Simulating Hospital Merger Simulations
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March 5, 2015

The heathcare sector in the United States has been an area of increased antitrust enforcement. Since 2008, the Federal Trade Commission (FTC) has taken enforcement actions in twelve horizontal merger matters involving general acute care hospitals, psychiatric hospitals, surgical centers, imaging facilities, or physician groups. This follows an eight-year period during which the FTC took only one enforcement action in horizontal merger matters involving these types of providers.

This increase in enforcement activity is closely connected to fundamental changes in the methods applied in analyzing these mergers. One such change was the development of merger simulation methods that were designed to accommodate key features of markets in which prices are determined through bilateral bargaining, such as healthcare markets. These simulation methods can be applied to prospective hospital mergers, and, to a limited extent, they have been applied in expert testimony in some of the recent enforcement actions.

The main purpose of this paper is to make a contribution to evaluating the accuracy of these merger simulation methods. A natural approach would be to compare the predictions of the simulation methods to the results of retrospective analyses of consummated mergers. However, compiling results from a population of mergers large enough to provide a sufficiently powerful test would be expensive. Moreover, data on actual transaction prices, which are likely the most useful for such an assessment, are often unavailable. In addition, this approach is subject to the limitations on the accuracy of retrospective merger analyses.

We take an alternative approach by testing the simulation methods in a Monte Carlo setting. We specify a theoretical model of hospital markets in which the primitives are defined on hospital attributes (location, quality, cost, and system affiliation), consumer attributes (location and probability of using inpatient care), and consumer preferences over hospitals and health insurers. We assume profit-maximizing behavior for both hospitals and health insurers. Equilibrium hospital prices and insurance premiums are determined by numerically solving a simultaneous Nash bargaining game and a Bertrand premium-setting game.

We solve the model for a large number of simulated markets with a wide variety of assumed hospital system affiliations and model parameters. For each simulated market we

calculate the true equilibrium hospital prices, both before and after a hypothetical hospital merger. We then take the data generated by the model that would be available in a real-world prospective merger analysis (pre-merger prices and patient-level discharge data), apply the merger simulation methods to those data, and compare the resulting predictions to the true price effects generated by the model. We examine the simulation methods' overall performance, as well as how that performance varies across model parameterizations.

Both our model and the simulation methods derive their basic intuition from bilateral bargaining theory. From this it might appear that the simulation methods are guaranteed to accurately predict the merger effects from our model. But this is not the case; the simulation methods omit important features of that are included in the model. These include competition in the health insurance market, profit incentives of health insurers, strategic responses in prices among hospitals, uncertainty over healthcare utilization, and the group purchase of health insurance. The simulation methods are therefore not guaranteed to perform well, and so our results provide some evidence on their real-world efficacy.

We consider three simulation methods: the Willingness-to-Pay (WTP) model exposited in Capps et al. (2003) (CDS), an extension to the CDS model contained in Gowrisankaran et al. (2013) and Brand (2013), and the Hospital-Specific HHI ($HSHHI$) model described in Capps and Dranove (2004) and Melnick and Keeler (2007). We find that, when examining only the point estimate of predicted price effects, $HSHHI$ and WTP exhibit some tendency to under-predict true price effects, while the B/GNT extension to WTP exhibits some tendency to over-predict true price effects. When accounting for the variance of each prediction, we find that both WTP models significantly outperform $HSHHI$.

We do not find meaningful differences in the simulations methods' performance across different levels of competition in the health insurance market or based on whether consumers purchase health insurance as individuals or through purchasing groups (e.g., employers). We do find some sensitivity in the simulation methods' performance to variation in the parameters of the model. Specifically, we find that the simulation methods perform less well under parameterizations in which consumers care more about whether a hospital is excluded from insurers provider networks, and in which hospitals capture a larger share of the joint bargaining surplus.