are linear functions of WTP, so that if WTP goes up, negotiated prices increase by a proportionate amount (for the sake of brevity, call this factor of proportionality α).[42] With estimates of both α and the merger-related change in WTP for the merging hospitals, it is possible to use the model to simulate the price effects of the merger.

To reliably predict post-merger price effects requires an estimate of the relationship between merger-related changes in WTP and merger-related changes in prices. (Or, more generally, an estimate of the relationship between the part of WTP associated with a hospital's bargaining power and the prices the hospital negotiates with health plans.) However, with the possible exception of Fournier and Gai (2007), there is no research that connects merger-related increases in hospital WTP to higher prices.[43] For example, in its published hospital merger retrospective studies, the FTC has not attempted to validate price increases predicted by the WTP framework with observed changes in price at the time of the merger.

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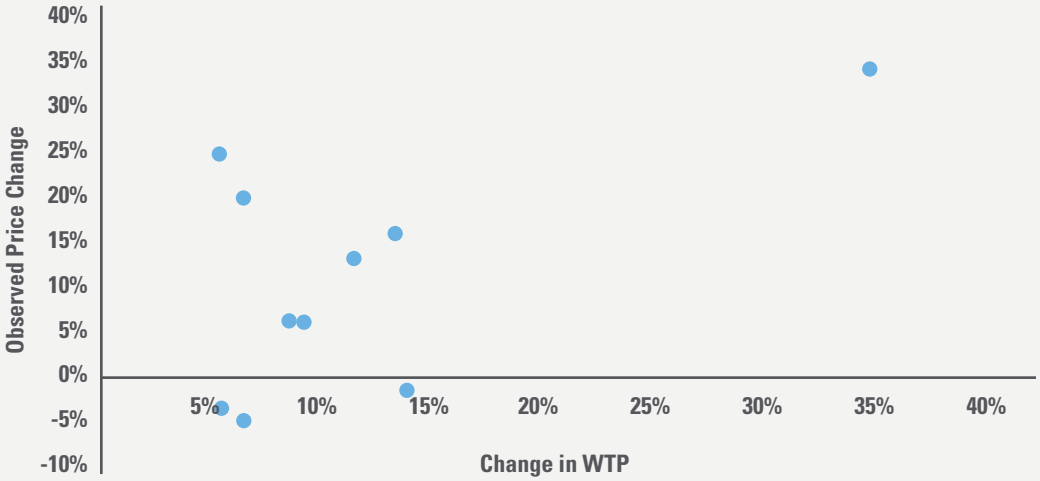
Arguments have also been made regarding the use of regressions of prices on the Herfindahl-Hirschman Index (HHI) to predict the competitive effects of mergers in other industries. Factors unrelated to market power can simultaneously affect prices, HHI, and WTP. Consequently, it is widely recognized by economists that cross-sectional relationships between HHI and price should not be used to predict the effects of mergers.[44] And, in similar fashion, it should be recognized that cross-sectional relationships between WTP and price are not always reliable in predicting the effects of hospital mergers.

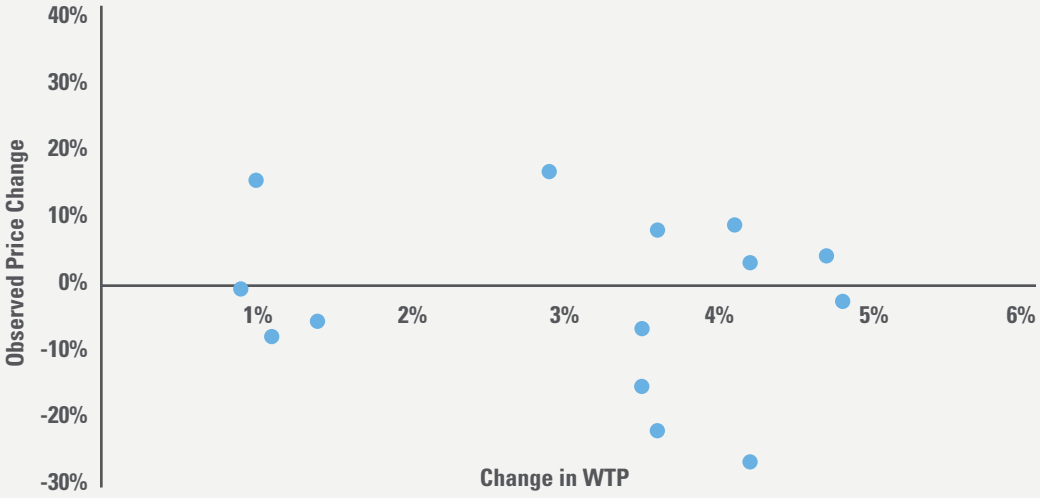
One widely cited merger retrospective by a former FTC economist (Garmon (2016)) demonstrates that changes in WTP are not reliable indicators of post-merger price increases. In this retrospective, the author compares the price changes that followed 26 consummated hospital mergers to the merging hospitals' changes in WTP.[45,46,47] Across the 26 mergers, WTP increased between 0.9 percent and 34.8 percent and price changes varied between -26.5 percent and 34.1 percent. But there is no positive relationship between price changes and changes in WTP. Figures from Garmon (2016) are reproduced below in Figures 1 and 2. Figure 1 compares the changes in WTP and price for the 10 hospital mergers where WTP increased by more than 5 percent; Figure 2 shows the same relationship for the 16 hospital mergers where WTP increased by less than 5 percent. Within both groups of hospital mergers, there is no clear relationship between WTP and prices.[48,49]

Observed Price Increases and Changes in WTP in Garmon (2016)

Hospital mergers where WTP increased by 5 percent or more.



Hospital mergers where WTP increased by less than 5 percent.



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Similarly, May (2013) uses results from the FTC's retrospective analysis of hospital mergers to compare the changes in WTP and prices that followed two mergers between hospitals on the North Shore of Chicago in early 2000, of which only one was challenged as anticompetitive by the FTC.[50] The FTC's merger retrospective found that the Evanston merger caused prices to increase by at least 10 percent and at times by more than 50 percent for four of the five health plans included in their analysis.[51] (For a fifth plan, the price increases were positive but small and statistically insignificant.) But according to the author's calculations, WTP increased by only 3 percent. In contrast, the FTC found that prices decreased by statistically significant amounts after the Provena merger for three of five health plans. Only one plan's prices increased after the Provena merger despite the author's calculation that the merging hospitals' WTP increased by 24 percent.

Absent evidence of a relationship between merger-related changes in WTP and prices, estimates of α have typically been derived from cross-sectional relationships between WTP and prices. For example, Capps, Dranove, and Satterthwaite (2003) calculate WTP and profits for a sample of 22 hospitals in San Diego. They find that the correlation between San Diego hospitals' WTP and profits is between 0.75 and 0.95.[52] That is, among the San Diego hospitals in the authors' sample, they find that the hospitals with the highest WTP are also the most profitable. The core problem with this approach is that economists have long recognized that the existence of a positive correlation between two measures – WTP and prices in this case – does not imply that increasing one will cause the other to increase. While hospitals may differ in bargaining power, they compete in a highly differentiated marketplace and sometimes differ in clinical quality, amenities, reputation, location, and so on. These factors may simultaneously affect the prices that hospitals negotiate and patients' WTP to have in-network access to the hospital. Suppose, for example, that hospital A has more technologically sophisticated services than hospital B and that patients value this sophistication. These quality differences will generate more admissions at hospital A (i.e., a higher share and a correspondingly higher estimated WTP)[53] and allow hospital A to negotiate higher prices with health plans than hospital B.[54] But it would be incorrect to observe that high-quality hospitals negotiate higher prices and conclude that an increase in WTP associated with a merger would allow the merging hospitals to do the same. As a result, measuring the price-WTP relationship without accounting for these factors, which the FTC's model does not do, may lead to biased estimates of how changes in WTP affect the prices negotiated by hospitals.[55]

Conclusion

The models that the FTC uses to evaluate hospital mergers have significant limitations. On the demand side, the FTC relies on models to estimate patients' unobserved preferences for hospitals, but the logit demand models used today can inaccurately predict patients' demand for hospitals. Indeed, the economics literature has shown that, in general, logit demand models, such as the one that the FTC uses, often perform poorly in predicting consumers' substitution patterns. In the hospital context, they overemphasize the role of hospital proximity in predicting consumers' choices, sometimes producing implausible results, and do not account for important factors such as hospital networks, patient-physician relationships, out-of-pocket costs, and home bias. On the supply-side, the two frameworks commonly used to predict the price effects of hospital mergers also have significant limitations: the GUPPI measure of prices that the FTC uses does not reflect how hospitals actually negotiate prices, and studies of consummated hospital mergers have shown merger-related changes in WTP are not reliable indicators of changes in hospitals' prices after a merger. The tools used to understand competitive effects of potential hospital mergers have progressed since the 1990s, but more work is needed to improve the reliability of the predictions of hospital merger effects. In the meantime, the FTC should exercise more caution when reviewing transactions in the hospital sector.

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Sources

1. This is a key question in merger analysis. As noted in the Horizontal Merger Guidelines: "The extent of direct competition between the products sold by the merging parties is central to the evaluation of unilateral price effects. Unilateral price effects are greater, the more the buyers of products sold by one merging firm consider products sold by the other merging firm to be their next choice." U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines (Issued: August 19, 2010) available at *https://www.justice.gov/atr/horizontal-merger-guidelines-08192010*.
2. Gautam Gowrisankaran, Aviv Nevo, and Robert Town. "Mergers when prices are negotiated: Evidence from the hospital industry." American Economic Review 105, no. 1 (2015): 172-203.
3. Michael J. Doane, Luke M. Froeb, and R. Lawrence Van Horn. "How Well Do Travel Cost Models Measure Competition Among Hospitals?" Vanderbilt Owen Graduate School of Management Research Paper No. 2012-06 (March 2012).
4. Devesh Raval, Ted Rosenbaum, Nathan E. Wilson. "Industrial Reorganization: Learning about Patient Substitution Patterns from Natural Experiments." FTC Bureau of Economics Working Paper No. 329 (May 2016).
5. Christopher Garmon. "The Accuracy of Hospital Merger Screening Methods." U.S. Federal Trade Commission, Bureau of Economics Working Paper No. 326. (February 2016).
6. Gregory Vistnes. "Hospitals, Mergers, and Two-Stage Competition." Antitrust Law Journal 67, no. 3 (2000). The two-stage model of hospital competition addresses two shortcomings of analytical tools previously used in hospital mergers. First, these models reflect the role of insurers in hospital competition rather than solely focusing on the decisions of patients. Second, these models account for the differentiated nature of hospital competition and potentially allow patients' demand for hospitals to reflect their specific medical conditions, demographics, and the characteristics of the hospitals.
7. Price is assumed to play a limited role in patients' decision of where to receive care because the insurer, not the patient, pays for almost all the cost of the hospitalization. In addition, some patients may have health plans for which there is a fixed copayment for hospital care; in those, the patient would pay the same amount out-of-pocket regardless of where he or she received care.
8. If hospitals A and B are merging, then the fraction of consumers who view A as their first choice and who also view B as their second choice is often referred to as a diversion ratio from A to B.
9. For a general discussion of these models, see, e.g., Kenneth Train. "Discrete choice methods with simulation." Cambridge University Press (2009).
10. These patient characteristics include numerous observable factors, including the patient's type of admission (e.g., whether the patient was admitted for emergency care), the type of care the patient is receiving (e.g., the patient's major diagnostic category, DRG, or DRG weight), and patient demographics (e.g., age and gender).
11. These hospital characteristics include numerous observable factors, including whether it is a teaching hospital, whether the hospital is for profit, the number of beds it has, its staffing levels, and the types of services it provides. Oftentimes, to control for hospitals' unobserved characteristics (e.g., their overall "quality"), hospital choice models include hospital "fixed effects" (or indicator variables), which implicitly control for hospital characteristics that do not change over time.
12. The logit model assumes each patient chooses among the hospitals in their area. In estimating these models, therefore, it is common to exclude any inpatient admissions where the patient did not make such a choice. For example, newborn babies are typically excluded from the analysis because their choice is not independent of their mother's decision. Similarly, if one were aware that certain patients' insurers only allowed them access to a narrow network of hospitals, either the model would need to be modified to account for these patients' limited choice set, or the patients would need to be excluded from the analysis.
13. Devesh Raval and Ted Rosenbaum. "How Strong is Gravity? Separating Home Bias from Transport Costs Using Hospital Choice." Working Paper (2018).
14. Economists refer to the limitation on substitution patterns in the logit demand model as the "independence of irrelevant alternatives" property. This property implies that substitution patterns between any two choices in the model do not depend on what other choices might be available. The most well-known illustration of this property was provided by McFadden (1974), who offered an example of commuters equally likely to choose between traveling by car or on a red bus. Now suppose that commuters are also offered the choice of traveling to work on a blue bus that is otherwise identical to the red bus. Common sense would suggest that half of the commuters would continue to travel by car, while the other half of consumers would choose either the red or blue bus. However, logit demand models require that the introduction of the blue bus does not affect the substitution between cars and the red bus. Since consumers would choose the red and blue bus – which are identical except for the color – in equal number, the only way to ensure this happens is if only a third of consumers travel by car, a third choose the red bus, and a third choose the blue bus. In the Logit demand model, adding additional buses of varying colors would further reduce the number of commuters who chose to drive, which makes no sense. Daniel F. McFadden, "Conditional Logit Analysis of Qualitative Choice Behavior," in Frontiers in Econometrics, Paul Zarembka, ed. New York: Academic Press, Inc., (1974): 105-42.

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15. As a way of mitigating the unrealistic substitution patterns of logit demand models, economists often attempt to include rich specifications of observable characteristics in their models. For example, economists may include separate indicators for each hospital and ZIP Code combination, or separate indicators for each hospital, ZIP Code, and DRG combination. Recent examples of economists adopting this approach to estimate hospital demand models include Devesh Raval, Ted Rosenbaum, and Steven Tenn. "A Semiparametric Discrete Choice Mode: An Application to Hospital Mergers." Economic Inquiry, 55, no. 4 (2017): 1919-1944; Devesh Raval, Ted Rosenbaum, Nathan E. Wilson. "Industrial Reorganization: Learning about Patient Substitution Patterns from Natural Experiments." FTC Bureau of Economics Working Paper No. 329 (May 2016). An alternative approach is to use a "random coefficients" model that allows patients to emphasize different factors when choosing a hospital. For example, some patients might care very much about whether they are admitted to the most prestigious teaching hospital, while other patients might emphasize the hospital's proximity to their home. In practice, however, these random coefficients models are seldom used to estimate models of hospital demand during merger reviews because they are computationally intensive and time-consuming to estimate.
16. Steven Berry, James Levinsohn, and Ariel Pakes. "Differentiated products demand systems from a combination of micro and macro data: The new car market." Journal of Political Economy 112, no. 1 (2004): 68-105.
17. All consumers were predicted to substitute to a Dodge Caravan or a Ford Econovan in the 1990s, when the data was collected.
18. 18. See footnote 14 above for explanation of random coefficients techniques.
19. See supra n.1.
20. Examples of both types of errors are demonstrated in Sean M. May. "How Well Does Willingness-to-Pay Predict the Price Effects of Hospital Mergers?" Working Paper (2013). The author compares post-merger price changes associated with two hospital mergers with the predictions of logit demand models. For the first merger, the logit demand model shows that the plurality of patients at the merging hospitals viewed the other hospital as their second choice, but FTC economists found no post-merger price increase. For the second merger, the logit demand model showed that only a small minority of patients of the merging hospitals viewed the other hospital as their second choice, but FTC economists found a large post-merger price increase. That is, while the FTC's retrospective study of the actual merger outcomes shows a substantial price increase associated with one merger but not the other, logit demand models predict the opposite result.
21. Berry et al. (2004) also adopt a random coefficients specification, which is typically not used in hospital demand estimation. Random coefficients models are not the same as models with a random component of consumer demand, which we discussed earlier.
22. Specifically, this model includes travel time; travel time interacted with patient demographics, patient clinical conditions, and hospital characteristics; an indicator for closest hospital and an indicator for hospital location in the same county as the patient's residence; and interactions between patient clinical conditions and hospital services.
23. Models of hospital choice typically assume travel costs are the main costs patients incur when seeking a hospital, unlike standard models of consumer demand which include the price that consumers pay to purchase the good.
24. To provide context for the magnitude of increase in travel times of one minute or five minutes, the average travel time for patients in this sample was 13 minutes to one hospital in the merger and 23 minutes to the other hospital involved in the merger.
25. See supra n.2.
26. See supra n.3.
27. Atorvastatin, the generic of Lipitor, is recorded as costing $9 at Walmart without coupon, using GoodRx (https://www.goodrx.com/lipitor, accessed Oct. 12, 2018).
28. Other researchers have proposed alternative explanations for why hospital choice models imply an unwillingness to travel. See, e.g., Benjamin Handel and Jonathan Kolstad. "Health Insurance for 'Humans': Information Frictions, Plan Choice, and Consumer Welfare." American Economic Review 105, no. 8 (2015): 2449-2500. The authors describe health care as an experience good and argue that patients are not necessarily well-informed or aware of differences in hospital service attributes or characteristics prior to receiving care. If lack of information is more severe for hospitals far away, Logit models of hospital choice will overstate patients' aversion to traveling for hospital care.
29. See, e.g., Elena Prager. "Consumer Responsiveness to Simple Health Care Prices: Evidence From Tiered Hospital Networks." Working Paper (2018); Gautam Gowrisankaran, Aviv Nevo, and Robert Town (2015). Both papers find that patients respond to out-of-pocket costs when choosing where to receive hospital care.
30. See supra n. 4.
31. See supra n. 16.

32. In other words, hospitals face a downward-sloping demand curve introduced to students in introductory economics courses.

33. An additional adjustment is necessary if the hospitals' relative prices are different. See, e.g., Serge Moresi. "The Use of Upward Price Pressure Indices in Merger Analysis." The Antitrust Source (February 2010).

34. Under the assumption that the demand curve for hospital services is linear, the GUPPI can be translated into a predicted price increase by multiplying it 0.5 (e.g., if the GUPPI is 0.05 and demand is linear, prices are predicted to increase by 2.5 percent.) See, e.g., Jerry Hausman, Serge Moresi, and Mark Rainey. "Unilateral effects of mergers with general linear demand." Economics Letters 111, no. 2 (2011): 119-121. The FTC's expert economist in the Advocate-NorthShore hospital merger that was successfully challenged by the FTC applied this approach. See: FTC v. Advocate Health Care, No. 15 C 11473, 2017 U.S. Dist. LEXIS 37707, at *59 (N.D. Ill. Mar. 16, 2017).

35. While models of bargaining and price-setting have largely developed separately in the economics literature, the same economic forces that determine price increases in a market where firms set price also apply to a market where prices are negotiated. See, e.g., Section 6.2 of the Merger Guidelines (merger analysis in settings involving bargaining relies on similar approaches to those employed when analyzing markets where firms directly set price). In addition, under certain assumptions it possible to derive the GUPPI formula from within a bargaining framework. See, e.g., Deborah Haas-Wilson and Christopher Garmon. "Two Hospital Mergers on Chicago's North Shore: A Retrospective Study." U.S. Federal Trade Commission, Bureau of Economics Working Paper No. 294. (January 2009). (Haas-Wilson and Garmon (2009) has since been published. However, the published version omits the GUPPI derivation.)

36. When predicting the price increases that follow a merger, first-order effects refer to the merging hospitals' immediate incentives to raise price, holding all other competitors' prices at their pre-merger levels. Second-order effects refer to other hospitals' subsequent response.

37. Economic margins are equal to the difference between the revenues a hospital receives for providing care to a patient and its marginal costs of treating the patient. These marginal costs should not include any allocation of the hospital's fixed costs, indirect costs, labor or supply costs, or any other variable cost that would have been incurred even if the patient had not been admitted to the hospital.

38. See, e.g., Corey Capps, David Dranove, and Mark Satterthwaite. "Competition and market power in option demand markets." RAND Journal of Economics (2003): 737-763; and Robert Town and Greg Vistnes. "Hospital Competition in HMO Networks." Journal of Health Economics 20, no. 5 (2001): 733-753.

39. See, e.g., Gary Fournier and Yunwei Gai. "What Does Willingness-to-Pay Reveal About Hospital Market Power in Merger Cases?" Working Paper (April 2007); Martin Gaynor, Samuel A. Kleiner, and William B. Vogt. "A Structural Approach to Market Definition with an Application to the Hospital Industry." The Journal of Industrial Economics 61, no. 2 (2013): 243-289.(January 2011); Matthew S. Lewis and Kevin E. Pflum. "Diagnosing Hospital System Bargaining Power in Managed Care Networks." Working Paper (January 2013); Gautam Gowrisankaran, Aviv Nevo, and Robert Town (2015); Leemore Dafny, Katherine Ho, and Robin Lee. "Price Effects of Cross-Market Hospital Mergers." NBER Working Paper 22106, revision requested by RAND Journal of Economics (June 2017).

40. Capps, Dranove, and Satterthwaite (2003) derive a formula that characterizes an insurer's WTP for a hospital on behalf on one patient. If the probability the patient chooses the hospital is given by p, then the patient's WTP for the hospital is -log(1-p). To calculate the insurer's overall WTP for the hospital, we repeat this calculation for all the insurer's members and sum the individual measures of WTP.

41. Suppose that hospitals A and B merge. Before the merger, the WTP for hospital A depends on how many patients view A as their first-choice hospital and how they would fare if the hospital were no longer in-network. After the merger, hospitals A and B jointly negotiate as a system. When calculating the post-merger WTP for these hospitals, economists measure the value that consumers place on a network that excludes both hospitals A and B. If the two hospitals are not viewed by patients as close substitutes, WTP for the merged system will be close to the sum of the WTP for the individual hospitals. But if diversion between the two hospitals is high, patients' valuation of a network that excludes both would be significantly lower as patients are forced to choose their third-choice hospital. That is, the higher is diversion from A to B, the greater the difference between the WTP for the system that includes both A and B and the sum of the WTPs for the individual hospitals. We can demonstrate this result formally using the formula for WTP in footnote 39. Let pA and pB denote the probabilities that one patient chooses hospital A or B, respectively. Then the patient's WTP for the merged hospital system is given by -log(1- pA - pB). A patient's WTP for a combined A and B is greater than his WTP for hospital A only if he is likely to also use hospital B (i.e., pB>0). In other words, the merger only increases the patient's WTP for the system including hospitals A and B (relative to the individual hospitals) only if the patient views B as a substitute for A.

42. Capps, Dranove, and Satterthwaite (2003) show that if insurers and hospitals always receive α and 1- α of the surplus generated from an admission and hospitals' costs do not vary, then the equilibrium price an insurer pays each hospital (and the hospital's profit per patient) is equal to α multiplied by WTP.

43. Fournier and Gai (2007) conduct retrospective studies of two merger hospitals in Florida and New York, concluding that mergers were associated with an increase in WTP and an increase in prices. However, in addition to the limitations of the measure of hospitals' prices and the empirical specification used in that paper, the authors present no evidence that the magnitude of the merger-related increase in WTP predicts the magnitude of any resulting price change.

44. See Orley Ashenfelter, et al. "Econometric Methods in Staples." Working Paper, (April 2004), regarding the Office Depot-Staples merger. The authors describe how it "may not always be possible, however, to observe and control for all ways in which regions can differ, affecting prices... When important variables affecting price in different regions cannot be observed, a cross-sectional analysis of pricing may mislead. The possibility of this 'omitted variable' bias creates the main potential disadvantage of employing cross-sectional estimates." For a similar assessment with regards to hospital analysis, Gaynor, Ho, and Town write, "The HHI (or any market structure measure) is likely endogenous. Unmeasured variation in demand and cost factors affect both quality and market structure. For example, a firm with low costs is likely to both have a high market share (leading to a high HHI) and choose high quality" or have high prices, which lead to unreliable estimates on the changes in price with changes in HHI without accounting for the unmeasured factors. (Martin Gaynor, Kate Ho, and Robert Town. "Competition in health care markets." In Handbook of Health Economics, vol. 2, (2011): 499-637.)

45. A published version of Garmon (2016) adds two mergers to the data. Here, we continue to work with the 26 mergers in the working paper because supplementary data for the published paper is difficult to work with.

46. The 26 hospital mergers identified in Garmon (2016) are between short-term acute care hospitals in the same MSA or adjacent MSA (or in the case of rural hospitals, the same or adjacent county) for which the author has at least one year of pre-merger and post-merger price data. In addition, the author excludes mergers in which a hospital system is purchasing several hospitals simultaneously, acquisitions of critical access hospitals, and acquisitions of failed or failing hospitals.

47. Garmon (2016) calculates changes in WTP for the 26 pairs of merging hospitals using state discharge data. He calculates these hospitals' prices before and after mergers using financial information from Medicare Cost Report data and the methodology for calculating commercial prices described in Leemore Dafny. "Estimation and identification of merger effects: An application to hospital mergers." The Journal of Law and Economics 52, no. 3 (2009): 523-550. However, a later paper found that the correlation between measures of "price" calculated using Dafny's Cost Report-based methodology and actual transaction prices contained in insurers' claims data is only 0.45, which casts doubt on the reliability of Garmon's measures of hospitals' prices. (Zack Cooper, Stuart V. Craig, Martin Gaynor, and John Van Reenen. "The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured." The Quarterly Journal of Economics, qjy020, available at https://doi.org/10.1093/qje/qjy020.)

48. Indeed, Garmon (2016) runs a regression of the 26 observed price increases on the 26 increases in WTP and finds a statistically significant positive relationship that is driven by only one hospital merger (where WTP and prices increased by 34.8 percent and 34.1 percent, respectively). When this outlying merger is dropped from the analysis, he does not find a relationship between increases in WTP and post-merger price increases.

49. Garmon (2016) similarly finds no relationship between the observed price increases and the increases predicted from a cross-sectional regression of price on WTP, which he refers to as a WTP "merger simulation."

50. The first merger involved Evanston Northwestern Healthcare and Highland Park Hospital (the "Evanston merger") and the second involved Provena St. Therese Medical Center and Victory Memorial Hospital (the "Provena merger"). Whereas the FTC challenged the first merger as anticompetitive, the FTC closed its investigation of the second merger after concluding there was insufficient evidence that it would raise prices.

51. Haas-Wilson and Garmon (2011). To estimate the price effects of the two Chicago mergers, the authors primarily relied on health insurance claims data from 1998 to 2002 for five health plans operating in the Chicago area. The plans' inpatient hospital claims contain information on the negotiated payment as well as information on the patients' age, gender, dates of service, and diagnosis and procedure codes.

52. The authors' results depend on how they measure WTP and whether they include the University of California, San Diego hospital (which is twice as profitable as any other hospital in San Diego and the only university hospital).

53. Recall that the WTP for hospital A is measured as the sum of -log(1-p) across all patients where p is the probability each patient chooses hospital A. This expression is increasing in p, which is also which is also correlated with a hospital's overall share of patients. Indeed, May (2003) demonstrates that the cross-sectional correlation between hospitals' share and WTP exceeds 0.99 in one sample of Chicago hospitals.

54. In differentiated product markets, higher quality products tend to have higher prices for reasons unrelated to bargaining power. In the case of hospitals, this is particularly true when capacity constraints potentially exist.

55. See, e.g., Garmon (2016). Referring to regressions of price on WTP, Garmon writes, "the estimated [α] may suffer from omitted variable bias if there are factors related to the hospital/MCO negotiation that cannot be observed or measured." Christopher Garmon. "The Accuracy of Hospital Merger Screening Methods." U.S. Federal Trade Commission, Bureau of Economics Working Paper No. 326. (February 2016).