Quantifying the Effects from Horizontal Mergers in European Competition Policy

Marc Ivaldi* **and Frank Verboven****

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Abstract

This paper starts from a recent case to study how merger analysis in Europe may potentially be improved through simulation analysis. Starting from the geographic market definition in the Merger Decision, we formulate and estimate an oligopoly model with differentiated products. The model is simulated to account for the changed multiproduct ownership structure after the merger. We show how our first two tests, a potential and an actual market power test, produce useful information, complementary to the traditional dominance principle adopted in the European Union. We also show how simulation analysis can provide useful additional information that goes beyond the traditional dominance principle. This is illustrated through two examples. First, we analyze the effects of efficiencies through cost savings. Second, we compare alternative merger sequences and emphasize the importance of evaluating the regional versus pan-European nature of a merger. These results contribute to the debate on the revision of current merger principles as they shed light on ways to improve actual practices.

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Contacts

Marc Ivaldi
Institut D'Economie Indutrielle
Université de Toulouse 1 - Sciences Sociales
Manufacture des Tabacs – 21, Allée de Brienne
31000 – Toulouse, France
tel: +33 (0)5 61 12 85 92
fax: +33 (0)5 61 12 86 37
ivaldi@cict.fr

Frank Verboven
Faculty of Economics and Applied Economics
University of Leuven
Naamsestraat 69
B-3000 Leuven, Belgium
Tel: +32-16-326944
Fax: +32-16-326732
frank.verboven@econ.kuleuven.ac.be

* University of Toulouse (IDEI, CEPR and EHESS)
** University of Leuven and CEPR

1. INTRODUCTION

Merger policy has shown several interesting new developments over the past years. In the U.S., the policy principles have been modified to incorporate recent theoretical developments in Industrial Organization, such as the analysis of oligopoly behavior and the role of efficiencies. This evolution is illustrated by the various revisions of the Merger Guidelines. At the same time, U.S. policy practice has shown significant changes. In particular, there has been an increasing reliance on empirical methods and simulation analysis. In Europe, policy principles have evolved more slowly, in part because of the shorter experience with European merger cases. The principles of market definition have recently been made more in line with U.S. rules. But once the market is defined, the actual merger investigation is still largely based on the traditional criterion of dominance, including the assessment of the market shares and qualitative criteria such as the easy of entry and buyer power.

This paper starts from a recent European case to show how merger analysis in Europe may be improved or complemented. Taking the geographic market definition from the Merger Decision as given, we formulate and estimate a suitable empirical oligopoly model with differentiated products. As an initial specification test, we verify whether our parameter estimates imply a price elasticity of total market demand consistent with industry sources. We then show how the model can be used to conduct a simulation analysis of the merger effects.

We look at the merger case from several different angles. First, we propose a hypothetical market power test, which measures the extent to which unilateral price increases by the merging parties are profitable. This test has the advantage of imposing only weak assumptions on firm behavior. Second, we apply an actual market power test, which measures the actual price increases based on more specific assumptions on post-merger firm behavior. Third, we modify the actual market power test to account for the role of cost saving efficiencies.

Finally, we consider a dynamic approach and show the importance of considering alternative possible merger sequences. More specifically, we compare sequential regional mergers with realistic pan-European alternatives. Regional mergers involve firms that belong to the same geographic area (e.g., Scandinavian countries), whereas pan-European mergers involve firms from different areas (e.g., one firm from the North and one from the South of Europe). In our application, we find that sequential pan-European mergers have significantly less anticompetitive effects than regional ones. The general lesson is that competition authorities should look forward when evaluating mergers and take into account possible future mergers and the way they may affect European integration. In this sense, the task for European competition policy authorities may be more involved than those in the U.S.

Our results imply that simulation analysis can provide useful information, complementary to the traditional dominance principle adopted in the European Union. They contribute to the debate on the revision of current merger principles as they shed light on the current approach. In particular this is apparent if one focuses attention to our first two tests (referring to potential and actual market power). On the one hand, we show that, in some circumstances that only an econometric model can precisely identify, the traditional market share investigation can provide a useful first indication on the expected anticompetitive effects. Because in the case considered here, we are not so far from satisfying these conditions, the ranking of the countries in terms of the merging firms' joint market shares is broadly consistent with a ranking based on our simulation analysis. On the other hand, a simulation analysis has the potential to improve the merger assessment since it allows one to incorporate all elements and complexities in an integrated framework. For example, current European practice asks whether a strong market share of a remaining competitor may compensate for a large joint market share of the merging firms. A simulation analysis can address the role of the competitors' market share in a theoretically consistent way.

We also show how simulation analysis can provide useful additional information that goes beyond the current approach based on the traditional dominance principle. For example, a simulation analysis can help to quantify the required cost savings from the merger. Similarly, it can be used to draw consistent comparisons with alternative merger scenarios that may take place if the proposed merger is blocked. Such a comparison may especially be relevant in Europe, because of different effects from regional and pan-European mergers. To apply an extended simulation analysis, it would be necessary to revise the current merger rules, based on the dominance principle.

There is an emerging literature on predicting merger effects based on a simulation analysis.[1] Baker and Bresnahan already propose a first approach to this question in 1985. Later Hausman, Leonard and Zona (1992, 1994) advocate the use of econometric models in competition analysis, and more specifically the use of multi-level demand model. Werden and Froeb (1994) calibrate (but do not estimate) a logit model to measure the effects of alternative mergers among U.S. long distance carriers. Jayaratne and Shapiro (2000) calibrate a nested logit model to assess the effectiveness of partial divestitures as a remedy to the possible anticompetitive effects of horizontal mergers. Nevo (2000) estimates a general random coefficient model to study merger effects in the U.S. ready-to-eat cereal industry. Pinkse and Slade (2002) follow a distance metric approach to study mergers in the brewing industry.[2] All these papers have their own focus of analysis, depending on the specifics of the case. The particular focus in the present paper is on several aspects of the European dimension. We ask how current European merger practice may be improved through simulation analysis, with or without diverting from the current approach based on the dominance principle. We also provide an

[1] Besides mergers, econometrics and statistical methods are now applied in many, if not all, domains of competition law. For a review, see Bishop and Walker (1999). See also the book edited by Slottje (1999).
[2] Advantages and inconveniences of the different types of modeling is beyond the scope of this paper.

economic justification for paying attention to the question whether a proposed merger, and possible further sequences, are of a regional or a pan-European nature. Detailed comparisons are possible, since the data are available for a large number of national markets.

2. THE MERGER PROCESS IN PRACTICE

2.1 General aspects of the merger process

The process of evaluating mergers follows various stages. A first stage usually asks whether the notified merger falls within the jurisdiction of the merger authority. In the European Union this includes the question whether the merger has a European dimension. If this is not the case, then the investigation is left to the individual country or countries.

The second stage considers the definition of the relevant market. The U.S. 1997 Horizontal Merger Guidelines explicitly state that "the market definition focuses solely on demand substitution factors, i.e., possible consumer responses". Supply substitution factors do not fall under the market definition process, but are considered elsewhere. Since 1982, the Guidelines specify their approach more precisely, based on the hypothetical market power test, or SSNIP-test. This principle states that the relevant market is a group of products and a geographic area such that a hypothetical, profit-maximizing firm would impose a "small but significant and nontransitory increase in prices". The profitability of such a price increase clearly depends on the extent of demand substitution. In a recent Notice (OJ C 372 on 9/12/1997), the European Commission has also set out its principles for market definition. Much in the spirit of U.S. practice, the focus is on demand substitution factors, with a reference to the SSNIP-test. "Small but significant" price increases are specified to be in the range of 5-10 percent. The attitude towards supply substitution factors is ambiguous. While it is stated that supply substitution constraints are taken into account at "the assessment stage of competition analysis", it is also stated that they may be taken into account when defining markets.

To define the relevant market in practice, both the U.S. Guidelines and the European Notice distinguish between the relevant product market and the relevant geographic market. For both dimensions the U.S. Guidelines describe a set of tools closely linked to the SSNIP-test. The tools set out in the European Notice correspond less clearly to this general principle. To assess the geographic dimension, the European Notice relies on "broad indications regarding the distribution of market shares of the parties and their competitors as well as a preliminary analysis of pricing and price differences at national and E.U. level". As supplementary information, the Notice assesses the actual pattern of trade flows, and identifies obstacles to trade (e.g., the distribution system) and the possibility that these will be removed in the short term. To assess the product dimension, the Notice

proposes to use various qualitative indicators, the views of customers and competitors regarding the price effects, and evidence of substitution in the past, possibly based on estimated price elasticities.

The third stage constitutes the actual merger investigation. In the U.S., this stage involves an analysis of market concentration and an investigation of potential adverse competitive effects, including the ease of entry.[3] The anti-competitive effects from the mergers may be explicitly balanced against beneficial effects, in particular the presence of efficiencies. In the European Union, the actual merger investigation focuses on an investigation of anti-competitive effects, without explicitly assessing beneficial effects, such as potential efficiencies. The investigation amounts to assessing the presence of dominance. A dominant position is found when a firm (or a group of firms) would be able to behave to an appreciable extent independently of its competitors and consumers. Assessing dominance is based on criteria such as the joint market share of the merging firms, the strength of remaining competition, and potential competition.

Neven, Nuttal and Seabright (1993) review the European merger decisions during the early nineties. They argue that the Commission has displayed little confidence in using the joint market share of the merging firms as the sole criterion. Their only consistent finding is that a joint market share of less than 25 percent is cleared within one month of notification. They also argue that the "strength" of the remaining competitors is most often used to complement information on the joint market shares. Finally, they observe the importance attached to buyer power and entry possibilities.

2.2 Differentiated Products in U.S. merger analysis

During the stage of the actual merger investigation the issue arises how markets with differentiated products should be treated. The European Merger Regulation does not consider this issue explicitly, in contrast to the U.S. Merger Guidelines. The Guidelines discuss the extent of product differentiation as one key determinant to identify a lessening of competition through unilateral effects (as opposed to coordinated interaction).[4] According to the Guidelines, the merging firms may find substantial price elevations profitable, depending on the extent to which the lost sales will be diverted to the product of the merging partner. If the merging firms' products are close substitutes relative to other products, the diversion will be particularly strong, making unilateral price increases more profitable. Interestingly, the Guidelines treat the observed market shares as an important indicator. According to the Guidelines, a significant share of consumers would be adversely affected if, among other things, the merging firms have a combined market share of at least 35 percent, and if a significant share of consumers of one merging firm's product regard the others as a second choice.

[3] Willig (1991) shows that, "for a market where the structure of demand was well represented by the logit model, (…) analysis of merger would be accurately based on market shares (…)." This remark is particularly acute to shed light on our analysis.
[4] The other determinant is the presence of capacity constraints.

Nevertheless, the Guidelines also state that market shares may both understate or overstate the competitive effects of concern.

Shapiro (1996) is more explicit about how the US antitrust agencies may conduct the actual merger investigation when products are differentiated. He distinguishes between four (pedagogical) steps in assessing the unilateral effects from a merger between brands "A" and "B". The first step is devoted to the measurement of the diversion ratio, which provides the fraction of sales lost by brand "A" that are captured by brand "B". Equivalently, it is the ratio of the cross-price elasticity of demand for "B" over the own price elasticity of demand for "A". At the second step, based on the diversion ratio and merging firms' current mark-ups, one calculates the post-merger price increase, assuming no synergies and no rival responses. The third step attempts to account for the effects of price and product responses by the rival firms. Finally the fourth step evaluates the potential presence of synergies that could reduce marginal costs.

Shapiro notes that the practical implementation of these steps depends on data availability. If there are detailed data on sales and prices, then the parameters of an oligopoly model for the industry can be estimated or calibrated, using assumptions about the structure of demand. That model can then be used to simulate the post-merger prices. The first two steps are thus effectively combined; the diversion ratio is implicitly subsumed in the analysis. The simulation approach has been applied several times in recent merger cases.[5]

If no detailed data are available, Shapiro proposes to employ some less sophisticated approaches to estimating unilateral competitive effects. Indeed the diversion ratio can be directly computed through survey data or company documents on the consumers' first and second choices. In other cases, one may apply the result that, under certain assumptions, the market share of brand "B" relative to the market share of all brands except "A" may also be considered as a first proxy for the diversion ratio.[6] For assessing the effect of the merger, one can obtain a measure of the expected post-merger price by combining a measure of the diversion ratio, an evaluation of mark-ups and some structural assumptions. For example, under a constant elasticity demand, when firms are symmetric and sell only one product before merger, Shapiro recalls that the predicted price increase satisfies the following relation:

$$\frac{p^* - p}{p} = \frac{mD}{1 - m - D},$$

where p and p^* are the pre-merger and post-merger prices, D is the diversion ratio and m is the pre-merger markup.[7]

[5] Shapiro (1996) discusses the proposed merger between Interstate Bakeries Corporation and the Continental Baking Company as an example where the simulation approach has been used.

[6] For example, if brand "A" has a market share of 25 percent and brand "B" a market share of 15 percent, one could compute the diversion ratio as 15/(100-25)=20 percent. This is an exact measure if (i) all brands compete symmetrically, and (ii) no consumers quit consuming, i.e. market demand is inelastic.

2.3 Summary

The long history of antitrust practice in the U.S. contrasts with the relatively short experience in Europe. This inevitably has led to some differences, although in some respects there is a tendency of convergence. The stage of the market definition has become more or less comparable in the U.S. and in Europe, at least in principle. The SSNIP test, first adopted in the 1982 U.S. Merger Guidelines has recently also become part of the market definition in Europe. In practice, the market definition may still differ substantially, depending on the case.

The stage of the actual merger investigation differs in several aspects. The U.S. makes an explicit balance between the anti-competitive effects from mergers against the beneficial effects, including efficiencies. A detailed list of tools is available, extending well beyond simple market share criteria and qualitative analysis. For differentiated product markets, simulation analysis has become recognized as a generalization of the traditional analysis based on market share criteria. In Europe, the actual investigation focuses on the likely anti-competitive effects from the merger. These are not balanced explicitly against beneficial effects. The analysis to assess dominance is currently based on market share criteria, combined with a traditional qualitative analysis.

3. THE VOLVO-SCANIA MERGER

The proposed merger between Volvo and Scania was notified to the European Commission on 22 September 1999 (Case No COMP/M. 1672). A Commission Decision on 15 March 2000 declared the merger incompatible with the Common Market and the functioning of the EEA Agreement. In light of our analysis, we summarize in this section the relevant aspects of the investigation by the European Commission, based on the public version of the Decision. We do not aim to offer a full description of the arguments used in the Decision.[8] We restrict attention to the analysis of the effects in the heavy trucks market.[9]

3.1 Market definition

The analysis of the relevant product market is short, and does not refer to the SSNIP-test. The truck market is classified in three categories: light duty trucks (less than 6 tons), medium duty trucks (5-16 tons) and heavy duty trucks (more than 16 tons). The heavy truck market is further subdivided

[7] Shapiro used this formula to obtain a rough sense of the likely price increase in the water jets merger.
[8] See http://europa.eu.int/comm/competition/mergers/cases/decisions/m1672_en.pdf.
[9] There was a separate analysis of the effects in the markets for buses and coaches.

into two segments: Rigid trucks and tractor trucks. Rigid trucks are integrated trucks, from which no semi-trailer can be detached. Tractor trucks are detachable. While it is recognized that rigids and tractors may not be fully substitutable, the overall conclusion is that the category of heavy trucks constitutes the single relevant market. Light and medium duty trucks are thus not included. No mention is made as to whether second hand trucks are part of the relevant market.

The analysis of the relevant geographic market is more detailed. Despite the views of the merging parties, the Commission concludes that the national markets constitute the relevant geographic market in the regions most affected. Several arguments are used to support this view. First, there are substantial price and markup differences across countries. Second, the models and technical configurations differ considerably, because of local consumer preferences and national technical requirements (e.g., the cab crash test in Sweden). Third, the selective and exclusive distribution system links the sales and after-sales services. The importance of profits from after-sales service may therefore induce dealers to charge higher prices to foreign customers. Finally, there are large variations in market shares across countries.

3.2 Assessment

The Commission Decision explicitly describes its methodology for assessing the creation or strengthening of a dominant position. It uses traditional market power proxies, i.e., market shares, supplemented by qualitative factors such as customer purchasing power and the likelihood of entry. The investigation is limited to the five countries where the creation of a dominant is found (Sweden, Norway, Finland and Ireland), or where this is found to be likely (Denmark).

For each of the five countries analyzed, the Commission takes the market shares as the starting point of the assessment. Table 1 gathers the market shares of the seven truck manufacturers. The table shows that the joint market share of Volvo and Scania is the largest in precisely the five countries where dominance is found (in the 49-91 percent range). This reveals that the Decision attached a high weight to the merging firms' joint market share in assessing dominance. In fact, from the borderline countries, namely Denmark and Portugal, one may infer that the critical market share for concluding dominance is around 44-49 percent in this case.

In its market share analysis the Commission also stresses that the merging firms' joint market share have remained stable, and showed no tendency to decline. Finally, the Commission points out the large difference between the joint market share of the merging parties and the market share of the largest remaining competitor in most of the five countries.

The Commission supplements its market share analysis with qualitative factors. First, the extent of brand loyalty and the customer structure is considered. For most of the five investigated countries, the Commission finds indicators of considerable brand loyalty and of a dispersed customer structure, with the large majority of transport companies owned by small operators. The Commission concludes that

there is little customer purchasing power to compensate for the increased market power by the merging firms. Second, the likelihood of entry is assessed. Entry costs are calculated to be high, especially in light of the small size of the markets and the low population density. The cab crash test in Sweden is mentioned as an additional entry barrier.

4. THE ECONOMETRIC MODEL

We specify an oligopoly model for the European heavy truck market that starts from the market definition adopted by the Commission. We thus assume geographically segmented markets and product differentiation in two segments: tractors and rigids. The specification closely follows the exposition of the nested logit model in Berry (1994), as extended to multiproduct firms by Verboven (1996).

4.1 Consumers and demand

A typical consumer is here a freight transportation company. There are *N* potential consumers, who may either buy one of *J* products (heavy trucks), $j = 1,..., J$, or otherwise choose the outside good 0, e.g. a medium duty truck, a second hand truck, or another transport mode.[10] The nested logit model classifies the products into *G* groups, and one additional group for the outside good. Products within the same group are closer substitutes than products from different groups. We consider two groups for heavy trucks: rigids (R) and tractors (T). The tree on Figure 1 depicts the consumer choice set.[11] Note that each group (buying a rigid truck or a tractor, or employing another transportation mean) corresponds to the use of a different logistic chain.

The utility to consumer *i* from purchasing product *j* is given by:

$$u_{ij} = d_j + z_{ig} + (1-s)e_{ij}. \quad (1)$$

The first term, d_j, is the mean valuation for product *j*, common to all consumers. It depends on the price of product *j*, p_j, a vector x_j of observed characteristics of product *j*, and an error term x_j reflecting unobserved characteristics:

$$d_j = x_j b - a\, p_j + x_j, \quad (2)$$

[10] Note that in this industry, each manufacturer produces one model per type of truck, which can come under many variants.
[11] This Figure and all subsequent tables are gathered at the end of the text.

where a and b are parameters to be estimated.

The second and the third term in (1), z_{ig} and e_{ij}, are random variables reflecting individual *i*'s deviation from the mean valuation. The term z_{ig} is consumer *i*'s utility, common to all products belonging to group *g*, whereas the term e_{ij} is consumer *i*'s utility, specific to product *j*. The parameter s lies between 0 and 1 and measures the correlation of the consumers' utility across products belonging to the same group. If $s = 1$, there is a perfect correlation of preferences for products within the same group; so these products are perceived as perfect substitutes. As s decreases, the correlation of preferences for products within same group decreases. If $s = 0$, there is no correlation of preferences: consumers are equally likely to switch to products in a different group as to products in the same group in response to a price increase. In this case, we have the standard logit model in which products compete symmetrically.[12]

Each potential consumer i chooses the product *j* that maximizes utility. To compute the probability that a consumer chooses product *j*, the nested logit model assumes that the random variables z_{ig} and e_{ij} have distributions such that z_{ig} and $z_{ig} + (1-s)e_{ij}$ have the extreme value distribution. Normalizing the mean utility level for the outside good to 0, i.e., d_0=0, the probability s_j that a potential consumer chooses product *j* is given by the following formula:

$$s_j = \frac{\exp\left(d_j/(1-s)\right)}{D_g} \frac{D_g^{1-s}}{1+\sum_{g=1}^{G} D_g^{1-s}}, \tag{3}$$

where D_g is defined by:

$$D_g = \sum_{k \in G_g} \exp\left[d_k/(1-s)\right]. \tag{4}$$

For the model to be consistent with (random) utility maximization, a has to be positive and s has to lie between 0 and 1. At the aggregate level, the choice probability s_j coincides with the market share of product *j*. The total quantity sold of product *j*, q_j, is simply given by the probability that a potential consumer chooses product *j* times the total number of potential consumers *N*:

$$q_j = s_j N. \tag{5}$$

The net consumer surplus, *CS*, measures the attractiveness of the set of *J*+1 products in monetary terms, after subtracting the price consumers have to pay. It is given by the expected value of

[12] In this case, the merger analysis can be based on market shares exclusively. See footnote 3.

the maximum of utilities. Using the assumptions of the nested logit model, the net consumer surplus *CS* equals (see, e.g., Anderson, de Palma and Thisse, 1993):

$$CS = \frac{1}{a} \ln\left(1 + \sum_{g=1}^{G} D_g^{1-s} \right). \tag{6}$$

4.2 Pre-merger and post-merger pricing

Each firm f produces a set F_f of products. Its profits are given by the sum of its operating profits for each product minus fixed costs *K*. The operating profits for product *j* equal the total sales of product *j* times the operating margin, i.e., the price p_j minus the (constant) marginal cost c_j for product *j*. Thus firm *f*'*s* profits are:

$$p_f = \sum_{j \in F_f} \left(p_j - c_j \right) q_j - K . \tag{7}$$

Producer surplus is simply the sum of these profits across firms. Total welfare is the sum of producer surplus and consumer surplus, defined earlier.

Firms choose the prices of their products to maximize profits, given the prices set by the other firms. Each firm trades off two effects when considering an increase in price by one unit: (i) it increases profits proportional to the current sales level of the firm, (ii) it reduces sales, which lowers profits proportional to the current markup. The multiproduct firm takes into account that the lost sales on one product may be partly compensated by increased sales on its other products. The importance of this effect depends on the above discussed diversion ratio between the products, i.e., the fraction of the sales lost due a price increase that is recaptured by the other products owned by the firm.

Pre-merger and post-merger pricing follow a similar logic. One simply needs to appropriately reinterpret the set of products F_f owned by the merged firm. If there are no other changes due to the merger (such as cost synergies), then the merged firm will always have an incentive to raise prices. This is because it takes into account the effect of a price increase on the sales of its merging partner. The magnitude of the price increase will depend on the diversion ratio.

More formally, a multiproduct Nash equilibrium is given by the system of *J* necessary first-order conditions.[13] Following Verboven (1996), the first-order condition for product *j* can be written as

$$p_j = c_j + \frac{1-s}{a\left(1-s\, s_{f/g} - (1-s)\, s_f\right)}, \tag{8}$$

[13] In the following we assume that a Nash equilibrium exists. Caplin and Nalebuff (1991) prove existence in a general discrete choice model, assuming single product firms. Anderson and de Palma (1992) prove existence for the nested logit model with multiproduct firms, assuming symmetry.

where $s_{f/g}$ is the market share of firm f in group g, and s_f is the market share of firm f in the total market. Intuitively, the price for product j is equal to marginal cost plus a markup term. The markup term depends on product j 's own-price elasticity and the cross-price elasticities with respect to the other products owned by the firm. The solution given by Equation (8) shows the role of the market shares and the substitution parameter s .

The marginal cost for product j is constant and depends on a vector w_j of observed characteristics of product j, and an error term w_j , reflecting unobserved characteristics:

$$c_j = \exp\left(w_j g + w_j\right), \tag{9}$$

where g is a parameter vector to be estimated.

4.3 Specification and estimation

We estimate the demand equation (3) and the pre-merger pricing equation (8), using the expressions for the mean utility (2) and marginal cost (9). The parameters to be estimated are a , s , b and g . The observed variables are prices, p_j , sales, q_j , and the characteristics, x_j and w_j , influencing the mean valuation and marginal cost. The total number of potential consumers N is assumed to be known. The econometric error terms are the unobserved characteristics, x_j and w_j . They enter nonlinearly in both the demand and the pricing equations (3) and (8). The pricing equation can be easily log-linearized. To linearize the demand equation, we follow the transformation procedure proposed by Berry (1994). We estimate the transformed demand and the pricing equation simultaneously using nonlinear three-stage least squares. This estimator takes into account cross-equation parameter restrictions and possible correlation between the error terms x_j and w_j . It also takes into account the endogeneity of prices and sales through instruments.

To estimate the model we use a panel of 16 countries in the E.E.A. over 2 years (1997 and 1998). Prices are list prices of a base model. Sales are total sales for the model range.[14] The characteristics vectors x_j and w_j contain the same exogenous variables: Horsepower, a dummy variable to denote "tractor", a set of dummy variables to measure country-specific effects, a set of dummy variables to measure firm-specific effects, and an interaction dummy variable to indicate whether the product is produced by a domestic firm.[15] To account for endogeneity, we use the following variables as instruments in the demand and pricing equation of prices and sales): The sum of

[14] These data have been obtained from a survey run by the Merger Task Force under the conduct of the authors. The values of market shares obtained by that way are very close to the ones presented in Table 1.

horsepower of all competing products in a country per year, and the sum of horsepower of all competing products in a group (tractor or rigid group).

The total number of potential consumers *N* is set equal to the average total sales in the country over 1997-1998, multiplied by a potential market factor 1+*r*. We consider two scenarios: $r = 0.5$ and $r = 3.0$. In other words, we assume that the total potential market is fifty percent to three hundred percent larger than the average annual sales. It is an implicit assumption on the size of the market share of the outside good. We return on this assumption below.

Most parameter estimates for the characteristics (in the vectors g and b) are significant with the expected sign, and robust whether $r = 0.5$ or $r = 3.0$ is assumed. For example, the estimates of the firm-specific fixed effects show that a firm with a higher marginal cost also tends to have a higher mean valuation. Domestic firms also receive a higher mean valuation. They experience only an insignificant cost advantage over foreign firms.[16] Horsepower has a positive and significant effect on marginal cost; it has a negative but insignificant effect on the mean valuation by consumers. To interpret this, note that the horsepower variable may not only capture truck performance. It may also reflect unmeasured maintenance and operating costs for truck drivers, which do not affect marginal cost, but negatively affect the mean valuation. As a result, the effect of horsepower on marginal cost is unambiguously positive, whereas its effect on the mean valuation may be positive or negative.[17]

Most relevant for our purposes are the estimates of the parameters a and s, which determine the estimated price elasticities and markups. Table 2 shows the estimates for the two assumed values of the potential market factor ($r = 0.5$ and $r = 3.0$). Note that these estimates satisfy the necessary restrictions for the nested logit model to be consistent with random utility maximization. Consumers respond to a price increase by reducing demand ($a \geq 0$). The hypothesis that trucks within the same group (rigid or tractor) are perfect substitutes can be rejected, since s is significantly less than 1. The hypothesis of symmetric competition between trucks from the same group and trucks from different groups cannot be rejected, yet the 95 percent confidence interval for s suggests that there is segmentation between segments. The estimated marginal costs c_j and mean valuations d_j implied by the estimates are positive for all products, and usually of a reasonable order of magnitude.

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[15] More specifically, DAF is a domestic firm in the Netherlands, MAN. and Daimler are domestic firms in Germany, Renault is a domestic firm in France, Iveco is a domestic firm in Italy, and Volvo and Scania are treated as domestic firms in the Nordic countries.

[16] A cost advantage for domestic firms may occur for example because of lower transportation costs.

[17] The literature on the automobile market usually finds a significant and positive effect of horsepower on the mean valuation term. First, this literature may better control for maintenance costs in the mean valuation term,

5. MERGER ANALYSIS

We now show how the econometric model can be used to assess merger effects. We begin with a specification test to see whether our estimates imply a price elasticity of total market demand consistent with industry sources. We then consider two tests, a potential and an actual market power test, to see how simulation analysis can provide useful information, complementary to the traditional dominance principle. We then go beyond the current policy principles in Europe by considering two extensions: The role of efficiencies and a comparison between a regional and a pan-European merger scenario.

5.1 Definition of the relevant market

The econometric model considered two different scenarios for the potential market factor *r*. The first scenario has a potential market factor $r = 0.5$, i.e., a potential market size that is fifty percent larger than the actual average market size during 1997-98. The second scenario has $r = 3.0$, i.e., a potential market size that is four times larger than the actual market size (measured by the average annual shipments). A preliminary question before assessing the merger effects is which of these two scenarios is the most plausible.

To address this question, note that there is a close correspondence between the potential market factor *r* and the price elasticity of total market demand. When *r* is large the outside good is an important substitute, so that the price elasticity of total market demand is large.[18] In principle, the parameter *r* can thus be estimated, just as one can estimate the price elasticity of total market demand. In practice, however, the identification of *r* requires data for a sufficiently large time horizon.

Since our product-level data set covers only two years, estimation of *r* proved difficult. Limited data are likely to be present in most other merger cases, since decisions need to be made fast, especially in Europe. A suitable alternative approach is therefore to make use of supplementary information. In particular, one may make use of available evidence on the price elasticity or estimate it based on long-term aggregate data. This may be confronted with the elasticity implied by alternative values of *r*. In our application, we looked for existing evidence on the price elasticity of market demand. The European Commission cites industry sources that have found the price elasticity to be around –0.9 for heavy trucks above 16 tons, and –0.4 for trucks above 24 tons. We confront these estimates with the price elasticities implied by our two alternative scenarios.

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see, e.g. Berry, Levinsohn and Pakes (1995) who include fuel efficiency. Second, consumers of cars may put a higher weight on the performance of a car relative to the implied higher maintenance costs.

[18] For example, in the simple logit model ($s = 0$) the price elasticity of market demand, measured at identical prices *p*, is equal to $-a\left[r/(1+r)\right]p$.

The results are displayed in Table 3. In the first scenario, the implied price elasticity of market demand mostly varies between –0.5 and –0.6 depending on the country. In the second scenario, it varies between –1.0 and –1.5. These values have a similar order of magnitude as the estimates from the industry sources. To take a conservative approach (in the sense that a larger potential market size favors merging firms), we focus on the second scenario in our merger analysis.

5.2 Potential market power test

Our first test is a *potential market power test*. This test computes the profitability of unilateral and nontrivial price increases by the merging firms. More specifically, we consider price increases by 5, 10 and 25 percent. The elements of this test are defined as follows:

- *Profitability*. The profitability of a price increase depends on the diversion ratio and the pre-merger markups. The greater is the diversion ratio between the two merging firms' products, the more the merging partners can recapture each other's lost sales from the price increase. The larger are the markups, the more the partners gain from the recaptured sales.
- *Unilateral price increase*: The rival firms are assumed not to respond to the price increase, e.g., by partially raising their prices as well.
- *Nontrivial price increase*: A small price increase after the merger would necessarily be profitable. It has a negative but negligible effect on the product's own profits, and a positive and non-negligible effect on the profits of the merging partner's profit.[19] In contrast, a sufficiently large price increase eventually becomes unprofitable: The negative own-profit effect becomes substantial and at some point outweighs the positive profit effect of the merging partner.

Note that the test is related to the discussed SSNIP test, yet the focus is different. The SSNIP-test asks how many firms are needed to make a given price increase profitable, for the purpose of defining the relevant antitrust market. Our potential market power test asks whether the two merging firms can profitably raise prices by alternative amounts. The purpose is here to examine the potential of increased unilateral market power.

Table 4 shows the (normalized) percentage profit changes accruing to Volvo and Scania, when both firms would unilaterally raise the prices of all their products by 5, 10 and 25 percent. A robust finding is that a hypothetical price increase by 5 percent is profitable in almost all countries. Only in four countries would Volvo and Scania's joint operating profits (slightly) decrease after this

[19] This is because the negative own-profit effect is a second order effect, since firms are already maximizing their own pre-merger profits. The positive effect on the merging partner B's profit is a first order effect, proportional to the pre-merger markup of firm B.

hypothetical price increase. The highest profit increases are found in Sweden, Norway, Ireland and Denmark.

A different picture emerges for a hypothetical price increase by 10 percent. On the one hand, such a price increase is unprofitable for nine countries. On the other hand, for markets where the price increase is profitable, it is frequently more profitable than the 5 percent increase. This is most notably true in Sweden, Norway, Finland and Denmark. This conclusion extends to the considered large price increase of 25 percent. Such a price increase is only profitable in Sweden, but the profit increase is larger.

One may also interpret the results in Table 4 in terms of the market definition based on the SSNIP test. Following the rule that the relevant market is the minimum number of firms that can profitably raise prices by 5 percent, the merging firms by themselves constitute the relevant market in twelve out of the sixteen countries. Modifying the rule to a 10 percent price increase (the upper bound in the European Notice), the merging firms still constitute the relevant market in seven out of the sixteen countries.

A ranking of the countries based on the potential market power test is not inconsistent with a ranking in terms of the merging firms' joint market shares. One notable difference occurs in the top 5, where Denmark and Ireland switch places. A main advantage of the ranking based on the potential market power test is, however, that one can use more explicit and transparent rules in determining the cut-off points at which the merger becomes potentially harmful. [20]

5.3 Actual market power test

The above test assessed the potential of increased market power, by looking at the profitability of price increases without making detailed assumptions about post-merger firm behavior. The test is conservative in that it underestimates the profitability of price increases in two respects. First, it considers a percentage price increase that is the same for all products of the merging partners. In practice, the merging firms will typically find it optimal to increase the prices of their products by different amounts. The profitability of optimal price increases is thus typically larger. Second, the test ignores responses by competitors. In practice, competitors may respond to a price increase by also raising their prices. This is most obviously the case if the merger triggers collusive responses by the other firms; in this case price matching could be complete. Yet also if the rivals behave non-cooperatively, one may expect positive – albeit incomplete – price responses.

An alternative approach is the actual market power test, which imposes more specific assumptions about firm behavior after the merger. In our application we assume that firms continue to

[20] The ranking from our potential market power test is very similar with the ranking based on the joint market shares. This is because the value of s is not very large here. This illustrates the usefulness of an econometric analysis which is able to determine the conditions under which the standard merger analysis is adequate.

set prices non-cooperatively after the merger. We numerically compute the post-merger Nash equilibrium, with a modified ownership structure, and compare this to the pre-merger Nash equilibrium. This amounts to solving a system of 14 pricing and demand equations, to obtain the equilibrium prices and quantities of the 14 products.[21] We do not consider the possibility that behavior shifts from non-cooperative before the merger to something more collusive after the merger.

Table 5 shows the predicted price increases after the merger between Volvo and Scania in the various countries. The first two columns show the equilibrium price increases by Volvo and Scania for their rigid and tractor trucks (sales weighted averages). The last two columns show the average equilibrium price responses by the competitors. Generally speaking, Volvo and Scania are predicted to increase their prices by more than 10 percent in several countries, in particular the Nordic countries and Ireland. Note the fairly large price increase in the UK, one of the largest European countries. The predicted price responses by the competitors are positive, but quite small. Most firms in most countries respond by negligible price increases or price increases by less than 1 percent.

Using the predicted post-merger prices, we calculate various components of welfare. We consider changes in consumer surplus, producer surplus and total welfare. Because prices necessarily increase, consumer surplus will generally decrease and producer surplus will increase after the merger. Total welfare may either decrease or increase.[22]

Table 6 shows the results. Decreases in consumer surplus may be viewed as increases in an industry price index. Consumer surplus decreases especially in Sweden, Norway, Finland, Ireland and Denmark (decreases by 5 percent or more). Producer surplus especially increases in the same countries. Total welfare drops in all countries, despite the output reallocation effect implied by the price increases by the merging firms. The largest welfare decreases again obtain in the same five countries.

5.4 Accounting for efficiencies

The potential and actual market power tests applied above can be used without a need to modify current European merger principles. This implies several possible restrictions on quantifying the economic effects. A first limitation is that the analysis does not explicitly consider the presence of efficiencies. The simulated merger only induces the partners to take into account the effect of a price increase on each other's sales. As a result, the post-merger Nash equilibrium will necessarily entail higher prices than the pre-merger Nash equilibrium. To appropriately interpret the results from a simulated merger absent efficiencies, the policy maker should therefore keep in mind a general

[21] Recall that there are 7 firms and 2 groups of product.

[22] An increase in total welfare may obtain, even absent efficiencies, because of an output reallocation effect to the outsider firms. This effect is beneficial if social value of the outsiders' products is sufficiently high, which occurs if they have a high market share in equilibrium. See Farrell and Shapiro (1990) for an analysis in a Cournot model.

tolerance level regarding price increases absent efficiencies. This tolerance level may be based on a general (implicit) presumption regarding the average size of efficiencies expected from mergers. (See Fisher and Lande, 1983, and Röller, Stennek and Verboven, 1999).

An alternative approach is to explicitly consider the possibility of cost savings in the merger simulation. These possible cost-savings may then be confronted with the actual cost-savings claimed by the merging parties. Table 7 considers such an analysis for hypothetical 5 and 10 percent cost reductions and compared to the status quo (0 percent).[23] It shows that a 5 percent cost reduction increases consumer surplus in four of the sixteen countries, whereas a 10 percent cost reduction increases consumer surplus in 8 of the sixteen countries. Similar findings obtain for total welfare. These results provide an idea of the minimum required efficiencies for consumer surplus and total welfare to increase. These findings may be confronted with any possible findings on the actual amount of efficiencies to be expected from the merger.

5.3 Comparison to alternative mergers

The potential and actual market power tests are also limited because they only analyze the effects from the actual merger. A more relevant and frequently ignored question in the merger decision process is what will happen next. For example, if cost-savings in the form of returns to scale are claimed, it seems reasonable to expect that other firms with similar scale may propose further mergers. It may sometimes even be difficult for the competition agency to block the second merger if the first merger was allowed. In our application, the question of alternative sequential mergers is especially important from an international European integration perspective. The proposed merger is a regional one, meaning that the two merging firms' market shares are strongly correlated across countries. If the merger would be approved, then a second regional merger should likely to be approved as well if the same criteria are applied.

We first ask what will happen when two regional mergers will obtain: Volvo/Scania followed by Renault/Iveco. We then compare this to the alternative that these two regional mergers are blocked in favor of two pan-European mergers: Volvo/Renault and Scania/Iveco. All four firms have comparable European level sales, so that scale economies should be comparable. The results are shown in Table 8.

The first column in Table 8 show that the two regional mergers (absent efficiencies) reduce consumer surplus by more than 3 percent in most countries, and by more than 5 percent in five countries. The four firms involved in the two regional mergers effectively succeed in dividing the market, with regional blocks being formed. The second column considers the two pan-European

[23] The percentage cost reduction applies to the average of the marginal costs across countries. Since the estimated marginal costs may differ across countries (because of local costs), the percentage cost reductions may actually differ across countries.

mergers. Even though the same firms are involved, the merger effects are considerably smaller for most countries. The reduction in consumer surplus is larger than 3 percent in only six countries, and larger than 5 percent in only 2 countries. Similar conclusions can be drawn from looking at the total welfare effects from the merger.[24]

At the time of the Volvo/Scania decision, the Commission did not yet know which alternative merger sequences would happen afterwards. But note that our hypothetical experiment was partly implemented since Volvo and Renault merged just a few months later.

6. CONCLUDING REMARKS

Using the Volvo/Scania case as a background, we have shown how the econometrics of differentiated products markets can be performed and applied to help European antitrust authorities in their investigation of mergers. We hope to have shown that this technique is a fruitful tool to evaluate the issues at stake and to account for effects that are otherwise very hard to measure, like actions of rival firms in terms of price and strategy, cost efficiencies and alternative merger sequences. We have used both tests that can be applied using the current European merger principles, and tests that would require some changes in European merger legislation.

The model involves assumptions about cost conditions, demand conditions and market equilibrium. All together they produce a model that is parsimonious in the number of parameters to be estimated. This approach is necessary given European merger investigations provide rather limited time to collect data and perform a quantitative analysis. However, we believe that the model still provides a good approximation of the working of the heavy truck market and that the assumptions are favorable to the merging firms. In other words, our chosen simplifying assumptions tend to generate either unbiased or conservative estimates of the merger effects on prices and welfare. We now review the role of these assumptions.

Cost assumptions

It is assumed that marginal cost is constant, i.e., independent of output. The predicted price increases arising from the merger would be stronger if marginal costs were decreasing in output.[25] In contrast, the price effects would be weaker in the reverse case of increasing marginal costs (a capacity

[24] The reader interested by the industry already knows that the merger between Renault and Volvo has not been blocked.

[25] This is because an increase in price implies a lower production, which in turn implies a higher marginal cost under decreasing marginal costs. The price effect would, however, be less than proportional to marginal cost, since marginal costs are passed on incompletely.

constrained industry). In fact, it is rather unlikely that marginal costs are increasing, given the cyclical nature of the market and the need for firms to invest in a sufficient amount of capacity ex ante.

The model neither estimates fixed costs nor assesses fixed cost savings. Since the primary interest of the competition agency is in the price or consumer surplus effects, this assumption does not affect our analysis.

Demand assumptions

The demand side of the model is based on the multinomial nested logit model, which generates the following substitution pattern. When the price of one product increases by one percent, it increases the demand for the other products within the same segment by an equal percentage, whereas it increases the demand for products in a different segment by a lower percentage. Intuitively, the nested logit model thus imposes symmetric substitution patterns within a segment, yet it allows for asymmetric substitution patterns across segments, while remaining parsimonious in the number of parameters to be estimated. Moreover, the assumptions of the multinomial nested logit model regarding the substitution patterns may be viewed as favorable to the merging firms regarding the predicted price effects arising from the merger for two reasons. First, all products are symmetric substitutes within a segment, whereas a separate investigation described in the Commission's Decision concluded that the merging firms are likely to be closer substitutes. If this is true, our analysis would underestimate the price effects. Second, the elasticities are increasing in prices, while in the econometric antitrust literature, one often either assumes constant elasticities, or otherwise performs simulation analysis after with a "linearized" model assuming elasticities do not change. When price changes are large, the assumption of constant elasticities or the "linearization" may yield significantly higher price effects.

The model is usually described as a discrete choice model, in which each consumer buys a single truck. The model can be straightforwardly reinterpreted to describe demand behavior whereby each consumer buys more than one truck, but still a fixed number of the same brand. Recently, it has been shown that the discrete choice model can also be re-interpreted as a representative consumer model, in which one consumer has a taste for diversity and decides to purchase multiple brands of trucks (see e.g. Anderson, de Palma and Thisse, 1994, for the logit model).

When truck manufacturers are selling trucks in large amount to transport firms, they may find it optimal to apply discounts. Our econometric model at least partially control for discounts. First, the model includes firm-specific and country-specific dummy variables, thereby controlling for firm- and country-specific discounts. Furthermore, the econometric error term in the demand equation may be interpreted as capturing product-specific price measurement error, which we incorporated by applying instrumental variables (Berry, 1994). However the model does not allow for individual-specific quantity discounts. From a theoretical point of view only a few studies have looked to competition with nonlinear pricing and asymmetric information between buyers and sellers. Generally speaking, it

seems fair to say that competition may limit the feasibility of quantity discounts. Hence a merger, which reduces the number of competitors, could create the potential for more price discriminating discounts. This would imply a greater loss in consumer surplus, since the manufacturers can extract more to their own gain. Note that quantity discounting also raises consumer switching costs, since it induces consumers to stay with the same firm. Indeed, at the equilibrium, discounts must be such that the consumer has no incentive to leave for a competing contract, in addition to be incentive-compatible and individually rational. (See Ivaldi and Martimort, 1994.)

Conduct assumptions

The model assumes that the competition between firms selects a static Nash equilibrium. However, alternative equilibrium concepts may well be more realistic in some situations. For example, the merger may facilitate collusive behavior, whereby firms behave cooperatively rather than non-cooperatively. Second, the merger may trigger other mergers. The price effects of such other mergers may especially be large in a more concentrated industry.

Summing up, several assumptions can be debatable. Nevertheless, care has been taken so that the assumptions will lead to no clear bias, or in fact lead to conservative estimates of the price effects. Furthermore, it is because we have a quantified model that one is able to assess the effects of the assumptions. Here we have just provided an example to illustrate how quantification can help the effectiveness of economic evidence.

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Figure 1: The choice set

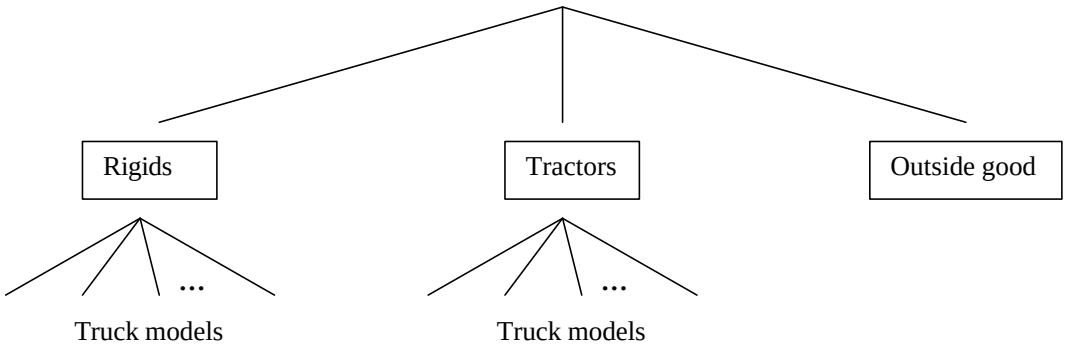

Table 1: Market shares per country in 1998

	Daf	Daimler	Iveco	Man	Renault	Scania	Volvo
AU	5	18	6	34	4	16	12
BE	17	18	6	11	8	17	23
DK	4	18	7	10	3	30	29
FI	0	10	4	3	18	31	34
FR	8	16	8	5	38	9	14
GE	5	42	6	26	2	9	8
GR	3	36	2	12	3	17	24
IR	13	9	8	6	3	27	22
IT	4	16	41	6	9	12	12
LU	15	28	8	14	10	15	11
NE	33	12	3	9	3	23	16
NO	4	9	2	12	1	32	38
PO	14	12	7	6	17	19	25
SP	9	19	20	8	19	16	13
SW	2	6	0	0	1	46	45
UK	18	9	9	7	6	19	18
EEA	11	21	11	13	12	16	15

Source: Commission Decision, based on the Notification.

Table 2: Estimates of main parameters of interest

	Potential market factor			
	$r = 0.5$		$r = 3.0$	
	Estimates	Standard error	Estimates	Standard error
a	0.312	0.092	0.280	0.094
s	0.341	0.240	0.304	0.240

Table 3: Price elasticity of total market demand

	Potential market factor	
	$r = 0.5$	$r = 3.0$
Austria	-0.49	-1.53
Belgium	-0.49	-1.11
Denmark	-0.47	-1.02
Finland	-0.38	-0.98
France	-0.44	-1.17
Germany	-0.53	-1.52
Greece	-0.28	-0.63
Ireland	-0.34	-1.05
Italy	-0.61	-1.63
Luxembourg	-0.41	-0.94
Netherlands	-0.59	-1.54
Norway	-0.56	-1.14
Portugal	-0.46	-1.21
Spain	-0.44	-1.22
Sweden	-0.44	-0.96
United Kingdom	-0.56	-1.27

Note:The price elasticity of total market demand in this differentiated product model is defined as the percentage change in total demand for trucks when the prices of all trucks increase by one percent.

Table 4: Potential market power test

	Profit change of merging firms from alternative price increases		
Price increase	5	10	25
Austria	-0.70	-5.96	-35.09
Belgium	1.05	0.49	-8.63
Denmark	1.63	2.09	-2.25
Finland	2.51	2.98	-4.89
France	0.18	-1.40	-13.86
Germany	-0.23	-2.79	-19.70
Greece	1.39	-0.02	-14.49
Ireland	2.12	1.70	-10.02
Italy	-1.14	-7.63	-41.79
Luxembourg	-0.07	-1.51	-11.86
Netherlands	0.77	-2.47	-26.70
Norway	2.74	3.58	-2.37
Portugal	1.16	-0.12	-13.37
Spain	0.23	-2.05	-18.65
Sweden	2.95	4.91	5.67
United Kingdom	1.28	0.49	-11.04
European Union	1.00	-0.49	-14.32

Note: Profit effects are based on the parameter estimates of scenario 2 ($r = 3.0$). The numbers are normalized such that the average percent profit change in the European Union under a 5 percent price increase is equal to one.

Table 5: Percent price changes after merger

	Volvo/Scania		Competitors	
	Rigid	Tractor	Rigid	Tractor
Austria	1.69	2.15	0.05	0.08
Belgium	6.75	5.41	0.14	0.16
Denmark	11.55	8.17	0.26	0.19
Finland	10.03	7.83	0.39	0.24
France	2.97	2.97	0.09	0.08
Germany	1.65	2.19	0.04	0.06
Greece	4.98	5.39	0.25	0.26
Ireland	10.87	7.36	0.21	0.30
Italy	2.02	1.49	0.07	0.07
Luxembourg	3.33	1.65	0.05	0.05
Netherlands	3.56	3.47	0.21	0.16
Norway	13.17	8.63	0.32	0.28
Portugal	6.67	5.06	0.19	0.12
Spain	3.65	2.98	0.06	0.08
Sweden	22.34	12.64	0.47	0.32
United Kingdom	7.15	4.79	0.27	0.12

Note: The predictions are based on the parameter estimates of scenario 2 ($r = 3.0$). All numbers are sales-weighted percentage changes.

Table 6: Welfare analysis of the merger

	Pre-merger consumer surplus	Change in consumer surplus (%)	Pre-merger industry profit	Change in industry profit (%)	Pre-merger total welfare	Change in total welfare (%)
Austria	100.0	-1.09	65.8	0.77	165.8	-0.35
Belgium	97.8	-3.05	63.9	1.73	161.6	-1.16
Denmark	97.4	-6.02	65.6	2.78	163.0	-2.48
Finland	98.6	-8.44	67.9	3.65	166.6	-3.51
France	98.9	-1.04	65.7	0.71	164.6	-0.34
Germany	99.5	-0.62	67.9	0.45	167.4	-0.19
Greece	97.7	-3.46	68.3	1.80	166.0	-1.30
Ireland	99.9	-7.00	66.6	3.33	166.5	-2.87
Italy	99.0	-1.03	66.9	0.71	165.9	-0.33
Luxembourg	97.8	-0.59	68.4	0.38	166.2	-0.19
Netherlands	98.8	-2.85	67.1	1.68	165.9	-1.02
Norway	96.9	-10.71	69.0	3.78	165.8	-4.68
Portugal	98.9	-3.34	64.1	1.92	163.0	-1.27
Spain	99.2	-1.39	63.7	0.94	162.9	-0.48
Sweden	97.4	-17.77	73.2	4.89	170.5	-8.05
UK	97.8	-3.77	64.5	2.05	162.3	-1.46

Notes: The monetary values (consumer surplus, industry profit and total welfare) are normalized such that consumer surplus in Austria is equal to 100. The calculations are based on the parameter estimates of scenario 2 ($r = 3.0$).

Table 7: Welfare analysis in the presence of cost efficiencies

	Change in consumer surplus			Change in total welfare		
	Cost efficiency of			Cost efficiency of		
	0 %	5 %	10 %	0 %	5 %	10 %
Austria	-1.09	0.02	1.19	-0.35	0.01	0.44
Belgium	-3.05	-1.41	0.31	-1.16	-0.56	0.14
Denmark	-6.02	-4.25	-2.42	-2.48	-1.79	-1.03
Finland	-8.44	-6.93	-5.37	-3.51	-2.93	-2.29
France	-1.04	0.10	1.29	-0.34	0.04	0.48
Germany	-0.62	0.24	1.15	-0.19	0.08	0.39
Greece	-3.46	-2.06	-0.60	-1.30	-0.80	-0.24
Ireland	-7.00	-5.15	-3.24	-2.87	-2.16	-1.38
Italy	-1.03	-0.02	1.04	-0.33	0.00	0.38
Luxembourg	-0.59	0.24	1.11	-0.19	0.08	0.39
Netherlands	-2.85	-1.30	0.32	-1.02	-0.48	0.14
Norway	-10.71	-8.95	-7.14	-4.68	-3.96	-3.19
Portugal	-3.34	-1.78	-0.15	-1.27	-0.70	-0.05
Spain	-1.39	-0.20	1.06	-0.48	-0.07	0.41
Sweden	-17.77	-15.89	-13.95	-8.05	-7.23	-6.38
UK	-3.77	-2.13	-0.41	-1.46	-0.85	-0.15

Note: The calculations are based on the parameter estimates of scenario 2 ($r = 3.0$).

Table 8: Alternative merger sequences

	Change in consumer surplus		Change in total welfare	
	Two regional mergers	Two pan-European mergers	Two regional mergers	Two pan-European mergers
Austria	-1.24	-0.88	-0.40	-0.27
Belgium	-3.31	-1.88	-1.25	-0.66
Denmark	-6.23	-2.30	-2.54	-0.82
Finland	-8.93	-5.53	-3.67	-2.09
France	-3.48	-4.58	-1.26	-1.74
Germany	-0.72	-0.60	-0.21	-0.17
Greece	-3.46	0.00	-1.30	0.00
Ireland	-7.23	-2.59	-2.94	-0.91
Italy	-4.10	-4.37	-1.52	-1.64
Luxembourg	-1.31	-1.49	-0.42	-0.48
Netherlands	-2.91	-0.78	-1.04	-0.25
Norway	-10.73	-0.75	-4.69	-0.26
Portugal	-4.25	-3.90	-1.57	-1.42
Spain	-4.11	-4.03	-1.47	-1.43
Sweden	-17.78	-0.37	-8.05	-0.13
UK	-4.35	-3.00	-1.64	-1.07

Notes: The calculations are based on the parameter estimates of scenario 2 ($r = 3.0$).