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EU merger analysis

Merger simulation models in the context of the Merger Regulation

by **Maurizio Conti***

The revised European Commission (EC) Merger Regulation adopted in 2004 has involved a shift from the use of a pure dominance test to a “substantial impediment of competition test” in merger analysis. It might be expected that this shift will lead to more empirical analysis in general, and to the use of merger simulation models in particular, by the European Commission, in order to evaluate the likely effects of mergers that reduce competition in the relevant markets on output and on prices. Although many economists would agree that merger simulation models, if properly applied, can provide useful insights in merger cases, their use is still controversial and often the source of debates among experts. This article aims briefly to assess the role of merger simulation models in the context of the revised EC Merger Regulation and then to use the merger simulation work commissioned by the Directorate General of Competition (DG Comp) in the Volvo / Scania merger as a case study with which to discuss the use of merger simulation models in merger analysis. (For key background information from the authors of the Commission report and the economists who worked for Volvo, see Ivaldi/Verboven and Hausman/Leonard in *References* below.)

Background

Before the revision of the EC Merger Regulation (Council Regulation No 139/2004), a merger could be challenged under European Community law only insofar it would create or strengthen a dominant position in the marketplace. The clearest possibility would be where the merger created a firm that was then individually in a dominant position and therefore able to increase prices (the unilateral effects of a merger) but, in a number of cases, the EC had found against a merger on the ground that it would lead to a position of collective dominance (also referred to as collusive oligopoly) and the probability of an increase in prices from tacit collusion (the co-ordinated effects of a merger). However the conditions necessary for the establishment of collective dominance are demanding (see further the Europe Economics (2001) EC assessment criteria report) and, as the judgment in *Airtours* confirmed, the Merger Regulation did not allow the EC effectively to tackle those mergers that, while they would not have created or strengthened a dominant position, individual or collective, would nevertheless have been anticompetitive with a probability of an increase in prices. Although the adoption of a substantial lessening of competition test as proposed by some countries might have been a more direct way of addressing this perceived gap in the EC Merger Regulation, the EC finally decided to revise the Merger Regulation merely by requiring that a merger would be challenged where it was likely to “significantly impede effective competition, in particular as a

result of the creation or strengthening of a dominant position”. The wording of the new test thus acknowledges the possibility that a merger might impede effective competition even when it would not give rise to a dominant undertaking or to a collusive oligopoly, that is, where the merger would give rise to unilateral but not co-ordinated effects. The scope of the regulation was thereby extended to cover mergers in a wider range of oligopolistic markets.

There is space here to provide only a brief explanation of the unilateral effects of a merger in an oligopolistic (or concentrated) market. In markets characterised by differentiation, firms would set prices in order to maximise their profits, taking the prices set by competitors as given (the analysis here is based on the Bertrand assumption that firms set prices rather than quantities): each firm would set prices at a level such that any further increase would result in a higher margin gained on infra-marginal consumers that was not enough to offset the fall in sales.

In an oligopolistic market, firms are restrained from setting too high prices because they know that they would then lose some customers to competitors, especially those that produce close substitutes. For instance, consider two firms, A and B, who want to merge. Before the merger, A (B) knows that setting too high a price would lead some customers to switch to B (A): however, after the merger, A (B) internalises the loss of customers to B (A) associated with the price increase, because it realises that at least a fraction of the lost customers would switch to the merging partner. The incentive to raise prices is particularly strong when the products of the merging firms are viewed by customers as close substitutes.

The higher prices set by the merged firm would then be likely to trigger a response by the remaining firms, which would increase their prices, triggering a response by the merged firm and so forth until a new equilibrium is reached. In the Bertrand framework, firms react to higher prices from a competitor increasing its prices (prices are defined as “strategic complements”).

The unilateral effect of a merger is therefore precisely the increase in prices that would result from the merger because of the merged firm’s internalisation of the “price externality” that prevented the pre-merger firms from keeping their prices “too high”.

Merger simulation models

While the old requirement of dominance could in principle allow the European Commission to base its decision mainly on the basis of the market share of the merging parties and other structural features of the market such as entry barriers, the “impediment of effective competition” test calls implicitly for

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the unilateral effects of any merger to be taken into account in order to decide whether or not it can constitute an impediment to the development of effective competition in the marketplace and hence to an increase in prices or other adverse effects.

Merger simulation models have been used in the past for this purpose. In the US, merger simulation models have been increasingly used in the last decade, perhaps reflecting the release of the 1992 horizontal merger guidelines which explicitly focused on the unilateral effects of mergers (see, for instance, Werden et al (2004)) and the view that consumer welfare should be the main standard to use in assessing competition cases. (Other reasons for the increasing use of merger simulation models might have been the improvements in computer power and speed and the availability of good data from retail scanning.) A similar trend towards the application of merger simulation models and, in general, quantitative methods in antitrust cases might therefore be expected also in the European Union and in the UK in particular. In the UK, the substitution by the Enterprise Act 2002 of a substantial lessening of competition test for the old public interest test – and the removal of ministers from the system – has led (if not unambiguously) to the elevation of consumer welfare as the correct standard to consider in competition cases, opening the way to the use of merger simulation models along the US lines.

Merger simulation models are appealing because, given some assumptions on the firms' conduct in the product market and some information on the demand and supply side, it is reasonably straightforward to derive the consequences that a merger would have on prices, profits and consumer welfare.

A merger simulation model can be described as an empirical approach, rooted in game-theoretical oligopolistic models, to estimate the unilateral effects of horizontal mergers. It combines a theoretical structural model of the industry in question with empirical estimates of demand and cost parameters in order to quantify the impact of the merger on equilibrium prices.

Merger simulation is in general conducted assuming that market shares and own and cross price elasticities have been determined (econometrically or from previous studies): these are used, together with the equations derived from the assumption that firms maximise profits, to determine the pre-transaction margins for each brand in the relevant market. Post-transaction prices are then computed, assuming that the merged parties maximise the sum of their joint profits. These post-merger prices are then used to compute post-merger margins, profits and consumer welfare (see further Epstein and Rubinfeld (2002) for an exhaustive introduction to merger simulation models). However, the use of merger simulation models is not free of problems as there are many models available in the academic literature that are based on various assumptions – for example, regarding the sensitiveness of marginal costs to output or the functional form (eg linear or with a “constant elasticity” form) chosen for the demand function – and that allow different degrees of “generality” and robustness in the results (ie they reflect real-world situations to different degrees), but which also have different features in terms of data required, the complexity of the computations and the time necessary to conduct the simulations (something which is often an extremely scarce resource in merger analysis). The main difference between merger simulation models rests on the

structural assumptions they make in order to deal with the high number of own and cross price elasticities that the model should calculate if some restrictions are not placed on the system of demand functions to be estimated.

For example, the PCAIDS model proposed by Epstein and Rubinfeld (which has recently been implemented by AGCM, the Italian competition authority and by the New Zealand Commerce Commission) is a very practical simulation model because it requires only the market shares, the industry price elasticity and the price elasticity of one brand in the market. The simplicity of the analysis and the paucity of information required stem from some simplifying hypothesis that are made: the most important is the “proportionality” assumption, ie the idea that a firm which raises its price will lose its customers to its competitors in proportion to their market shares, with no role played by “closeness” in the product differentiation space and, as a consequence, the fact that it is not necessary to estimate all the cross price elasticities.

When more time and information is available, it is possible to estimate (some of the) own and cross price elasticities as well as the price effects of a merger using econometric models which allow the researcher to relax some of the strongest and less tenable assumptions of the simplest models like the PCAIDS or the Logit. The main advantage of the Logit model is that it is simple to apply and it is not data-intensive. However, the flip side of the coin is that the cross price elasticity between any product i and any product j different from i is always the same. Different models are available in the economics literature like the Nested Logit (discussed further in the *Volvo / Scania merger* section below), the AIDS and the Random Coefficients Logit model, in ascending order of generality.

The Almost Ideal Demand System (AIDS), originally proposed in the context of merger analysis by Hausman et al (1994), is a quite flexible model as it avoids imposing “too strong” rigidities in cross price elasticities. To implement it, econometricians partition different goods into groups and groups into subgroups. For instance: drinks could be classified as wines, spirits and beers; beers could be further divided into lagers, ales and stouts; lagers could then be classified according to brands. This allows a very good degree of flexibility within groups, even if not across groups. The Random Coefficients Logit model is very flexible because it does not impose any strong a priori restrictions on the pattern of own and cross price elasticities. It does so assuming the consumer preferences are heterogeneous and estimating the unknown distribution of consumer preferences' heterogeneity. This avoids imposing too rigid a structure on the pattern of cross price elasticities. It is, however, difficult to estimate and rather data intensive.

The less restriction a model places on substitution possibilities between different brands, the more reliable the predictions of the simulation exercise are likely to be – providing that all the conditions necessary to estimate complex models are fulfilled, such as (for instance) quality of data and enough “degrees of freedom”. Therefore, the choice of the type of model to conduct the analysis is often not neutral in terms of the results of the merger simulation exercise. Furthermore, even the implementation of the same model could lead to debatable conclusions depending on issues such as data quality and robustness of the analysis.

The merger between Scania and Volvo that the European Commission did not allow to proceed in March 2000 is probably the first case of a fully fledged merger simulation exercise that has been attempted in an EC case so far. Without entering too much into the technical details of the case, it will be shown that sometimes economists disagree significantly over the merits and value of a particular model and that the findings of merger simulation exercises can therefore be highly controversial.

The Volvo-Scania merger

The merger between Volvo and Scania was notified to the European Commission in September 1999 and then blocked in March 2000. The main concerns arising from the merger related to the truck market. The truck market could be segmented into three categories: light duty trucks, medium duty trucks and heavy duty trucks (further divided into rigid trucks and tractor trucks).

The Commission decided to focus its analysis on the heavy truck segment only and to restrict the investigation to Sweden, Norway, Finland, Ireland and Denmark because the merger would not have created any dominant position in the remaining European Union countries. In the five countries mentioned, the joint market share of Scania and Volvo would have been in the 49%-91% range. The Commission defined the relevant geographic markets as the national markets of these five countries. Although DG Comp commissioned a merger simulation exercise from Professors Ivaldi and Verboven, the decision was ultimately based on conventional market share analysis. The large market shares of the merging parties, coupled with a large difference between the market share of the merged entity and that of the closest competitor (in the range of 36%-85%), strong brand loyalty, little customer bargaining power and high entry costs were invoked by the Commission to justify blocking the merger.

As said above, a fully-fledged econometric analysis was undertaken to simulate the consequences of the merger. The model chosen by Ivaldi and Verboven was the Nested Logit model, which has the advantage of allowing for some flexibility into the analysis by dividing products into nests – in the Volvo-Scania case, the two nests corresponded to rigid and tractor trucks – whereby products belonging to the same nest are closer substitutes than products belonging to another nest (but, within the same nest, the proportionality assumption of the simple Logit and PCAIDS model applies). Therefore the Nested Logit model is not a fully flexible model as it restricts somewhat the cross price elasticities, although in many cases it is considered a reasonably good approximation. The main results of the merger simulation exercise were computed assuming that Volvo and Scania were under common ownership and that the merger would not have induced any change in the degree of collusion in the industry. Two scenarios were considered.

The first was that the merger would not have entailed any efficiency saving. In this case, the merger simulation exercise showed that the merged entity would have led to an increase in prices of more than 10% in several countries (and, in particular, in all the countries analysed by the Commission), followed by negligible price increases by competitors. According to the simulation exercise, consumer welfare would have fallen in all

EU countries and, in particular, by 10% in Norway, 18% in Sweden, and more than 5% in Denmark, Ireland and Finland.

In the second scenario, it was assumed that the merger would have brought about a 5% reduction in marginal costs. In this situation, economic theory suggests that at least a fraction of these cost savings would be passed on to customers, reducing the increase in prices that would have otherwise occurred. The simulation showed that in the Volvo / Scania case, consumer welfare would have gone up slightly in four countries and down in the remaining twelve. In particular, the countries with the highest fall in consumer welfare would have been exactly the five countries considered by the European Commission.

The merger simulation exercise therefore offered strong support to the European Commission's conclusion, which was based on traditional market shares analysis. (However, it should be noted that the strong similarity between the conclusions of the merger simulation exercise and of the conventional market share analysis is likely to be case specific and should not be assumed to hold in general.) To reinforce their analysis, the authors also conducted some robustness tests which basically reinforced their confidence in the validity of the main conclusions, ie that the merger would have significant unilateral effects (Ivaldi and Verboven, 2005). Furthermore, the merger simulation analysis was conducted making assumptions which in general could be thought to be in favour of the merging parties (ie against the probability of finding adverse effects of the merger). One example is that marginal costs were assumed to be constant: if there were economies of scale, the post-merger restriction in output would have tended to raise marginal costs, reinforcing the post-merger price increase. The price elasticities were assumed to be increasing with prices, which again would tend to reduce the likelihood of a post-merger price increase.

Overall, it could be argued that the econometric analysis conducted on behalf of the Commission in the Volvo / Scania merger is a piece of work which clearly represents the state of the art in merger simulation analysis. Nevertheless, the results of the merger simulation exercise were strongly criticised by the team of economists defending Volvo. While referring back to Hausman and Leonard (2005) and Ivaldi and Verboven (2005) for a thorough discussion, there follows a brief analysis of the two most interesting issues that were raised by the Volvo economists in the case.

The first referred to the use of list prices in the simulation exercise. Volvo claimed that actual discounted prices should have been used in the analysis. This is a potentially serious limitation of the simulation exercise in that it could have led to serious bias in the estimates of the price effects of the merger. Ivaldi and Verboven replied that they had to use the information which was available (list prices) – hardly a convincing argument – and that, in any case, their model took into account the possibility that discounts were brand and country specific through the inclusion of brand and country effects in the econometric model, and that therefore they did not expect serious biases in their estimates.

Volvo experts also claimed that the results were extremely sensitive to the software and mathematical algorithm used in the econometric estimation procedure (up to 80% for the parameter of price): Ivaldi and Verboven replied that according to their

analysis, the difference was much smaller and that, in any case, the main conclusions of the report were unaffected. Clearly, dispute on these two issues by the rival economists was not resolved.

Conclusions

This discussion indicates why merger simulation models can be controversial, despite, indeed, perhaps because of, the sophistication of the underlying economic theory and econometrics. The analysis developed by Ivaldi and Verboven for the European Commission is a good example of one of the state of the art merger simulation models that are currently available in the economics literature. The authors found results consistent with traditional market share analysis and the results do not appear to be driven by particular assumptions favouring the finding of adverse effects of the merger.

However, as this case also illustrates, the report gave rise to a debate about the data used, the correct application of the methodology and the plausibility of the results of the econometric analysis. This might suggest that, while in general simulation exercises can provide useful indications on the likely effects of a merger, substantial care should be devoted to consideration of the quality of the data as well as to spelling out in detail the effects that the assumptions underlying the analysis might have had on the main predictions of the model and their consistency with economic reality.

Finally, it should be borne in mind that even best-practice merger simulation exercises are just a model – ie a simplified picture of how real markets work. It might therefore be that even a well-developed merger simulation exercise would not be able to capture the full effect of a merger on market outcomes. In fact, current merger simulation models cannot take into

account the full dynamic processes that a merger could give rise to, such as the possibility that a merger would trigger new entry, or market repositioning of rivals (for instance through the introduction of new brands), or a change in buying practices when some buyer power might be thought to exist. However, they can be a useful starting point in a merger case provided that good quality data are available and that they are used when the underlying theoretical model fits the market that is being simulated. When these conditions are not met, though, it could be safer not to expect too much from them, and in any case, results should be carefully scrutinised against those suggested by more conventional approaches.

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