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The Emperor's New Clothes? – the role of merger simulation models

The Commission's new Notice on Horizontal Mergers highlights the importance of unilateral effects analysis in evaluating mergers in differentiated product markets.[1] In industries where the products supplied by firms are differentiated, market shares can either over- or understate the significance of the competitive constraint that each party poses on the other, and a more sophisticated analysis is needed. Reflecting that need, there has been a recent upsurge in interest in the potential role of merger simulation models in EC merger control. Proponents of these models often claim that they result in a robust prediction of the ultimate impact of differentiated product mergers – that they allow the analysis to go "straight to the answer", rather than becoming distracted by unproductive debates on market definition and purely structural factors.

This Brief takes a critical look at simulation models. Can they deliver on such promises? Or is their contribution a more limited addition to the range of analytical techniques that can usefully be applied in merger assessment?

What do merger simulation models aim to do?

Merger simulation models attempt to estimate the effect that a merger will have on market prices by combining estimates of elasticities of demand (and other variables such as price and quantity) with an economic model of how firms interact. The more substitutable are the products of the two merging parties (i.e. the greater their respective cross elasticities of demand), the more likely it is that the merger will cause a price increase. This approach is consistent with the standard theory of unilateral effects. Whereas pre-merger each merging party would lose sales to the other if it were to increase price, any such switching that occurs post-merger will merely re-distribute revenue from one part of the firm to another. The merger makes a price rise more likely because it removes a constraint.

Simulation models also seek to assess the impact on the prices charged by rival suppliers. This can be done in various ways, but essentially the models assume that an increase in price by the post-merger firm will boost demand for competing firms' products as consumers switch their demand towards these alternatives, and will therefore encourage them to raise prices too. This turns the "unilateral" effect into what some have called a "multilateral" or "non-coordinated" effect of price increases all round, until some new sustainable equilibrium is found in the market.

Variants and technical issues

There are many variants of merger simulation models that range in sophistication. However, in order for estimates to be made, some assumptions need to be made as to the nature of competition. The standard assumption made in merger simulation models in differentiated product markets is that firms compete in a manner consistent with so-called Bertrand competition: each firm chooses a price to maximise profits assuming its rivals will keep their prices constant. This gives rise to what is known as a non-cooperative Nash equilibrium.

One of the main reasons for increased interest in the technique is the development of simple simulation models that require only limited data on the merging firms and their competitors. The PCAIDS model, advocated by Epstein and Rubinfeld, is the simplest model.[2] It requires just two inputs – the pre-merger market shares and the brand level demand elasticity of one of the merging parties – in order to generate a prediction of the

1 "Guidelines on the assessment of horizontal mergers under the Council regulation on the control of concentrations between undertakings", DG COMP, 28 January 2004. The Notice uses the term "non-coordinated effects" instead of unilateral effects.

2 Roy Epstein and Daniel Rubinfeld, "Merger Simulation: a Simplified Approach with New Applications", Antitrust Law Journal, 2002, Volume 69. The PCAIDS model shares many of the same simplifying assumptions as the logit model, another simplified commonly advocated approach.

effect of a horizontal merger. The model assumes that if one firm raises price it loses demand to other brands in proportion to their market shares.[3] Assumptions about the shape of the demand curve determine how far the post-merger firm will push up prices, and the assumption of Bertrand behaviour allows the model to solve for its ultimate impact on market prices.

But, this is an extremely restricted model, in which the unilateral effect of a merger on the merging firms' prices is constrained to be related directly to the market share of the merging firms. Thus, the simplicity of this model comes at a very high cost – its complete inability to explain the reality of an industry that is characterised by differentiation. It is possible to add slightly more realism into this model through introducing "nests" into the demand assumptions, whereby certain products are acknowledged to be closer substitutes then others. Information on diversion ratios between the brands can help to inform the way the nests are constructed.[4]

With better information on the nature of inter-brand competition, a further class of more ambitious simulation models take this a step further by including statistical estimates of the individual cross-price elasticities as inputs into the simulation. This approach was adopted by Ivaldi and Verboven in their analysis of the European truck market conducted for DG COMP on the Volvo/Scania merger.[5] Such approaches require much more in the way of data, but can claim to derive more realistic results based on the actual interaction between brands. They also allow the analysis to be be less constrained by specific market definitions, since the degree of substitutability between brands "reveals itself" through the estimation process.

Despite the sophistication of the empirical techniques they use, the predictions generated by these models remain highly dependent on a number of key technical parameters. For example, whether demand curves are linear or convex can make the difference between high or low post-merger price increases, and varying assumptions about the nature of interaction between the members of an oligopoly group affects the way in which a unilateral price rise by the merging firm will translate to an industry-wide outcome.[6]

Policy implications

There are a number of important issues raised by the use of simulation models in merger control, and it is important that the debate on their uses and abuses is embraced by all interested parties, not just the technicians.

"All mergers are bad"

The notion that a simple deterministic relationship exists between the structure of a market and the price level has been discredited in the industrial organisation literature since the 1970s, yet oddly the economics profession has given a surprising level of support to this proposition when analysing unilateral effects. A recent research paper carried out for DG COMP by some of Europe's most distinguished academic industrial economists exemplifies this in the following conclusion:[7]

> "Whether firms compete in prices or quantities (or capacities), a merger between competitors increases the remaining firms' market power (both for the merged firm and its competitors), thereby leading (absent any efficiency gain) to higher prices and lower output".[8]

The concept of "non-coordinated effects" in the Commission's Notice on horizontal mergers was introduced partly in response to such sentiment, and specifically to allow the Merger Regulation to attack mergers at levels of concentration below the dominance threshold.[9] It is clearly legitimate in principle for merger control to be used to prevent mergers that have significant adverse unilateral effects, and the ability to do so should

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Thus, for example, in a 3-firm model containing brands A, B and C where market shares are 20%, 20% and 60% respectively, it assumes that the loss of demand brand A will suffer if it raises price will be distributed between brands B and C in the ratio 20:60.

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In a merger in the car sector, for example, luxury car brands such as BMW, Mercedes and Saab would be placed together in a nest that accepted these brands competed more directly with one another than they do with Ford, Renault and Volkswagen. The diversion ratios for the BMW brand would measure the proportions in which demand that switches away from BMW is captured by Mercedes, Saab, Renault, etc.

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Mark Ivaldi and Frank Verboven, "Quantifying the Effects from Horizontal Mergers in European Competition Policy", Working Paper, December 2002. The authors' analysis was not, however, expressly relied upon by the Commission in their prohibition decision.

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For a discussion, see "Gregory Werden, "Simulating the Effects of Differentiated Products Mergers: A Practitioner's Guide", 1997, and Gregory Werden and Luke Froeb, "Calibrated Models Add Focus, Accuracy and Persuasiveness to Merger Analysis", Discussion Paper June 2002.

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"The Economics of Unilateral Effects (Preliminary Version)", by Marc Ivalidi, Bruno Julian, Patrick Rey, Paul Seabright and Jean Tirole (IDEI, Toulouse), March 2003.

not have to be dependent on artificially fitting the facts of an industry into a market definition straightjacket. But the "all mergers are bad" school runs a severe risk of defining an excessively strict merger standard.

This problem carries over directly to merger simulation models, because they are built around the assumption that mergers involve a simple transformation from one equilibrium to another, in which the only change is the number of competitors. Although there is wide-ranging debate about the appropriate choice of model and its associated assumptions, the debate on merger simulation is often focused exclusively on how big those price rises will be. All horizontal merging parties are guilty, the only question is whether they are guilty enough to justify having their mergers blocked.

Exaggerated role for efficiency effects

One direct consequence of this is the emphasis that it places on the need to show efficiency benefits from a merger. If all mergers increase market power, then the only way to justify a merger as having a benign effect on prices and consumers is if the merger causes a fall in the merging firms' marginal costs that is greater than the post-merger increase in price-cost margins. But in practice proving merger-specific changes in marginal costs is notoriously difficult.[10]

The study of post-merger efficiencies is a worthy cause, and often one that can yield useful insights into the way in which competition in an industry works. However, the heightened importance that has been given to merger efficiencies as the only antidote to the "all mergers are bad" prescription has distorted the debate on merger effects.

Moreover, there is a clear inconsistency between such statements and the existing enforcement policies of the major merger control authorities. Whereas merger simulations and simple oligopoly models consistently predict significant post-merger price increases at comparatively low levels of concentration, the fact is that up to now few mergers are challenged on grounds of unilateral effects or single firm dominance unless they occur in very concentrated markets. This means either that merger control is too permissive, or that merger simulation models are systematically too pessimistic about the effects of mergers on competition.[11]

It is critically important to resolve this inconsistency because the two interpretations have a big impact on the level of enforcement of merger control.

What's missing?

In particular, we believe that slavish use of merger simulation models will give rise to policy that is out of line with economic reality, since such models (and those who advocate their use without due regard for their limitations) systematically underestimate the resilience of markets to change.

The main ingredient that is missing from the simulation models but that is present in real world markets is market dynamics in the form of active customers and responses by rivals. Simulation models uniformly assume essentially passive customers who, although they switch demand away from brands whose price has increased, take no active steps beyond this to prevent the merger from inflicting harm on them. In this setting, it is easy to see how mergers reduce competition, and how the reactions of rival suppliers to the post-merger firm reinforce the unilateral price rise.

This passive characterisation of the competitive process has the merit of being convenient to model. However, it is completely inconsistent with the way in which competition operates in most markets. When an element of customer reaction, buyer power and/or supply-side response is added to the mix, the neatness of these simple predictions is upset in a manner that is fact-dependent and varies substantially from the assumptions

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To illustrate the phenomenon of mergers that can give rise to a "strong impact on prices" through unilateral effects despite not creating a single dominant firm, the authors construct a Cournot model in which a 5 to 4 merger between equal-sized firms in a homogeneous goods market results in a post-merger price rise in excess of 5%. Similar price predictions can be extracted from Bertrand models at low levels of concentration.

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In the Draft Notice on horizontal mergers, the term "non-collusive oligopoly" was used to capture this class of case. See Simon Bishop and Derek Ridyard, "Prometheus Unbound: Increasing the scope for intervention in EC merger control", ECLR Issue 8, 2003, for a fuller discussion of the Draft Notice.

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Even if successful, it carries with it the danger that superior post-merger efficiency will be added to the list of negative factors when the Commission comes to assess the risk of dominance.

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Epstein and Rubinfeld highlight this point. argueThey argue, on the basis of their simulation model, that the US merger guidelines are too permissive in suggesting a safe harbour from unilateral effects below 35% because their simulation model generates adverse outcomes at lower levels of concentration.

of Bertrand conduct.[12] For example, merger simulation models are most commonly applied in branded consumer goods markets, in which producers sell to large grocery retail chains. Yet whilst end consumers in such markets may be passive, grocery retailers most certainly are not. Their ability to control and re-allocate shelf space, discipline powerful suppliers and promote rival brands injects a powerful dynamic force into competition in branded consumer goods markets that has to be taken into account when assessing mergers in this sector. Similar effects apply in most other industries.

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It is possible to replace the Betrand behaviour assumption with some other mechanistic rule for oligopoly behaviour such as imposing a Stackleberg equilibrium. But such variations do not resolve the problem we identify here.

The debate on the utility of simulation models as a guide to merger effects cries out for some kind of sanity check in which their assumptions are assessed against the observed behaviour of post-merger firms and the role that customers and rivals play in circumventing increases in market power following mergers. One such check is provided by a piece of work commissioned by the OFT in 1999 which balanced an assessment of the theoretical models against a series of empirical case studies that took a retrospective look at several completed mergers in highly concentrated markets that had been vetted and approved by the UK authorities.[13]

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"Merger appraisal in oligopolistic markets", OFT Research Paper 19, November 1999.

The most striking feature of the OFT research was the lessons that could be drawn from the case studies. In most cases, post-merger events were substantially shaped by the strategic behaviour of rival firms and/or powerful buyers in the affected markets, or by dynamic changes in the industry that had provided part of the rationale for the merger itself. This was summarised in the OFT research as follows:

> "the case studies provide a reminder that mergers do not take place in a vacuum. The dynamic responses that take place after mergers underline the fact that post-merger predictions based purely on clues from demand-side relationships tell only part of the story. Thus, although models of unilateral effects provide useful insights into possible danger areas, they must be supplemented by an attempt to assess how the market may respond to structural changes caused by mergers."

At a minimum, proponents of merger simulation models need to heed the lessons from such studies before making exaggerated claims for their ability to predict merger outcomes.

Conclusions

Merger simulation models clearly have a role to play in modern merger analysis. However, such models on their own seldom if ever provide robust predictions of the ultimate effects of horizontal mergers. There are sufficient grounds in theory alone to be suspicious of the simplified assumptions of Bertrand behaviour on which these models typically rely. In many instances, there may also be other more effective ways to apply econometric techniques in merger analysis that do not rely on such restrictive assumptions. Moreover, insufficient attention has been given to testing the predictions of these models against actual outcomes from mergers in concentrated markets.

At present, a more realistic claim for merger simulation is that it provides a more intelligent and systematic way to capture the kind of prima facie concern for mergers that has traditionally been provided by a quick look at market shares or concentration ratios, particularly in differentiated product markets. However, as with market share tests, its true role is to provide an intermediate staging post on the way towards a comprehensive merger analysis. Until convincing ways are found to model the effects of customer reactions and strategic factors such as entry and supply-side re-positioning, merger simulations provide at best a part of the story, and not the final word.