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merger simulations

The key in an evaluation of a proposed merger is to determine whether the reduction of competition it would cause is outweighed by potential cost reductions. Traditional analysis of mergers is primarily based on industry-concentration measures. A market is defined and market shares of the relevant firms are used to compute a pre-merger concentration measure as well as a change in this measure due to the merger. Both the pre-merger level and the change in concentration are then compared with preset levels. The intuition is that, if the industry is concentrated, or if the change in concentration is large, then the anti-competitive effect will dominate. Using this approach to evaluate mergers in some industries is problematic for at least two reasons. In many cases the product offerings make the definition of the relevant product (or geographic) market difficult. Even if the relevant market can be defined, the computed concentration index provides a reasonable standard by which to judge the competitive effects of the merger only under strong assumptions.

Merger simulation attempts to deal with these challenges. The basic idea consists of 'front-end' estimation, in which the structural primitives of the model are estimated, and a 'back-end' analysis, in which the estimates are used to simulate the post-merger equilibrium. The approach proceeds as follows.

First, demand parameters are recovered by econometric estimation, if the data are rich enough, or, if data (with enough variation) are not available, then marketing and other anecdotal evidence can be used to approximate the effects of prices on demand (Werden and Froeb, 1994). Estimation has to deal with two main challenges: a flexible functional form, especially with a large number of products, and reasonable identifying assumptions. The most commonly used approaches, to deal with the large number of products, are multi-level budgeting (Hausman, Leonard and Zona, 1994) and the discrete-choice, characteristics, approach (Berry, Levinsohn and Pakes, 1995; Nevo, 2000). Prices are set endogenously and typically respond to demand shocks that are unobserved by the researcher, and therefore instrumental variables are needed. Two common instrumental variables are observed characteristics of other products (Bresnahan, 1987; Berry, Levinsohn and Pakes, 1995) and out-of-market prices (Hausman, Leonard and Zona, 1994; Nevo 2000.)

Second, pre-merger cost parameters are recovered. One approach is to assume a model of pricing (Bertrand, say) and to use it jointly with the estimated demand parameters to recover implied marginal costs. If needed, the implied marginal costs can be regressed on characteristics in order to recover cost functions. Alternatively, the pricing equation, and the cost functions, can be estimated jointly with demand. Either way, the model of pricing can, and should, be tested (Porter, 1983; Bresnahan, 1987; Nevo, 2001). Finally, marginal cost can be approximated from accounting data, but these tend to be unreliable.

Third, the recovered marginal costs and estimated demand parameters are used jointly to simulate the new equilibria that would result from a merger. Usually, the analysis focuses on 'unilateral effects', with the likelihood of (tacit) collusion fixed. In principle, however, the simulation can use a different model of competition post-merger from the one used to recover the parameters. In order to address potential cost reductions, the simulation can be performed with marginal cost fixed, by changing marginal costs or by asking what cost saving is required to keep consumer welfare, or any other

measure, at a certain level (Nevo, 2000). Finally, the model can be used to assess the likelihood of entry and/or the change in incentive to collude.

The end result is a prediction of post-merger prices and quantities under several scenarios. With the use of the estimated demand and supply functions, these equilibrium quantities can be converted into consumer welfare and (variable) profits. The change in welfare and profits can be used as the basis for evaluating the merger instead of the change in concentration. This has the advantage of being linked to economic theory and the underlying trade-off between reduction in competition and improved efficiency. It also allows the parties to assess the accuracy of the prediction due to the assumptions by simulating under different assumptions, or due to the data by computing standard errors.

There are several potential pitfalls in using merger simulation. The simulation is only as good as the model it is based on and the parameter estimates that go into the simulation. Therefore, one should take extra care in choosing a model suitable for the industry. Furthermore, in some cases data and time constraints might limit the ability to consistently estimate the parameters required for the simulation.

Despite the fact that merger simulation has been used extensively in practice, there is little work testing its accuracy with the use of post-merger data. One exception is a study of mergers in the airline industry (Peters, 2003) that finds that simulation methods do a reasonable job at predicting the price effects of mergers. Peters also finds that a large fraction of the unexplained change in prices comes from changes in marginal costs or firm conduct (his analysis cannot separate the two). Retrospective analysis of this sort is useful not just in evaluating the quality of predictions but also in pointing to directions in which the modelling and analysis can be improved.

For further readings and details see Whinston (2005, ch. 3).

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Index terms

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