

## Economic analysis in vertical mergers

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*Economic analysis played a central role in the Commission's recent assessment of several purely vertical mergers, such as TomTom/TeleAtlas, Nokia/Navteq and IteMa/BarcoVision. This paper describes the economic and econometric analysis that the Commission carried out in these cases, focusing in particular on input foreclosure, and explains why this analysis ultimately led, in each of these cases, to a clearance decision without remedies.*

### 1. Introduction

Vertical integration has been the subject of considerable economic research since Coase's seminal contribution on the nature of the firm <sup>(2)</sup>. While the efficiency enhancing effect of vertical mergers has long been recognised <sup>(3)</sup>, the last two decades have seen the development of game-theoretic models showing that, under certain conditions, vertical mergers could have anticompetitive effects <sup>(4)</sup>. From an empirical point of view, however, efficiencies associated with vertical integration are found to outweigh possible anticompetitive effects in most contexts <sup>(5)</sup>.

Drawing on the economic literature on vertical integration, the Commission adopted its Non-Horizontal Merger Guidelines in November 2007 (hereinafter the 'Guidelines'). The Guidelines stress that vertical and conglomerate mergers between firms operating in closely related but different markets should be treated differently than horizontal mergers between rivals. While non-horizontal mergers do not remove direct competition between rivals, in certain circumstances, they may lead to anticompetitive effects, e.g. through input foreclosure. The Guidelines also emphasise that non-horizontal mergers offer substantial scope

for efficiencies through the elimination of double margins and other productive efficiencies <sup>(6)</sup>.

In the few months that followed the adoption of the Guidelines, the Commission assessed three purely vertical mergers, *TomTom/TeleAtlas*, *Nokia/Navteq* and *IteMa/BarcoVision*, which were each cleared without conditions after an in-depth investigation. This paper describes the economic analysis that was carried out in light of the recently adopted Guidelines, with a particular focus on input foreclosure <sup>(7)</sup>. This paper also touches upon a number of important issues raised in these cases, such as confidentiality concerns, coordination, commitment problems, non-linear prices, efficiencies and merger specificity.

This paper is structured as follows: Section 2 describes the main theory of harm considered in the above-mentioned decisions; Section 3 reviews the empirical analysis that was carried out by the Commission; and Section 4 concludes.

### 2. Main theory of harm considered

On the day that the Guidelines were adopted, the Commission started an in-depth investigation into the acquisition of digital map supplier TeleAtlas by TomTom, a manufacturer of Portable Navigation Devices (PNDs). Shortly after, the Commission reviewed a similar merger: the acquisition of TeleAtlas' competitor, Navteq, by mobile handset manufacturer Nokia. Both mergers were examples of backward integration, where a downstream producer acquires one of the two suppliers of navigable digital maps, which constitute an input for its downstream product <sup>(8)</sup>. *IteMa/BarcoVision* is another purely vertical merger which, although in a totally different industry (equipment for the textile industry), shares a number of structural characteristics with *TomTom/TeleAtlas* and *Nokia/*

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<sup>(2)</sup> Coase (1937).

<sup>(3)</sup> For example, vertical mergers solve issues arising from contract incompleteness (e.g. Grossman and Hart (1986)) and allow the elimination of double margins (see, for example, Tirole (1988)).

<sup>(4)</sup> E.g. Hart and Tirole (1990), Choi/Yi (2000), Chen (2001), Nocke and White (2007) and Hombert et al. (2007).

<sup>(5)</sup> See, for example, Syverson and Hortacsu (2007) for a recent empirical study on this question. Lafontaine and Slade (2007) provide a detailed survey of the empirical literature.

<sup>(6)</sup> Guidelines, § 11-15.

<sup>(7)</sup> Economic analysis also played an important role in shaping the theory of harm in *Google/DoubleClick*, another recent case in which both conglomerate effects and input foreclosure were considered (De Coninck and Papandropoulos (2008)). *Thomson/Reuters* was another high-profile merger with vertical aspects, adopted shortly after the non-horizontal merger guidelines came into force. However, any potential vertical effects were resolved in this case through divestitures addressing the horizontal overlaps.

<sup>(8)</sup> Both *TomTom/TeleAtlas* and *Nokia/Navteq* are described in more detail in Esteva Mosso et al. (2008).

*Navteq*: in all three mergers, the upstream market is a duopoly, and the acquiring party has an important position in the downstream market <sup>(9)</sup>.

The main theory of harm that was considered in these three cases was input foreclosure, whereby the merged entity would potentially restrict access to an essential input to its downstream competitors <sup>(10)</sup>, thereby raising its downstream rivals' costs and increasing the price charged to consumers <sup>(11)</sup>. In particular, it was considered whether the integrated company would stop supplying its downstream competitors (total foreclosure), who would be faced with only one other input supplier and the possibility of increased prices. Alternatively, it was considered whether the integrated company would increase prices or degrade the quality of the input supplied to its downstream competitors in a way that may harm end users (partial foreclosure).

Input foreclosure can only be a concern if the anticompetitive effects of the transaction are more important than the efficiencies brought by the vertical integration. In this regard, the three decisions recognise that the transaction would create efficiencies through the elimination of double margins, which is a direct result of profit maximisation <sup>(12)</sup>. In addition, in *TomTom/TeleAtlas*, the decision recognises that other efficiencies would materialise, as the transaction will allow

the development of better maps and faster updates by integrating end-user data gathered by TomTom into TeleAtlas' mapmaking process <sup>(13)</sup>.

Finally, it is interesting to note that, in view of the market characteristics, vertical integration was considered unlikely to lead to coordinated effects in all three mergers. Of course, every case is different, and coordination may play a more central role in future cases <sup>(14)</sup>.

### 3. Empirical assessment of the incentive to foreclose

This section first describes the main motivation for relying on empirical analysis to assess non-horizontal mergers. It then describes the econometric analysis and competitive assessment that were carried out in the above-mentioned merger investigations.

#### 3.1. Motivation

Although the three mergers share a relatively similar structure, the competitive analysis needs to go beyond that observation and take into account the specificities of each case. As detailed in the Guidelines, the profitability of an input foreclosure strategy consists of a trade-off between profits lost upstream and profits gained on the downstream market. In particular, the Guidelines <sup>(15)</sup> indicate that whether an input foreclosure strategy is profitable depends on how much sales the merged entity would capture in the downstream market, which is best addressed with a detailed empirical

<sup>(9)</sup> See also Neven and Albaek (2008) for a discussion of these three mergers.

<sup>(10)</sup> In *TomTom/TeleAtlas* and *Nokia/Navteq*, the input was the navigable digital map. In *Itema/BarcoVision*, the input product supplied by BarcoVision was electronic sensors. These sensors are used in the winding machines ('winders') manufactured by Itema and its competitors (winders transform yarn from spinning bobbins into larger packages). The downstream products were portable navigation devices in *TomTom/TeleAtlas*, mobile handsets in *Nokia/Navteq* and inputs in *Itema/BarcoVision*. In these three cases, the input made up 10% or less of the price of the downstream product.

<sup>(11)</sup> See paragraph 38 of Guidelines: 'When competition in the input market is oligopolistic, a decision of the merged entity to restrict access to its inputs reduces the competitive pressure exercised on remaining input suppliers, which may allow them to raise the input price they charge to non-integrated downstream competitors. In essence, input foreclosure by the merged entity may expose its downstream rivals to non-vertically integrated suppliers with increased market power. [...]'

<sup>(12)</sup> It should be noted that the elimination of double margins would not be considered merger-specific if it were just as likely to be eliminated in the absence of the merger through non-linear pricing. On the other hand, the use of non-linear pricing by the upstream competitors may limit the impact on the downstream market of an increase in the input price.

<sup>(13)</sup> The Commission assessed whether these efficiencies were likely to materialise in the absence of the merger in order to determine whether they should be considered merger-specific. Although part of this information could possibly be exchanged between the parties through contractual means, the Commission concluded that, given the required investment specificity and contract incompleteness in a rapidly evolving and uncertain environment, the parties would be unlikely to improve the map production process with the use of TomTom's data to the same extent in the absence of the merger as with the merger. In other words, the decision considered that the merger would reduce transaction costs and allow a more efficient production process for digital maps.

<sup>(14)</sup> Recent economic theory suggests that vertical integration may increase the scope for coordination, in particular by limiting the non-integrated company's incentive to deviate from a collusive agreement (Nocke and White 2007).

<sup>(15)</sup> Guidelines, § 42.

analysis <sup>(16)</sup>. The remainder of this section will describe the empirical analysis carried out by the Commission regarding the incentive to foreclose.

While some of the elements described in the Guidelines, taken in isolation, may give the impression that foreclosure would result from these mergers, other elements invariably point in the other direction. For example, gross margins are much higher in absolute value downstream than upstream, but this is because the input accounts for a small portion of the downstream product price, which would tend to limit the risk of foreclosure. The main advantage in conducting an economic analysis of the incentive to foreclose is that, contrary to a checklist approach, it allows an assessment of the likely effect of the transaction without having to arbitrarily give weight to opposing criteria.

### 3.2. Econometric analysis

In *TomTom/TeleAtlas* and *Nokia/Navteq*, the Commission estimated downstream elasticities to calculate how much sales the merged entity would be able to capture downstream if it were to carry out an input foreclosure strategy <sup>(17)</sup>.

The Commission estimated a discrete choice demand system (nested logit). Specifically, the utility  $u$  of consumer  $i$  for good  $j$  belonging to group (or nest)  $g$  is given by:

$$u_{ij} = \delta_j + \zeta_{ig} + (1 - \sigma)\varepsilon_{ij} \text{ where } \delta_j = x_j\beta - \alpha p_j + \xi_j$$

where  $\delta_j$  is the mean utility for product  $j$ , which depends on the product characteristics  $x_j$  (observed) and  $\xi_j$  (unobserved by the econometrician) and is negatively related to the price of good  $j$ ;  $\varepsilon_{ij}$  is an i.i.d. extreme value random variable specific to product  $j$  for individual  $i$ , while  $\zeta_{ig}$  is a shock common to group  $g$  for individual  $i$ . Sigma is a parameter between zero and within one, which captures the within-nest correlation of utility

<sup>(16)</sup> A related issue raised during these three investigations concerned the potential access by the integrated companies to confidential information from its downstream competitors. In all three cases, however, it was considered that the integrated company would have a strong incentive to solve these confidentiality concerns and/or decrease prices to keep supplying the input. Indeed, confidentiality concerns are a form of product degradation, and a similar upstream/downstream profit trade-off applies (see footnote 20 for a discussion of product degradation).

<sup>(17)</sup> In *Itella/BarcoVision*, robust and precise elasticity estimates could not be calculated econometrically due to the lack of appropriate instruments and the data frequency. In order to approximate the volume of sales that the merged entity could capture by raising its rivals' costs, own-price elasticities were calibrated using the Lerner index (see, for example, Werden 1998), and a wide range of diversion ratios were considered for cross-price elasticities starting from the calibrated own-price elasticities.

levels. With the inclusion of nests, the independence of irrelevant alternatives assumption, whereby consumers switch to each good in proportion to market shares, is only imposed within each nest.

The model was estimated with retail data covering monthly sales and volumes of PNDs (in the case of *TomTom/TeleAtlas*), and of mobile handsets (in *Nokia/Navteq*). The data were used at the stock-keeping unit level and covered a period of three years. The datasets also contain a detailed description of each device's characteristics, such as the presence of an MP3 player, the presence of Bluetooth, and the size and format of the screen. The nest structure of the base specification was defined on the basis of a premium and non-premium segmentation in *TomTom/TeleAtlas* and on whether the mobile handset was GPS-enabled or not in *Nokia/Navteq*.

The parameters of the nested logit model described above were obtained by estimating the linear statistical expression derived by Berry (1994):

$$\ln(s_j) - \ln(s_0) = x_j\beta - \alpha p_j + \sigma \ln(s_{j/g}) + \xi_j$$

where  $s_j$  stands for the share of good  $j$ ,  $s_0$  is the share of the outside good and  $s_{j/g}$  is the share of good  $j$  in nest  $g$ . In addition, year and manufacturer fixed effects were included in the base regression, as was a fixed effect for each month in the product's life cycle. Instrumental variables were used to account for the possible endogeneity of the coefficients alpha and sigma. For example, the share of other products with a media player and the share of other products with Bluetooth were used as instruments in the base specification in *TomTom/TeleAtlas*. Additional instruments, such as the size and the format of the screen, were also used, which led to similar results.

Using these estimated coefficients for alpha and sigma, own-price elasticities and inter- and intra-nest elasticities were calculated for each product, as detailed in Verboven (1996). These elasticities for each product were then used to measure the impact on the merged entity's downstream sales of a percentage price increase of all other products (except for downstream competitors protected by a long-term contract). In *TomTom/TeleAtlas*, for example, the results indicate that, if all other PNDs except Garmin <sup>(18)</sup> increase their prices by 10%, TomTom's sales would increase in the range of 3-5%. Numerous robustness tests were carried out, in particular with respect to the definition of nests, the choice of instruments and the total market size.

<sup>(18)</sup> Garmin is TomTom's main competitor; Garmin is protected from foreclosure by a long-term contract with Navteq.



### 3.3 Profit trade-off and competitive assessment

Using these econometric estimates and industry data on prices, margins and sales, the Commission calculated whether the sales that the merged entity could capture downstream by raising its rivals' costs would be sufficient to compensate for the lost sales upstream if it engaged in input foreclosure. In particular, the Commission calculated the critical price increase by the remaining upstream supplier that would make a foreclosure strategy profitable for the merged entity. In both *TomTom/TeleAtlas* and *Nokia/Navteq*, given in particular the small share of the map cost in the PND price and the relatively limited cross-price elasticities downstream, the critical price increase was superior to 200%. Such a price increase by the integrated company's upstream competitor appears unrealistic and might trigger entry.<sup>19</sup> The Commission also calculated that the integrated company would not raise map prices to its downstream competitors in a way that would have a significant effect downstream (partial foreclosure)<sup>(20)</sup>, even if the remaining upstream supplier is assumed to match any price increase by the merged entity<sup>(21)</sup>.

In *Itasca/BarcoVision*, although robust and reliable econometric estimates of elasticities could not be obtained, the available evidence suggested that the critical price increase would also be very

high<sup>(22)</sup>. Such a price increase appeared unlikely given the threat of vertical integration by customers. If Uster (BarcoVision's competitor on the upstream market) increased prices as a result of an input foreclosure strategy by the merged entity, Itasca's competitors on the downstream market (Schlafhorst and Murata) would have a strong incentive to develop their own sensors for winders in-house, which would lead to significant revenue losses for Uster and the merged entity. Remarkably, even though this may take several years to materialise, the threat was considered credible, particularly in light of the vertical integration of Schlafhorst in spinning<sup>(23)</sup>.

The decisions therefore highlight the importance of qualitative arguments to be used in conjunction with the empirical exercise, as any model will only reflect part of the market reality. In these cases, the likelihood that the upstream competitor would increase the price by more than the critical price increase has to be measured against market characteristics, such as the reaction of potential entrants. Taken in a vacuum, i.e. without reference to the specifics of the market, the critical price increase would not be informative.

Finally, it is important to stress that the likelihood of an input foreclosure will also depend on the merged entity's ability to commit to stop competing on the upstream market. Indeed, the integrated company may be tempted to re-enter the upstream market by slightly undercutting its rival, as this would allow it to gain upstream sales with only a marginal effect on the downstream market<sup>(24)</sup>. However, since the three mergers were cleared, the question as to whether the merged entity could commit to stop competing upstream (e.g. through technical means) could be left open.

<sup>(19)</sup> A new entrant could recoup its investment by capturing a relatively limited market share. Indeed, it was calculated that, as the market for digital maps is growing, the minimum viable scale for a new entrant is relatively limited, even at current prices.

<sup>(20)</sup> Similarly, the Commission considered that the merged entity would have no incentive to degrade the quality of the input supplied to its downstream competitors. Indeed, downstream companies can always turn to the integrated company's upstream competitor for a quality input. Degrading quality would therefore only be profitable for the merged entity if, as a result of a price increase by its upstream competitor, it is able to capture sufficient sales downstream to compensate for the losses upstream. As detailed above, this was considered unlikely in these three cases.

<sup>(21)</sup> In order to estimate the overall impact of the proposed transaction, the Commission also simulated pre- and post-merger equilibrium prices with a simple model of Bertrand competition with differentiated products facing a linear demand. The model indicated that the vertical integration would lead to a small decrease in the average price of the downstream product as a result of the elimination of double marginalisation. Indeed, the vertical integration allows the merged entity to internalise the double mark-ups resulting from both parties setting their prices independently pre-merger, thereby allowing the merged entity to profitably expand output on the downstream market.

<sup>(22)</sup> The critical price increase by Uster (BarcoVision's competitor on the upstream market) that would make a foreclosure strategy profitable for the merged entity was calculated using a simple model of Bertrand competition with differentiated products and linear demand, in which elasticities were calibrated as detailed in footnote 17.

<sup>(23)</sup> In addition, Premier, which is a committed entrant on the market of sensors for winders, may exert additional competitive pressure on Uster.

<sup>(24)</sup> This refers to the commitment assumption in Ordover et al. (1990). It is different from the Hart and Tirole (1990) commitment problem, whereby a monopolist could not exert market power if it is not able to commit to its customers that it will not sell at lower prices to their rivals (as further explained in footnote 40 of the NHM guidelines). This second commitment problem is also discussed in *TomTom/TeleAtlas*.

## 4. Conclusion

Economic analysis played a central role in assessing the likely effect of *TomTom/TeleAtlas*, *Nokia/Navteq* and *Itella/BarcoVision*. In particular, it is clear from these three decisions that carrying out a detailed economic analysis is an essential tool in assessing whether an integrated company would have the incentive to engage in input foreclosure to the detriment of end-users.

All three cases reviewed in this paper were subject to an in-depth investigation, but were ultimately cleared without remedies by the Commission. This in no way suggests that vertical mergers should be subject to an in-depth investigation as a matter of course. However, experience has shown that complaints are often expressed during the initial market investigation in vertical cases, and it may be difficult at first sight to distinguish between the valid concern of a company that has reason to believe that it will be foreclosed (possibly harming customers) and the opportunistic concern of a company which is afraid of facing a fiercer competitor thanks to the efficiencies resulting from the vertical integration. This does stress the need for the parties and complainants to be forthcoming and provide substantial economic data and analysis early in the merger review process, ideally during the pre-notification stage, to allow the Commission to make an informed decision at the end of phase I and, if appropriate, avoid the cost of opening a phase II investigation without running the risk of clearing an anticompetitive transaction.

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