



# CRA Insights: Health Care

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## Predicting the price effects of hospital mergers

An evaluation of the willingness-to-pay technique

### Background

A variety of forces are leading many hospitals to seek opportunities to join integrated health care systems. Declining reimbursement from government programs and increasing cost sensitivity of employers, along with declining demand for inpatient hospital services, are contributing factors. Accommodating the more fundamental change from fee-for-service reimbursement toward “accountable care” and “population health management” requires scale to bear risk and develop the necessary health information technology and other infrastructure.

Hospitals represent the largest source of spending on health care services in the US, accounting for \$882 billion in expenditures, or one third of total expenditures on health care services, while private health insurers spent almost \$321 billion (or 35 percent of health insurance premiums) on hospital care in 2012.<sup>1</sup> Some economic studies have suggested that hospital consolidation is associated with higher prices for hospital care,<sup>2</sup> while others have recognized the offsetting quality and cost reduction benefits.<sup>3</sup>

Not surprisingly, hospital mergers attract a significant amount of attention from antitrust enforcement agencies. In 2002 the Federal Trade Commission (FTC) undertook a retrospective study of consummated hospital mergers to allow “the Commission to update its prior assumptions about the consequences of particular transactions and the nature of competitive forces in health care.”<sup>4</sup> At the same time as the FTC was conducting its retrospective study of hospital mergers, economists were

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<sup>1</sup> Centers for Medicare and Medicaid Services, Office of the Actuary, National Health Expenditure Accounts, National Health Expenditures, Aggregate and per Capita Amounts, Annual Percent Change and Percent Distribution, by Type of Expenditure: Selected Calendar years 1960-2012, and Private Health Insurance Premiums, Benefits and Net Cost; Levels, Annual Percent Change and Percent Distribution, Selected Calendar Years 1960-2012, accessed February 24, 2014, [www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/tables.pdf](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/tables.pdf).

<sup>2</sup> William B. Vogt and Robert Town, “How has hospital consolidation affected the price and quality of hospital care?,” Robert Wood Johnson Foundation, Research Synthesis Report No. 9, February 2006; Martin Gaynor and Robert Town, “The impact of hospital consolidation—Update,” Robert Wood Johnson Foundation, Research Synthesis Report No. 9, June 2012.

<sup>3</sup> David Cutler and Fiona Scott Morton, “Hospitals, Market Share and Consolidation,” *Journal of the American Medical Association* 310, November 13, 2013, pp.1964-1970.

<sup>4</sup> Timothy J. Muris, “Everything Old is New Again: Health Care and Competition in the 21st Century,” prepared remarks before 7th Annual Competition in Health Care Forum, November 7, 2002, at 19.

developing models (commonly referred to as willingness-to-pay or WTP models) to study the negotiations between managed care organizations (MCOs) and hospitals and how these negotiating dynamics might change because of a hospital merger.<sup>5</sup> Previously, prospective analysis of hospital mergers often relied on simple analyses of patient travel patterns to define geographic markets, and conclusions about the likely competitive effects of hospital mergers were based on measures of concentration within those markets. Markets defined in such a way were typically quite broad and the resulting market structure was rarely consistent with the conclusion that a merger could result in a meaningful diminution in competition.<sup>6</sup>

WTP attempts to address some of the shortcomings of the techniques previously used to analyze competition among hospitals. The model reflects the two-stage nature of hospital competition wherein hospitals both negotiate with managed care companies to be included in their provider networks and compete with other hospitals to provide care to the managed care company's members. WTP also attempts to provide an estimate of the effect of a merger on prices negotiated between MCOs and hospitals without the need to explicitly define geographic markets.

WTP is now routinely used by the FTC and featured prominently in the economic analysis put forward by the FTC in at least two recently litigated hospital mergers.<sup>7</sup> However, the validity of the methodology's predictions has not been tested and one FTC commissioner expressed skepticism as to the merits of the methodology, noting: "[The] issues [in relying on 'willingness to pay models'] begin with the reliability of the models themselves. They are a form of 'simulation' study. Critics have charged that such studies always predict a price increase if there is any degree of substitution between the merging parties' products."<sup>8</sup>

## CRA's analysis

We assessed the reliability of WTP by comparing its predictions regarding merger-related price changes with estimated price changes following two consummated hospital mergers that occurred on the North Shore of Chicago in 2000. The first merger involved Evanston Northwestern Healthcare (now NorthShore University HealthSystem), then comprised of Evanston Hospital and Glenbrook Hospital, and Highland Park Hospital (the Evanston Merger). The second merger was the combination of Provena St. Therese Medical Center and Victory Memorial Hospital, both in Waukegan, Illinois (the Vista Merger). As a result of its retrospective merger investigation, the Commission challenged the consummated Evanston Merger. In 2005, an FTC administrative law judge found that the merger was anticompetitive and this decision was upheld by the Commission in 2007, although the Commission did not order the divestiture of Highland Park Hospital.<sup>9</sup> On the other

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<sup>5</sup> Robert Town and Gregory Vistnes, "Hospital Competition in HMO networks," *Journal of Health Economics*, vol. 20, no. 5, September 2001; Cory Capps, David Dranove, and Mark Satterthwaite, "Competition and market power in option demand markets," *RAND Journal of Economics*, vol. 34, no. 4, Winter 2003.

<sup>6</sup> For a critique of hospital market definition based on patient travel patterns, see Cory S. Capps, David Dranove, Shane Greenstein, and Mark Satterthwaite, "The Silent Majority Fallacy of the Elzinga-Hogarty Criteria: A Critique and New Approach of Analyzing Hospital Mergers," National Bureau of Economic Research Working Paper No. 8216, April 2001; and Kenneth Elzinga and Anthony Swisher, "Limits of the Elzinga-Hogarty Test in Hospital Mergers: The Evanston Case," *International Journal of the Economics of Business*, vol. 18, February 2011.

<sup>7</sup> See Opinion of the Commission, *In the Matter of ProMedica Health System, Inc.*, Docket No. 9346 at 49-51 and Complaint Counsel's Pre-Trial Brief, *In the Matter of OSF Healthcare System and Rockford Health System*, Docket No. 9349 at 43-44.

<sup>8</sup> Concurring Opinion of Commissioner J. Thomas Rosch, *In the Matter of ProMedica Health System, Inc.*, Docket No. 9346 at 5. See also Orley Ashenfelter, et. al. "Retrospective Analysis of Hospital Mergers," *International Journal of the Economics of Business*, vol. 18, no. 1, February 2011.

<sup>9</sup> Opinion of the Commission, *In the Matter of Evanston Northwestern Healthcare Corporation*, Docket No. 9315, August 6, 2007.

hand, the Commission closed its investigation of the Vista Merger after finding insufficient evidence to support a conclusion that competitive harm had resulted from the merger.<sup>10</sup>

We obtain estimates of the price changes that occurred following the Evanston Merger and the Vista Merger from an empirical study published by economists working with the FTC on its retrospective studies of the mergers.<sup>11</sup> We then compare these estimated price changes with the price effects predicted by the WTP methodology.<sup>12</sup> The WTP methodology predicts a price increase of between 13 and 30 percent associated with the Vista Merger, which is substantially larger than the predicted increase of between 2 and 4 percent predicted for the Evanston Merger. However, the FTC's retrospective study of these mergers shows exactly the opposite: estimated price changes associated with the Evanston Merger were substantially larger than the estimated price changes associated with the Vista Merger.<sup>13</sup>

Although these comparisons comprise a small sample, they are, to our knowledge, the first analysis of the reliability of the WTP framework in predicting the price effects of hospital mergers.<sup>14</sup> These results cast some doubt on the reliability of the WTP framework in predicting the competitive effects of hospital mergers.<sup>15</sup>

### Estimates of merger-related changes in WTP

As a first step in implementing the WTP framework, we estimate a model of patients' choices of hospitals. The model of hospital choice can also be used to calculate diversion ratios for the merging hospitals as a measure of the closeness of substitution between them in the eyes of consumers. Mergers between hospitals with high diversion ratios, i.e., where patients have a high probability of choosing the other merging hospital if one of the merging hospitals were not available, are also likely to result in large increases in WTP.

Using the model of hospital choice, the predicted change in WTP resulting from the combination of Evanston Hospital and Glenbrook Hospital with Highland Park Hospital was only 3 percent. In other words, the merger increased the value that the three hospitals contribute to a managed care network by only 3 percent relative to the value that the hospitals contributed before the merger. This suggests that patients in the Chicago PMSA did not view the hospitals as close substitutes, which is confirmed by the estimated diversion ratios calculated using the model of hospital choice. These diversion ratios

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<sup>10</sup> Statement of the Federal Trade Commission, *Victory Memorial Hospital/Provena St. Therese Medical Center*, File No. 011 0225, July 1, 2004.

<sup>11</sup> Deborah Haas-Wilson and Christopher Garmon, "Hospital Mergers and Competitive Effects: Two Retrospective Analyses," *International Journal of the Economics of Business*, vol. 18, no. 1, February 2011.

<sup>12</sup> This approach to validating the WTP framework was suggested by, among others, FTC economists who noted that no one had conducted such an analysis as of the time of the publication of the FTC's merger retrospective studies (Ashenfelter et. al., 2011).

<sup>13</sup> Other economists have questioned the reliability of these retrospective studies of hospital merger price effects. See Gregory Adams and Monica Noether. "Comment on Hospital Mergers and Competitive Effects: Two Retrospective Analyses," *International Journal of the Economics of Business*, vol. 18, no. 1, February 2011.

<sup>14</sup> Gary M. Fournier and Yunwei Gai, "What does Willingness-to-Pay reveal about hospital market power in merger cases?," Working paper, April 2007. The authors compare the predictions of the WTP framework with estimates of the merger-related price effect of a 1995 hospital merger in Palm Beach, Florida. The authors do not have the actual prices paid by MCOs, but instead use a proxy that is the product of the charges for a particular inpatient admission at a hospital and the ratio of total revenue deduction to total charges for all commercial admissions at the hospital. The authors compare a price index at the merging hospital pre- and post-merger to estimate the merger-related price effects, but do not control for many other factors that could have affected the prices of the merging hospitals (e.g., changes in costs).

<sup>15</sup> Another explanation for the inconsistencies between the prediction of the WTP framework and the estimated merger price effects are that the estimated price effects are unreliable, as Adams and Noether (2011) argue.

identified five hospitals that were closer substitutes to Evanston Hospital than was Highland Park Hospital and two hospitals that were closer substitutes to Highland Park Hospital than was Evanston Hospital.

In contrast, the Vista Merger resulted in a substantial predicted increase in WTP of 24 percent for residents of the Chicago PMSA. This increase in WTP is again consistent with the analysis of diversion ratios that suggested that St. Therese Medical Center and Victory Memorial Hospital were the closest substitutes to each other. Before the merger, MCOs might have been able to build a desirable hospital network by including one or the other. After the merger, the bargaining position of the two hospitals is improved because it would be difficult to build a desirable hospital network that excluded the only two hospitals in Waukegan.

To serve as a comparison for these increases in WTP, in the successfully litigated *ProMedica* and *Rockford* cases, the increase in WTP associated with the merger was substantially higher than the increase in WTP associated with the Evanston Merger but lower than the increase in WTP associated with the Vista Merger.

While we lack access to the MCO claims data that are used to translate these predicted changes in WTP into predicted price increases, using previously published estimates of the relationship between negotiated prices and WTP, a 3 percent increase in WTP corresponds to a predicted increase in prices of between 2 and 4 percent, while a 24 percent increase in WTP corresponds to a predicted increase in prices of between 13 and 30 percent. Whatever the exact magnitude of the relationship between WTP and prices was in Chicago in 1999, it is clear that the predicted price increase associated with the Vista Merger will be higher than the predicted price increase associated with the Evanston Merger.

### Retrospective estimates of merger-related changes in prices

We then compare the predicted price effects under the WTP framework to estimated price changes associated with the Evanston and Vista Mergers published in Haas-Wilson and Garmon (2011), who rely on health insurance claims data from 1998 to 2002 for five MCOs operating in the Chicago area. For the Evanston Merger, the authors find that the merger was associated with statistically significant relative price increases at the merging hospitals for four of the five MCOs. For these four MCOs, depending on the set of comparison hospitals and the methodology for controlling for complexity of care, the magnitudes of the estimated relative increases range from the low teens to more than 50 percent.<sup>16</sup>

For the Vista Merger, the authors estimate that the merger was associated with statistically significant relative price decreases at the merging hospitals for three of the five MCOs.<sup>17</sup> For these MCOs, the magnitudes of the estimated decreases in relative prices range from between roughly -5 and -23 percent. Of the two remaining MCOs, one experienced a statistically significant relative increase in price, while the other generally experienced no statistically significant change in relative prices. These findings likely explain why the FTC prosecuted the Evanston Merger while closing its investigation of the Vista Merger.

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<sup>16</sup> Interestingly, Adams and Noether (2011) note that the largest payer in the analysis, Blue Cross Blue Shield, was the one MCO for which there was no estimated relative increase in post-merger prices at the Evanston Northwestern Healthcare hospitals.

<sup>17</sup> We emphasize that these are *relative* price changes. That is, a negative number does not imply that prices decreased at the merging hospitals post-merger, simply that they increased less than prices at comparison hospitals.

Recalling that the Vista Merger was associated with a substantially larger predicted increase in WTP, for the WTP framework to be useful as a prospective tool for analyzing the competitive effects of hospital mergers, the estimated price increases associated with the Vista Merger should be larger than the estimated price increases associated with the Evanston Merger.<sup>18</sup> But this prediction of the WTP framework is inconsistent with the conclusions of Haas-Wilson and Garmon (2011) and the FTC in its investigations of the mergers, which, in turn, leads to the question of the potential reasons for the inconsistency.

### Sources of potential error in the willingness-to-pay framework

We identify at least two sources of potential error in the WTP framework: the reliability of the model of hospital choice and the measurement of the relationship between hospitals' WTP and prices.

In our implementation of the hospital choice model, consistent with previously published academic papers and work at the FTC, patients' choices of hospitals in the model are determined by five factors:

- hospital-specific fixed effects that are constant across all patients and conditions;
- travel time and the interactions of travel time with patient demographics, patient clinical conditions, and hospital characteristics;
- interactions between patient demographics and hospital characteristics;
- interactions between patient clinical conditions and hospital characteristics; and
- “match” interactions between patients' medical conditions and whether the hospital offers obstetric, pediatric, cardiac, or trauma services.

While the model of hospital choice theoretically represents a substantial advance over the formerly popular, descriptive analyses of patient travel patterns, in practice most of the factors included in the estimation of such models have little predictive power, at least in part because of data limitations. Consistent with prior research, our model suggests that travel time is the most important determinant of hospital choice: the model predicts that the hospital closest to the patient has the highest probability of being chosen for 64 percent of the patients in the Chicago PMSA. In fact, when the complete model of hospital choice for residents of the Chicago PMSA is compared to a much simpler model that relies solely on patient travel time and hospital fixed effects, the correlation in predictions exceeds 95 percent. The model's strong reliance on travel time essentially implies that—despite the highly differentiated nature of hospital services and differences in patient demographics and medical conditions—every patient residing in a particular ZIP Code has the same preferences for hospitals.<sup>19</sup> But such a prediction is subject to the same criticisms levied against descriptive analyses.<sup>20</sup>

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<sup>18</sup> The two mergers took place within months of each other in the same PMSA. Whatever the magnitude of the relationship between WTP and negotiated hospital prices at that time in that area, a merger associated with a larger increase in WTP should also be associated with a larger increase in price.

<sup>19</sup> While the data used to estimate the hospital choice model identifies only a patient's first-choice hospital (i.e., the hospital the patient actually chose), the WTP framework requires that the model of hospital choice generate reliable estimates of how much patients value their second-choice hospitals. This is because the value an MCO places on having a hospital in-network depends on the decrease in utility its members will experience if admitted to their second-choice hospital, which, in turn, depends on the MCO's members' relative first-choice and second-choice hospital valuations. The model's reliance on travel time implies that patients' first-choice hospital is often the hospital closest to them, their second-choice hospital is often the second-closest hospital, and so on.

<sup>20</sup> See, Kenneth Elzinga and Anthony Swisher, “Limits of the Elzinga–Hogarty Test in Hospital Mergers: The *Evanston Case*,” *International Journal of the Economics of Business* 18, 2011, pp. 133-146.

A second problem with the WTP framework is that it relies on the cross-sectional relationship between WTP and prices to predict the effect that merger-related (i.e., caused by merger-induced changes in hospitals' bargaining power with MCOs) changes in WTP will have on hospitals' prices. However, the existence of a positive cross-sectional relationship does not necessarily imply that increasing the WTP for a hospital will *cause* the prices that hospital can negotiate with MCOs to increase.

While hospitals may differ in bargaining power, they compete in a highly differentiated marketplace and also likely differ in clinical quality, amenities, reputation, location, and so on. Suppose, for example, that Evanston Hospital offered more technologically sophisticated services than Highland Park Hospital and that consumers value these services. These quality differences will generate more admissions, which will lead to a higher measured WTP for Evanston Hospital and may allow the hospital to negotiate higher prices with MCOs.<sup>21</sup> But it would be incorrect to infer on the basis that higher-quality hospitals receive higher prices that an increase in WTP associated with a merger would allow the hospitals to negotiate higher prices with MCOs. To reliably predict merger-related price effects requires an estimate of the relationship between merger-related changes in WTP and merger-related changes in prices.

One way of estimating this relationship would be to extend our empirical analysis by constructing a sample of consummated hospital mergers and comparing the magnitudes of the merger-related increase in WTP with the merger-related changes in prices following the merger, controlling for other factors that might have affected hospital prices that were unrelated to the merger. However, with the exception of Fournier and Gai (2007) and the empirical work referred to in this paper, there is no research that connects *merger-related* increases in hospital WTP to higher prices.<sup>22</sup> To our knowledge, 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. While CRA's research compares the magnitude of the changes in WTP associated with the Evanston and Vista Mergers with the FTC's estimates of the post-merger price increases, extending the analyses to a larger group of retrospective analyses of hospital merger-associated price increases would be useful in validating the use of WTP for prospectively analyzing the competitive effects of hospital mergers.

## Conclusion

While a potentially useful tool for antitrust analysis, little is known about how well WTP performs in predicting the actual effects of hospital mergers. Our analysis suggests that the answer may be “not very.” A comparison of the predictions of the WTP framework for two mergers that occurred on the North Shore of Chicago in 2000 with estimated price changes that occurred following the two mergers reveals that the merger predicted to result in large price increases was associated with very small estimated price increases, while the merger predicted to result in small price increases was associated with more substantial estimated price increases. This inconsistency casts some doubt on the reliability of WTP as a tool for prospectively analyzing the competitive effects of hospital mergers, and highlights two areas for further research: developing models of hospital choice that generate

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<sup>21</sup> In differentiated product markets, higher quality products tend to have higher prices for reasons unrelated to bargaining power. This is particularly true in the case of industries such as hospitals in which capacity constraints potentially exist.

<sup>22</sup> Fournier and Gai (2007) conduct retrospective studies of two merger hospitals in Florida and New York, concluding that the mergers were associated with an increase in WTP and 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.

more realistic patterns of substitution between hospitals and obtaining better estimates of the relationship between merger-related increases in WTP and price.

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