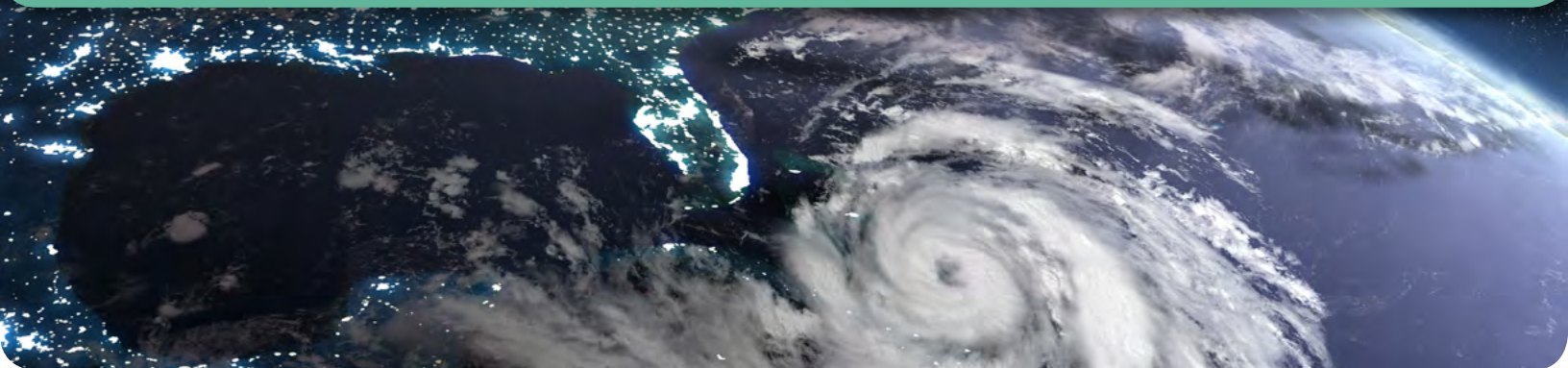


HOSPITAL MERGERS – RETROSPECTIVE STUDY TO IMPROVE PREDICTION



BY CHRISTOPHER GARMON ¹



Weather forecasting — once notoriously unreliable — has become extremely accurate in recent years. The forecasts for catastrophic storms, such as hurricanes, were once no more than educated guesses. Now, hurricane forecasts are relatively precise and rapidly improving. Since the turn of the twenty-first century, the U.S. National Hurricane Center's mean error for a two-day forecast track has fallen from 130 nautical miles to 60.² The improvements have come about due to better forecast models, more extensive observations of the atmosphere with which to calibrate the models and the rigorous analysis of past hurricanes and the accuracy of the forecast models in those events.

By comparison, the science of forecasting the effects of hospital mergers is in its infancy. However, much progress has been made in the past 20 years, through the development of more realistic models and the rigorous analysis of consummated hospital mergers and other events. Where hospital merger forecasting lags behind other predictive sciences most acutely is the collection of reliable data. Also, unlike physical sciences like meteorology, hospital merger forecasting aims to predict the behavior of individuals, which presents its own unique analytical challenges.

Modern hospital merger forecasting in the U.S. traces its roots to the 1990s — a period of crisis for hospital antitrust enforcement. After an era of relative success challenging hospital mergers, the federal and state antitrust agencies lost in eight straight attempts to block alleged anticompetitive hospital mergers. Reviews of this period point to two primary factors for the antitrust agencies' lack of success. First, courts of this period relied on patient flow statistics to establish relatively large geographic markets (and, thus, a low inferred probability of post-merger harm) even when the merging hospitals were close substitutes. Second, courts of this period were swayed by non-profit defendants' arguments that they would not exercise any market power obtained or enhanced by the merger.

This losing streak of the U.S. antitrust enforcers spurred an explosion of research into the effects of hospital competition. Many researchers studied the cross-sectional relationship between hospital competition and market outcomes, such as clinical

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² http://www.nhc.noaa.gov/verification/figs/GPRA_track.jpg.

quality and the price charged to commercial payers. Generally, these studies established that, all else equal, competition leads to lower prices and higher quality on average in hospital markets, similar to its effect in non-hospital markets. Other articles analyzed the effects of past hospital mergers. The studies in this latter literature that looked at a sample of mergers of competing hospitals usually found that the mergers resulted in higher prices on average. Case studies of individual mergers had more mixed results. However, the individual case studies established that mergers of competing non-profit hospitals can, in some cases, lead to substantial price increases (refuting the argument that non-profits would never exercise market power obtained through a merger). In addition, the case studies documented large price increases for some mergers of competing hospitals located in large metropolitan areas containing many other hospitals, indicating that relevant antitrust markets may be much smaller than traditional flow statistics would suggest. Finally, the case studies established that the price effects for a particular merger could vary substantially across the commercial payers who contract with the merging hospitals.

This empirical literature was quickly complemented by a theoretical literature that developed new tools and methods for analyzing proposed hospital mergers and predicting their effects. The focus of this new theoretical literature was on the negotiation between the hospital and health insurer for the hospital's inclusion in the insurer's network of providers. One new tool developed from this bargaining framework is Willingness-to-Pay ("WTP"), which is a proxy for a hospital system's leverage in negotiations with health insurers and can be used to approximate the change in leverage when competing hospitals merge. WTP was used by the plaintiff's economic expert in most of the Federal Trade Commission's ("FTC") recent challenges of hospital mergers. Another tool, Upward Pricing Pressure ("UPP"), which was developed to analyze mergers in markets with product or geographic differentiation, was adapted to fit the hospital/health insurer bargaining framework. UPP became a centerpiece of the FTC's two most recent hospital merger challenges, against the proposed merger of Pinnacle Health and Penn State Hershey in central Pennsylvania and the proposed merger of Advocate Health and NorthShore University Health in the Chicago area. Both WTP and UPP are based on the predictions of econometric models of patient choice that estimate how patients would change their behavior if a hospital or health system were dropped from their health insurer's network.

However, little work has been done, until recently, to evaluate the accuracy of the new tools and better understand their advantages and limitations. How do the econometric patient choice models perform in predicting actual changes in patient behavior in response to the loss of a hospital from the patient's options? How well do the new tools (WTP and UPP) perform in predicting the effects of hospital mergers? Do they do a better job of forecasting than the traditional methods of market definition and concentration measurement? Are there models and tools that are more accurate than WTP and UPP? If so, what data are necessary to calibrate them? These are the same type of questions that weather forecasters grappled with to evaluate and improve their models. However, unlike weather forecasters studying storms and the physical, thermodynamic processes that dictate their behavior, economists studying hospital mergers must account for the behavior of hospital executives and patients, which presents unique analytical challenges.

For instance, consider the first question above: How well do econometric patient choice models perform in predicting changes in patient behavior when a hospital is dropped from a health insurer's network? You might think that the best way to answer this question would be to look at instances in which a hospital was dropped from a health insurer's network, see how patients responded, and compare these responses to the models' predictions. However, health insurance network construction is a function of consumer preferences. If you observe patients switching to another hospital after a hospital is dropped from a health insurer's network, it might be in response to losing this choice. It might also be the case that the dropped hospital was becoming less popular with patients and that's why it was dropped. How can a researcher disentangle this "chicken and egg" problem: Did patients switch in response to the hospital being dropped or was the hospital dropped in response to a change in patient preferences?

Three FTC economists developed a novel way to avoid this problem and test the accuracy of patient choice models.³ And, appropriately, it involves using severe weather phenomena like hurricanes and tornados. Occasionally, a storm is so severe that it damages a hospital to the point where it must be closed for an extended period of time for repair. The FTC

3 Raval, Rosenbaum & Wilson, (2016, May). Industrial Reorganization: Learning about Substitution Patterns from Natural Experiments. *FTC Bureau of Economics Working Paper #329*.

economists used these hospital closures to test the accuracy of the choice models, knowing that the hospitals were closed by an “Act of God,” not because they were losing patients. They compared each model’s prediction of how patients would respond to the patients’ actual change in behavior after the hospital’s closing. They found that the patient choice models that form the basis of hospital merger forecasting are accurate and particular combinations of the models are even more accurate at predicting patient behavior.

What about the accuracy of WTP and UPP? How well do these measures predict the outcomes of hospital mergers? Testing the accuracy of merger screening tools, like WTP and UPP, using actual hospital mergers also presents empirical challenges to overcome. First, imagine the ideal laboratory for testing merger screening tools like WTP and UPP. In this ideal laboratory, a scientist could select hospitals at random to merge, calculate the upward pricing pressure and change in leverage (as measured by the change in WTP) associated with each merger of random hospitals, and then observe what actually occurred after each merger (measuring the outcomes relative to a suitably chosen group of control hospitals that did not merge). The scientist in charge of this ideal lab could then compare the predictions of WTP and UPP to the actual outcomes for each randomly selected set of merging partners to evaluate the accuracy of these predictions.

Unfortunately, the real world does not resemble this ideal laboratory. In particular, hospitals are not randomly selected to merge. There are reasons hospitals merge (e.g. because one hospital is failing, because the combination will lead to lower costs, etc.) that might affect the post-merger outcomes in non-random ways. Most relevant for the evaluation of screening tools like WTP and UPP is the fact that these tools are in active use by the antitrust agencies. Because of that, mergers that WTP and UPP would be likely to flag as anticompetitive are likely to be blocked by the antitrust agencies or never proposed in the first place. Thus, the mergers that can be used to test the accuracy of WTP and UPP in the real world are most likely to be those that WTP and UPP would not flag as anticompetitive. It’s as if hurricanes that the weather models predicted would be severe decided to dissipate on their own because of the prediction. Obviously, that would make it challenging to test the accuracy of weather models against actual hurricanes.

For this empirical challenge, there are no perfect solutions. Instead of looking at hospital mergers, some economists have tested how well WTP explains differences in hospital prices that other factors cannot explain.⁴ Other ongoing research tests WTP and UPP in a virtual world where hospitals are randomly selected to merge.⁵ My own research looks at actual hospital mergers, but focuses on mergers in periods with less effective antitrust enforcement and excludes mergers involving failing hospitals and cost reductions.⁶ Overall, this recent research tends to show that the new tools (WTP and UPP) are more accurate at predicting the outcomes of hospital mergers and explaining price variation than the traditional tools of market shares and concentration.

However, the new hospital merger screening tools, while more accurate than traditional methods, are not perfect predictors of hospital merger effects. In particular, both WTP and UPP are based on the “first-order” incentives of hospitals and health insurers in their post-merger negotiations. Neither measure accounts for the “second-order” feedback effects that occur in the shift to a new post-merger equilibrium. Just as weather forecasters developed better models to account for the complex feedback effects in the atmosphere, economists have recently attempted to build richer models of hospital competition that incorporate the additional complexities and feedback effects of health care markets. For instance, the structure of local health insurance markets may impact hospital competition and some recent articles attempt to model both markets simultaneously to better understand the feedback effects between the health insurance and hospital markets.⁷ Other recent models of hospital competition incorporate coinsurance and patient responsiveness to price, even for hospitals within the patient’s network.⁸ Some industry observers have speculated that hospital mergers may impact competition even when

4 Dranove & Ody, (2016). Evolving Measures of Provider Market Power. *American Journal of Health Economics*, 2(2), 145-160.

5 Brand & Balan, (2017). *Simulating Hospital Merger Simulations*. Working Paper.

6 Garmon, (Forthcoming). The Accuracy of Hospital Merger Screening Methods. *The RAND Journal of Economics*.

7 Ho & Lee, (Forthcoming). Insurer Competition in Health Care Markets. *Econometrica*.

8 Gowrisankaran, Nevo & Town, (2015, January). Mergers When Prices are Negotiated: Evidence from the Hospital Industry. *American Economic Review*, 105(1), 172-203.

the merging hospitals serve different patients. Recently, models have been developed to explore and estimate the effects of these “cross-market” hospital mergers.⁹

Although these new models incorporate more features of hospital and health care markets and may be more accurate at forecasting hospital mergers, a significant limitation of the models is the information and data needed to calibrate them. One big practical advantage of WTP is that it can be calculated from patient discharge data, which most states collect and make available to researchers. However, many of the recent, more detailed models require more detailed health insurance claims data. Far fewer states collect the all-payer claims data (“APCD”) needed to calibrate many of the recent models of hospital competition and fewer still make this data available to researchers. Even then, many state collections of APCD are relatively new and only capture a small number of past hospital mergers. Private collections of health insurance claims data either mask the identity of the hospital (making research on hospital mergers impossible) or contain only a subset of health insurers.

Continuing progress in the quest for more accurate methods of hospital merger prediction will depend on data collection and availability. Unfortunately, a recent U.S. Supreme Court decision (*Gobeille v. Liberty Mutual Insurance Co.*) casts doubt on the ability of states to collect the type of data most likely needed to advance our understanding of hospital competition. In that decision, the court ruled that states do not have the power to compel employer-sponsored health plans to provide their data if the health plans are governed by the federal Employee Retirement Income Security Act (“ERISA”), as many are. States may attempt to collect the data voluntarily or they may wait for more guidance from the Department of Labor, which regulates ERISA health plans. Either way, the challenge of obtaining the data needed to better understand health care competition may continue.

Another shortcoming of hospital merger prediction to date is its almost exclusive focus on price. Hospital mergers may also affect quality and access to care, but these aspects of health care are more difficult to measure than price. Although there is a large literature on the relationship between competition and hospital quality, there is relatively little research describing the effects of hospital mergers on quality. The literature that does exist focuses almost exclusively on outcome measures of quality (e.g. mortality rates) and describes mixed results. This is consistent with theoretical predictions of the effect of a loss of competition on quality. Whereas theory predicts that a merger of competing hospitals will lead to increased bargaining leverage and an increase in price (absent other changes, such as cost savings), the effect of a merger on quality is theoretically ambiguous when prices are negotiated.¹⁰ However, such ambiguity would argue for more research, not less. What factors typically lead to improved quality after a hospital merger and what factors typically lead to a decline? What about other aspects of quality apart from clinical outcomes? How do hospital mergers affect things like customer service, the ability of a patient to get an appointment or the waiting time before a surgical procedure? These issues are largely unexplored and should be a focus of future research.

Overall, hospital merger research and prediction has come a long way in a relatively short period of time. It is nowhere near the level of accuracy of current weather forecasting. Given the empirical challenges health economists face that weather forecasters do not, hospital merger forecasting may never reach weather forecasting’s level of accuracy. Still, the importance of the hospital industry to the U.S. economy, and the rapid pace of hospital consolidation in recent years, necessitates that we continue to research hospital mergers and develop better methods to predict their effects.

9 Dafny, Ho & Lee, (2016). The Price Effects of Cross-Market Mergers. *NBER Working Paper #22106*.

10 Gaynor, Ho & Town, (2015). The Industrial Organization of Health Care Markets. *Journal of Economic Literature*, 53(2), 235-284.

