

## The use of pricing analysis for market definition purposes: the Arjowiggins/M-real Zanders Reflex and Arsenal/DSP mergers

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### Introduction

The Commission recently considered a number of transactions in which one of the main issues during the Phase II investigation was the delineation of the geographic market. These include COMP/M.4513 — *Arjowiggins/M-real Zanders Reflex*, COMP/M.4989 — *Älo/MX* and COMP/M.5153 — *Arsenal/DSP*. While the investigations in the first two transactions examined whether the national boundaries of EEA Member States circumscribe geographic markets, or whether there is a wider EEA market, the assessment of the third transaction hinged on a world- or EEA-wide geographic market definition. The distinction between national and EEA-wide or perhaps region-wide markets is becoming increasingly important, as twelve additional Member States have joined the EEA common market since May 2004. Any Commission decisions prior to 2004 delineating markets as EEA-wide should therefore no longer be relied on, as such analysis refers to the old EU-15 Member States. Moreover, the addition of twelve new Member States with their own specificities has further increased the level of heterogeneity, which was already high among the old fifteen Member States that previously formed the European Union. It thus seems useful to provide an overview of empirical techniques that lend themselves particularly well to the delineation of geographic markets. In particular, this article sets out an easy framework that relies on pricing analysis to examine how wide the geographic markets are and uses the Arjowiggins/M-real Zanders Reflex and Arsenal/DSP transactions as concrete examples.<sup>(2)</sup> It is important to note that although all of the above-mentioned cases entered into a Phase II investigation, the techniques in this paper are fairly straightforward and are thus particularly well suited for investigations during Phase I proceedings.<sup>(3)</sup> In addition, although the article con-

centrates on the delineation of geographic markets, the same framework can be used for product market definition.<sup>(4)</sup>

The article is divided into four sections. The next section contains a brief overview of the relevant question that needs to be answered to delineate the markets and explains how pricing analysis can approximate the answer to this question. The third section surveys the statistical techniques that are used for pricing analysis. The types and sources of data that are needed to perform the analysis are discussed in the fourth section. Specific examples from the Arjowiggins and Arsenal transactions are discussed in the fifth section. In addition to offering some general conclusions, the last section also discusses other uses of the data that is collected for performing pricing analysis, and in particular how the additional information in these databases can be used to strengthen the findings from the pricing analysis.

### The intuition behind geographic market definition

Market definition is based on the SSNIP test that examines whether a hypothetical monopolist would profitably and permanently increase prices by 5-10% in a given candidate market. The hypothetical monopolist test requires the Commission to start with the smallest possible candidate market and to see whether such market is a relevant market, or whether it is part of a wider market, to ensure that only the most important competitive constraints on the hypothetical monopolist are included in the relevant market.

Consider for example a transaction in which there are only two firms that produce a particular product in a given Member State, and these firms are undertaking a merger. The relevant question is thus whether the given Member State forms its own relevant market, or whether it is part of a wider (for example EEA-wide) market, as the firms would be merging to monopoly if the relevant geographic market was to be defined by national boundaries. Intuitively, we need to assess whether the merging

<sup>(1)</sup> The content of this article does not necessarily reflect the official position of the European Commission. Responsibility for the information and views expressed lies entirely with the author.

<sup>(2)</sup> Älo withdrew its notification of the Älo/MX transaction during the Phase II investigation, and so this case is not discussed any further.

<sup>(3)</sup> For example, pricing analysis was already undertaken during the Phase I investigation of the Arsenal/DSP transaction. Pricing analysis was also used to delineate product markets in the Phase I investigation in COMP/M.5190 — *Nordic Capital/Convatec* (see Recitals 27 to 30).

<sup>(4)</sup> For example, the Commission used pricing analysis in the Arjowiggins/M-real Zanders Reflex transaction to examine whether reels and sheets are both part of a larger carbonless paper market, or whether each product forms its own product market.

parties' competitors in at least the neighbouring Member States would direct *enough of their sales* to the Member State of the merging parties to thwart a permanent price increase by the merging parties. If these additional imports make the price increase unprofitable, this implies that the relevant market is not defined by national boundaries, as the competitors in the neighbouring Member States must exert a competitive constraint on the merging parties. If, however, this price increase would be profitable, this implies that the Member State in which the merger takes place forms a relevant geographic market on its own.

The question of whether *enough sales* would be directed to a particular Member State in response to a price increase of 5-10% cannot simply be assessed by pointing to centralised manufacturing sites, low transport costs, and high levels of trade flows within the EEA, which are the usual type of arguments that Form COs contain in support of wider markets that encompass the EEA. This is because, although such statements are consistent with a wider market, they provide only limited insight as to how much substitution there is between the products of the competitors in the different Member States, and whether these competitors would have the incentives to sell more of their product in a particular Member State in response to price increases in that Member State.<sup>(5)</sup> Instead, the assessment of the hypothetical monopolist test requires careful empirical analysis.

There are two basic types of empirical analysis that lend themselves particularly well to the assessment of the hypothetical monopolist test. The first type of analysis, called critical loss analysis, directly assesses whether the price increase of 5-10% is profitable by comparing by how much the hypothetical monopolist's quantity sales would have to decrease to make a price increase unprofitable (i.e. the critical loss) with an actual loss that the hypothetical monopolist would incur in response to the same price increase. While the critical loss is easy to compute, it is significantly more complicated to compute the actual loss, which depends on the reaction of consumers and thus requires the demand curve and in particular its elasticity to be estimated.<sup>(6)</sup> Such esti-

mation is, however, fairly difficult and has very high data requirements. As a result, there are many instances in which this method produces rather non-robust estimates or no estimates at all.

The second type of analysis, called pricing analysis, uses the key intuition that if two geographic areas are in the same relevant geographic market, then any "misalignment" in the prices specific to each geographic area would only be temporary, as prices would be forced back into line with each other due to exports from the "low price" geographic area to the "high price" geographic area. Thus, for example, if markets are EEA-wide, any "misalignment" in national prices should only be temporary, as imports would be shifted from one Member State to another. Such an analysis is clearly only an approximation to the SSNIP test question, as it does not provide a direct answer to whether or not a price increase of 5-10% would be profitable for the hypothetical monopolist. Neither does finding that prices in two geographic areas move closely together provide any insights as to the causality of the relationship between the prices. That is, such a finding does not provide any evidence for whether the competing producers in the surrounding geographic areas provide a competitive constraint on the hypothetical monopolist, and hence the prices move together, or whether the hypothetical monopolist constrains the competing producers in surrounding areas. Obviously, for merger control purposes, the latter rather than the former is required.

On the other hand, unlike critical loss analysis, pricing analysis uses fairly straightforward and easy-to-implement empirical techniques that lend themselves particularly well to examining the closeness of price movements over time. There is thus a trade-off between the evidentiary value of the findings from the pricing analysis and the ease with which the pricing analysis can be implemented. To alleviate such concerns, it is always important to supplement the findings from the pricing analysis with some factual evidence that explains how the producers in the surrounding areas can constrain the hypothetical monopolist. Consider for example an unexpected event such as a plant shutdown in a given Member State. If prices in that Member State move in line with prices in the other Member States despite this plant shutting down, as producers in the surrounding areas are shifting some of their sales to that particular Member State, it is likely that the Member State must be part of a wider market. At the same time, it is important to note that if strong price co-movements over time are not found, this generally suggests that the competitive relationship between two geographic areas is not particularly strong, and they are not in the same geographic market. Thus, while additional qualitative information is needed

<sup>(5)</sup> It should be noted that it is indeed *necessary*, for example, to observe high levels of imports and exports within the EEA to establish that competing producers in other Member States may exert competitive pressure on the merging parties. Observing such patterns is, however, not *sufficient* to argue that markets are wider than any given Member State.

<sup>(6)</sup> For more details on critical loss analysis, see Andrea Amelio, Miguel de la Mano and Manuel Godinho de Matos, Ineos/Kerling merger: an example of quantitative analysis in support of a clearance decision, Competition Policy Newsletter 2008, Number 1 — Spring.

in conjunction with the results of the pricing tests to argue that two geographic areas are in the same relevant market, the lack of price co-movements is usually indicative that two geographic areas are not in the same market. <sup>(7)</sup>

### Statistical techniques used for pricing analysis

There are two techniques that lend themselves particularly well to examining the extent to which prices move together over time. The first technique, *correlation analysis*, measures the extent (summarised by the correlation coefficient) to which prices in one geographic area are associated with prices in another geographic area. If the prices of the two geographic areas move perfectly in line with each other, the correlation coefficient is one. If there is no relationship between the prices, the correlation coefficient is zero. As the correlation coefficient can vary between zero and one, it thus needs to be assessed whether the prices are *sufficiently* correlated to consider the two geographic areas to be in the same market. To do this, it is typical to use as a benchmark the correlation between two geographic areas that are accepted as being in the same market. For example, if it is accepted that the geographic market is EEA-wide, and the issue to be examined is whether the market is world-wide, the correlations between the prices in the different Member States may be used as useful benchmarks against which the price correlations of the different continents can be compared. Of course, there may also be instances in which no benchmark is readily available. In such a case, a view must be taken on what level of correlation is high enough to indicate that two geographic areas are in the same market. In general, it is hard to reconcile any correlation coefficient below 0.8 with the hypothesis that two geographic areas are in the same market. <sup>(8)</sup>

Although correlation analysis is fairly easy to implement, it suffers from some major shortcomings. For example, one important element of correlation analysis is controlling for common shocks to prices across the different geographic areas such as common cost movements or currency movements, as it is possible that high correlations could be driven entirely by changes in these common elements. In such an instance, the conclusion would be arrived at that two geographic areas are in the same market, although the prices may not be directly related to each other. For example, if the relationship between prices of a

chemical product in two Member States is examined, such prices should be adjusted for the effect of crude oil, as crude oil usually accounts for a large portion of the product costs and may induce common movement in the prices of the chemical product in the two Member States. <sup>(9)</sup> It is, however, important to note that once it is found that prices that are not adjusted for common elements do not move together, it is no longer necessary to examine whether prices that are adjusted for common elements move closely together, as removing common elements should make the price correlations even lower.

It is also possible that although prices of two geographic areas are related, they may be subject to significant random disturbances at some point in time (e.g. there may be an event that occurs in one Member State but not in another), or prices may respond to changes in market conditions with a time lag. This may result in low correlation coefficients, as correlation analysis examines contemporaneous movements over time. Care is thus needed when interpreting the results from correlation analysis, and it is preferable to supplement the results from correlation analysis with findings from another technique such as the stationarity tests that are described next.

Stationarity analysis, which is the second technique used for pricing analysis, avoids most of the above-mentioned issues. This is because it examines (using sophisticated statistical tests) whether the relative prices of two geographic areas tend to revert to a long-run average value over time. The use of relative prices means that the role of the common elements or currency effects is reduced to a minimum. Stationarity tests do not also require the use of any subjective benchmarks and are generally robust to responses with time lags and temporary random disturbances. At the same time, however, stationarity tests are more difficult to implement and can also result in misleading findings due for example to the presence of a number of structural breaks in the relative prices.

Essentially, for geographic market definition purposes, stationarity analysis amounts to examining whether the relative price series oscillate around a

<sup>(7)</sup> Unless the competitive relationship between the different geographic area has been subject to some large structural change over time.

<sup>(8)</sup> This of course assumes that appropriate care is exercised in the construction of the average price series that are to be analysed, and the below-described shortcomings of the correlation tests are properly accounted for in the analysis.

<sup>(9)</sup> There are two ways of adjusting for common effects. The most precise method amounts to obtaining a “recipe” for the production of the particular product and subtracting the portion that is accountable for by the common effect. If such a recipe is not available, the common effect can be adjusted for by using regression analysis, in which the price of the product is regressed on the price of the common effect (e.g. price of crude oil), and the portion of the price of the product that is not explained by the price of the common effect is used as the adjusted price.

constant value that is close to one over time.<sup>(10)</sup> If they do (i.e. the relative price series are found to be stationary), this is consistent with the two geographic areas being in the same market, as the prices can only deviate from each other for a short period of time. Consider, for example, Figure 1 and Figure 2 in the Annex that display the hypothetical price of a product in Member State A relative to the hypothetical price of a product in Member State B. In Figure 1, the relative price oscillates around 1, implying that the prices in the two Member States are on average the same, which is consistent with the two Member States being in the same market. In Figure 2, the relative price is sloping upwards, which implies that the product in Member State A is becoming relatively more expensive compared to the product in Member State B, and thus there is no long-run stable relationship between the prices that would be consistent with the two Member States being in the same market.

It is also important to note for both correlation and stationarity analysis that, as we are looking at movements of prices over time, it is necessary to have enough observations to ensure that the analysis is meaningful. In general, it is necessary to have about three years of data at monthly levels as a minimum, although five or six years of data would be preferred. In this regard, one question that arises is how data from five years ago may be useful in delineating the markets today. Thus, it is usually advisable to look at different subsamples throughout the whole period to ensure that prices move closely together over time. Consider, for example, Figure 3 in the Annex that plots hypothetical prices of a given product in Member States A and B for five years, while Figure 4 plots the same prices only for the last three years. It can be seen that although the prices appear to move closely together throughout the whole period, which is also confirmed by the correlation coefficient of 0.95, the movement is not as close if only the last three years of data are considered (the correlation coefficient is 0.46). This would suggest that the prices in the two Member States can drift apart from each other for a fairly long period of three years, which is not consistent with the two Member States being in the same mar-

ket, although the correlation coefficient is very high if we look at the whole period of five years.<sup>(11)</sup>

## Data

There are in general two types of data that can be used to perform pricing analysis. The first type uses data from marketing agencies such as AC Nielsen or Gfk that for example collect scanner data in supermarkets and report aggregate statistics for each country such as the total amount of a product sold in a given country and the price at which this product is sold.<sup>(12)</sup> There are also periodicals such as FarmBrief in the UK that systematically collect prices of products such as fertilizers on a monthly basis by calling different purchasers and collating this information. When attempting to gather and use this data for market definition purposes, it is important to keep the following limitations in mind. First, this type of data is not available for every industry and can also be fairly costly to obtain. Second, as this data is based on a sample that is extrapolated to construct the aggregate figures, it may in some instances result in somewhat imprecise estimates. Third, as usually only the aggregate figures are available, it is not possible to see how this data was constructed and to clean any outliers in the data.

The second type of data is based on the accounting systems of the merging parties as well as their competitors. Accounting systems store information for every sale that a firm makes, including information on the date of the product sale, the type of product sold, customer name and location, the quantity of the product sold, sales revenues and production costs. It is thus possible to create weighted average prices for each firm in the industry by product and by location (e.g. country or continent) on a monthly basis by aggregating over total revenues and total sales of each firm. If the same type of data is also available from the competitors of the merging parties, this allows actual market-level prices in each geographic area to be constructed, and such prices can then be used to approximate the SSNIP test. In many instances, however, the only data available is that of the merging parties. While such prices do not correspond to market prices in most instances, they can still provide important insights into the market definition question. This is because the

<sup>(10)</sup> If the relative price oscillates around a constant value, the relative price is said to be “stationary” (see Figure 1). If the relative price does not oscillate around a constant value and is not subject to a trend, the relative price is said to be “non-stationary”. If the relative price is subject to a trend and oscillates around this trend, the relative price is said to be “trend-stationary” (see Figure 2). If the relative price is subject to a trend but does not oscillate around this trend, the relative price is said to be “trend non-stationary”.

<sup>(11)</sup> This result may be somewhat counter-intuitive. The correlation coefficient however depends on the extent to which the two variables are related (the so-called covariance) *relative* to the extent to which each of the two variables varies over time (the so-called variance), and this relationship may not be constant over time such as in the example that is considered here.

<sup>(12)</sup> Such data is usually constructed by collecting the required information in supermarkets that account for a large percentage of total sales and is extrapolated to construct the total amount of product sold in a given country.

way that each of the merging parties sets prices in a number of geographic markets provides important evidence as to the competitive constraints that it faces in each geographic area. In particular, if a firm sets prices in two geographic areas such that the prices move closely together over time, this is consistent with these geographic areas being in the same market.

It is important to note that the data must be “cleaned” prior to constructing the weighted average prices that are used in the pricing analysis, to ensure that the results are not driven by outliers. For example, customers may often return the products they purchased, and such returns are often recorded with negative revenues and negative quantities sold. If such a return is large enough as a percentage of the total sales in any given month, this may influence the weighted average price in that particular month and, as a result, the pricing analysis. To minimise the effect of such rogue observations, it is customary to purge from the analysis all observations with non-sensical values such as negative revenues and quantities, and observations whose prices are either too high or too low compared to what we would expect the customers to pay for the products.<sup>(13)</sup>

### The Arjowiggins/M-real Zanders Reflex and Arsenal/DSP transactions

The issues that arise while defining geographic markets were discussed in great detail in the *Arjowiggins/M-real Zanders Reflex* and *Arsenal/DSP* decisions, which both contain detailed annexes that not only review the Commission’s analyses and preferred empirical techniques but also discuss the arguments and alternative empirical analyses put forward by the notifying parties. This section briefly introduces both transactions in more detail and explains how the Commission applied the above-developed framework in the two cases to delineate the geographic markets.

#### Arjowiggins/M-real Zanders Reflex

This case was notified on 31 October 2007 and related to the acquisition of M-real Zanders Reflex (“Reflex”), a paper plant in Düren (Germany), by Arjowiggins. The parties horizontally overlapped in the production and sales of carbonless paper, tracing paper and premium fine paper. The key market reviewed in this transaction was the carbonless paper market, by far the largest of the three affected markets with EEA sales of around half a billion euros. Carbonless paper is used to make duplicate copies without a carbon layer (for example for invoic-

ing forms and purchase orders) and is sold either in reels or sheets (sheets are created by cutting reels into smaller pieces).

The EEA carbonless paper industry mainly comprises five producers that account for around 90% of the EEA market, and there are hardly any imports into the EEA. As Arjowiggins was the largest of these five producers, the transaction would further strengthen the position of Arjowiggins with the combined entity having around half of the EEA market, and a large increase in market share coming from Reflex. The position of the merged entity would be even more marked if national markets were to be considered, as the market share data showed significant variations among the different national markets, and these markets included some of the largest Member States.<sup>(14)</sup> This significant variation in the presence of the merging parties is also true for the other producers. For example, Torraspapel is mostly present in the Iberian peninsula, where it is a major player. The varying presence of the different competitors in the different parts of the EEA thus suggests that the conditions of competition may not be homogeneous across the EEA and that geographic markets may be as narrow as the individual Member States.

This indication is also consistent with the findings in a recent cartel case which suggest that the cartel members agreed on price increases for each country separately for reels and sheets, as the agreed price increases were often quite different, with the maximum difference being a 15% increase for one Member State and no increase for another.<sup>(15)</sup> Thus, it appears that the cartel members’ agreement was not consistent with EEA-wide geographic markets either. On the other hand, the notifying party pointed to centralised manufacturing, the existence of European/world-wide brands, limited transport costs and high levels of import and export within the EEA as evidence that the market is EEA-wide. Given the conflicting qualitative evidence, as on the one hand the market share variations and the cartel decision were pointing towards national markets, while on the other hand the high trade flows were consistent with a wider geographic market definition, the Commission used pricing analysis to gauge how wide the geographic market is.

<sup>(14)</sup> For example, the merged entity would have [70-80]% of the German sheets market that accounts for 13.3% of EEA sheets sales, [60-70]% of the French sheets market that accounts for 13.7% of EEA sheets sales, and [70-80]% of the Italian reels market that accounts for 14.9% of EEA reels sales.

<sup>(15)</sup> Commission Decision 2004/337/EC of 20 December 2001 relating to a proceeding pursuant to Article 81 of the EC Treaty and Article 53 of the EEA Agreement, Case COMP/E-1/36.212 — *Carbonless paper*.

<sup>(13)</sup> In practice, it is usual to discard the top 1% of the data with the highest values and the bottom 1% of the data with the lowest values.

The Commission obtained monthly volume sales and value sales by country and for reels and sheets from the five largest producers of carbonless paper for the period January 2004 to December 2007 that it used to construct market-level prices in the different Member States. In addition, the Commission also obtained transaction-level data at invoice level from Arjowiggins for January 2002 to December 2007 and constructed Arjowiggins-specific average country prices in the different Member States. As discussed above, market-level prices are preferable for the SS-NIP test analysis. However, combining data from five different producers may be inherently subject to measurement error, as data from five different accounting systems are put together. Given that Arjowiggins' own data was submitted at invoice level, which allowed thorough cleaning, it thus served as a useful check on the results based on the data from the five producers. Therefore, the Commission performed two types of analysis: the first one was based on the data from the five largest producers, and the second one was based on Arjowiggins' transaction data.<sup>(16)</sup> The analysis was performed for six out of the 29 EEA countries: Germany, France, Italy, Poland, Spain and the UK. These countries accounted for around three quarters of total carbonless paper sales in the EEA over the period. As a separate analysis carried out by the Commission pointed mainly towards separate product markets for reels and sheets of carbonless paper, the Commission investigated how wide the geographic markets are for these two products separately.

Figure 5 and Figure 6 in the Annex plot the country-level prices for reels and sheets for the six Member States. The correlation coefficients for sheets, which range from -0.16 to 0.46, suggest that the prices do not move closely together, and thus these results point towards national markets. The evidence was more mixed for reels. In particular, the French, Polish and Italian prices appear to move more closely together.<sup>(17)</sup> The correlations between Germany and these three countries range from 0.73 to 0.77, which is somewhat lower. The correlations between the United Kingdom and the four Member States range from 0.45 to 0.51, which suggest that the United Kingdom may be systematically different from the other Member States.

Given that (i) there is no clear benchmark against which to assess the correlation results, and (ii) some of the close price movement may be driven by move-

<sup>(16)</sup> Given that the analysis based on Arjowiggins' own transaction data is confidential to Arjowiggins, the results are not discussed any further, although it is noteworthy that the findings are very similar to those based on the data from the five largest producers. It thus provides additional comfort in terms of the robustness of the results.

<sup>(17)</sup> The correlation coefficients range from 0.86 to 0.94.

ments in input costs (for example paper pulp), the correlation analysis was supplemented by stationarity tests that do not require a subjective benchmark and reduce the role of common elements to a minimum.<sup>(18)</sup> Taking Germany as an example, the Commission examined whether the prices in the other five Member States relative to the German prices (see Figure 7 and Figure 8 for the relevant plots) are stationary, which would be consistent with Germany being part of a wider market. Particularly the relative reels prices suggest that there are clear upward trends that are not consistent with a geographic market that would be wider than Germany. This was also confirmed by the formal stationarity tests, which implied that, with the exception of the UK for reels and Spain for sheets, there is no stable long-run relationship between the German prices and the prices in the other Member States.<sup>(19)</sup> Similar results were found for the other Member States such as France and Italy. Thus, the stationarity analysis did not provide any evidence that the "law of one price" holds across the different geographic markets for both reels and sheets.

In conclusion, the hypothetical monopolist test requires the Commission to start with the smallest possible candidate geographic market and to see whether such market is a relevant market, or whether it is a part of a wider geographic market. In this instance, the smallest possible relevant market was a Member State, while a wider market was the EEA. Neither the correlation analysis nor the stationarity tests provided any consistent evidence that would point towards EEA-wide markets, and instead much of the evidence points towards national markets. This is also consistent with the behaviour of the cartel members, which agreed on price increases that differed across the different Member States, and with the widely varying presence of the different producers across the EEA, which also suggests that the conditions of competition are not homogeneous across the EEA.

## Arsenal/DSP

This case was notified on 17 June 2008 and related to the acquisition of DSP, a subsidiary of DSM, by Arsenal Capital Partners, the owner of Velsicol. Both of the parties were active in the production and sale of solid technical grade benzoic acid and sodium benzoate.<sup>(20)</sup> These products are used as antimicrobial preservatives in foods and drinks,

<sup>(18)</sup> The price series could also be adjusted for paper pulp costs, and such adjusted prices could be used for the correlation analysis. However, such information was not available to the Commission, and thus it relied on the stationarity tests.

<sup>(19)</sup> The relative prices were found to be trend-stationary in all the other instances.

<sup>(20)</sup> The transaction also gave rise to an investigation of vertical issues in the benzoate plasticizer market that is not discussed in this article.

and the difference between the two is that sodium benzoate is soluble in water whereas benzoic acid is not.<sup>(21)</sup> There are currently only four major producers of technical grade benzoic acid in the world. These are DSP and Velsicol in the EEA, Emerald Kalama in the US, and Wuhan in China. The same four producers are also the major producers of sodium benzoate, although there are other large producers of sodium benzoate in China. The merger would thus combine the only two EEA producers of solid benzoic acid and sodium benzoate. In the case of benzoic acid, the parties would merge to a near monopoly, as imports of benzoic acid from China and the US were very marginal. As regards sodium benzoate, the merged entity would have about two thirds of the market, while the rest would be supplied by the Chinese competitors. Thus, the key question to be examined was whether the geographic market for both of these products was EEA-wide or world-wide. That is, whether in the event of price increases in the EEA, the US and Chinese competitors could thwart price increases by exporting more of both products to the EEA. As the analysis for both of these products followed the same steps, this article only discusses one of these markets, the benzoic acid market, to demonstrate the role of pricing analysis in delineating the geographic markets.

The qualitative evidence for solid benzoic acid is already highly indicative that the EEA forms its own market. This is because the European producers have a virtual monopoly in the EEA. The Chinese producers' market share amounted to [1-2]% of EEA sales, while the US producers' market share decreased by about half from 1999 to 2007, although the euro significantly appreciated during the same period. The market investigation also revealed that (i) the EEA producers' competitive advantage due to transport and tariff costs amounts to 10-15% over the Chinese and US competitors, and (ii) EEA customers did not consider Chinese benzoic acid, in particular, to be of the same quality as that of the EEA producers.

Nonetheless, the notifying party pointed to increased world-wide trade flows of benzoic acid and the fact that both Velsicol and DSP were exporting most of their output outside of the EEA as evidence that the EEA was part of a wider world-wide market. The Commission thus undertook pricing analysis to further examine how wide the geographic market for benzoic acid is.

Invoice data from the merging parties and their US competitor Emerald were obtained for the period

January 2002 to July 2008. As data from the Chinese competitor Wuhan were not available, the Commission could not construct market-level prices for Asia and thus could only use market-level data to examine whether North America and the EEA are part of the same market.<sup>(22)</sup> The resulting correlation coefficient between the EEA and North American prices was 0.53. Given that the EEA is assumed to be a single market, the correlations between the different Member States can serve as useful benchmarks against which the magnitude of the correlation coefficient between the EEA and North America can be compared. The benchmark correlations of the four largest Member States (in terms of benzoic acid sales) range from 0.94 to 0.96. This implies that North America and the EEA are not part of the same market. Moreover, North American prices were also significantly higher than EEA prices from 2004 until 2007, which is not consistent with global markets either. The lack of any stable long-term relationship between these two continents was further confirmed by the stationarity tests, which suggested that the relative prices are trend non-stationary.

Given that data from the Chinese producer Wuhan were not available, the Commission relied only on Velsicol's and DSP's average EEA and Asian prices to gauge whether there is any evidence that would be consistent with these two continents being in the same geographic market. As the techniques that were used in the analysis of both Velsicol's and DSP's data are the same, the analysis of Velsicol's data is described as an example. The price correlation between the EEA and Asia was found to be 0.89, which may be indicative that Velsicol sets prices such that the EEA and Asia are in the same market. However, when the correlation coefficient was calculated only for the more recent three-year period from 2005 onwards, the correlation coefficient dropped to 0.18. This implies that although Velsicol may have faced similar competitive constraints in Asia and the EEA in the past (and hence sold benzoic acid for the same price in both locations), this is no longer the case for the more recent years. Moreover, the benchmark correlation between the UK and the Netherlands was calculated to be 0.97 for the whole period and 0.85 for the period from 2005 onwards.<sup>(23)</sup> This further shows that while the competitive conditions that Velsicol faced in the

<sup>(21)</sup> Benzoic acid is produced in liquid form, and this liquid can either solidify to produce solid benzoic acid or can be used as an input in other products such as sodium benzoate or benzoate plasticizers.

<sup>(22)</sup> The analysis using Velsicol's and DSP's weighted average prices yields the same findings and is thus not discussed in this article.

<sup>(23)</sup> There was no other Member State to which Velsicol sold more than 10% of its output in any given year. To avoid the impact of outlying values and thus very low correlations among Member States that would be indicative that the markets are not wider than a given Member State, which is not sensible, the Netherlands and the UK were used to calculate the benchmark correlation.

EEA remained similar throughout the whole period (as would be expected as the EEA is assumed to be one single market), the competitive conditions in Asia relative to the EEA must have changed over time. The results from the correlation analysis were further confirmed by the stationarity tests on the relative prices, which suggested the relative prices were not stationary.

In addition to the qualitative evidence overviewed above, the conclusion from the empirical analysis that the market for benzoic acid is EEA-wide is perhaps best documented by the unexpected and prolonged simultaneous shutdowns of Velsicol's and DSP's plants in April 2007. Such an event can serve as a useful test (the so-called event study) of whether the US producer Emerald and the Chinese producer Wuhan would or could export more output to the EEA in the event that the combined entity decided to restrict sales of benzoic acid to its EEA customers. Neither Wuhan nor Emerald supplied more benzoic acid to the EEA, and the shortage of benzoic acid in the EEA lasted approximately for a year and resulted in benzoic acid price increases in the EEA. This implies that the US producer Emerald and the Chinese producer Wuhan do not exert a competitive constraint on the merging parties that would be consistent with a world-wide market for benzoic acid.

## Conclusions

Market definition is based on the SSNIP test that examines whether a hypothetical monopolist would profitably and permanently increase prices by 5-10% in a given candidate market. Answering this question requires careful empirical analysis that cannot be performed by merely pointing to high trade flows or the existence of centralised manufacturing sites, although such findings are certainly consistent with the hypothesis that markets are EEA- or world-wide. This is because such statements provide only limited insight as to how much substitution there is between the products of the competitors in the different geographic areas that can potentially be in the same relevant geographic market.

Although pricing analysis only approximates the answer to the SSNIP test question, it can provide useful insights into geographic market definition when combined with additional qualitative evidence. Its advantage over techniques such as critical loss analysis, which directly answers the SSNIP test, is however that it is fairly straightforward and easy to implement.

It is now customary for companies' accounting systems to store information on each sale that is made.

The stored data usually includes among other information the customer's identity and location, characteristics of the products sold, the quantity and revenue amount of the product sold, production costs and margins. When such data is collected from the merging parties as well as their competitors, it can be used to create market-level prices that can be directly used to perform the SSNIP test analysis. If it is too costly to collect such data from every competitor, or such data is not readily available, the transaction data of the merging parties can be used on its own to assess how the parties set prices in different geographic areas, as their pricing behaviour will depend on the competitive constraints that they face in each market. Thus, such an analysis can indeed provide very useful insights into geographic market definition.

The availability of transaction-level data from the merging parties can also allow a number of additional tests to be performed that are directly related to defining markets. For example, such data usually contains information on the margins earned on each sale, which allows average margin per product or geographic area to be constructed. Comparing the magnitudes of the margins across different geographic area or products may provide additional information for market definition, as the margins would be expected to be similar if two geographic areas are in the same market. Likewise, in many instances, the merging parties argue that they are subject to increasing world-wide competition, which would constrain them in the event of price increases, although the geographic market may not be world-wide. Plotting the margins of the parties thus seems to be a useful way to check on this increased competition: if margins are indeed declining over time, this may be used as evidence that the parties are indeed facing increased competition in the market. Assessing the development of margins during an unexpected event that leads to a shortage of a product is another useful test: if, following the event, the parties' margins increase for a long period, this would be consistent with the hypothesis that the parties are not constrained by other competitors in their own geographic market, and thus this market probably forms a relevant market on its own. Finally, accounting systems also include information on the characteristics of customers, such as for example whether they are final customers or distributors. This information can then be used, for example, to check whether the company prices the same way to both types of customers or not, as distributors may be more likely to multi-source and thus to more easily thwart any price increases. This may then provide further guidance on how to segment the markets.



# Annex

Figure 1: Stationary relative price

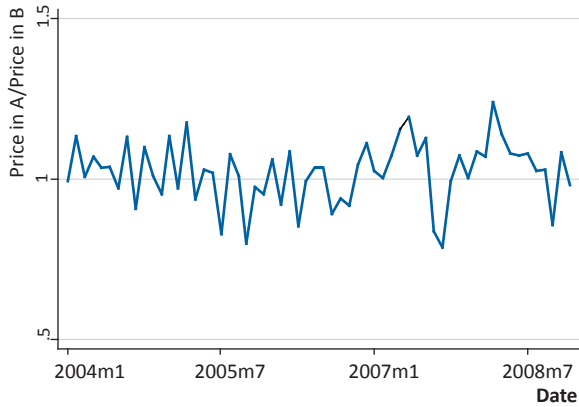


Figure 3: Monthly prices in Member States A and B from 1/2004 to 12/2008 (correlation=0.95)

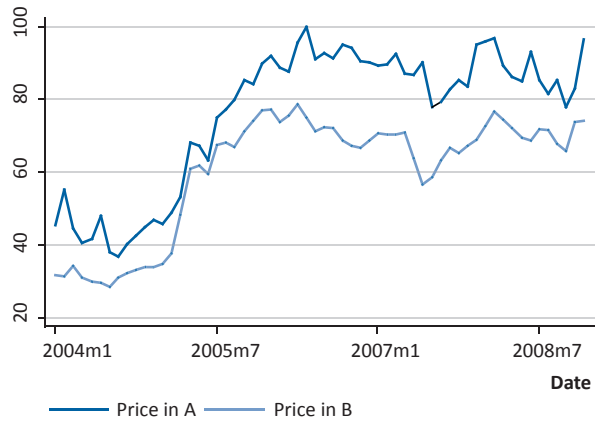


Figure 2: Trend-stationary relative price

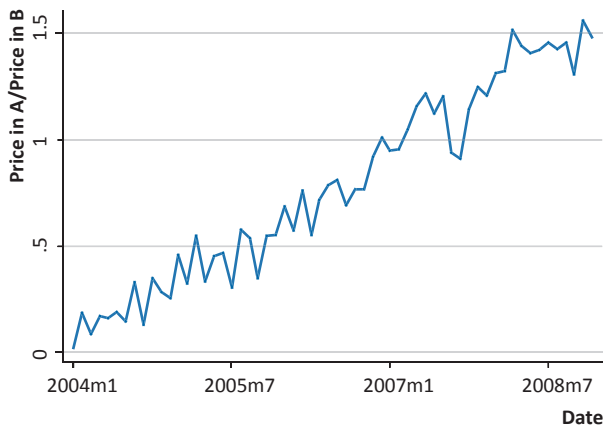
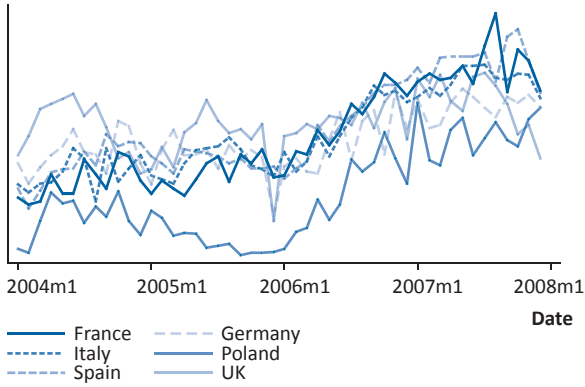


Figure 4: Monthly prices in Member States A and B from 1/2006 onwards (correlation=0.46)

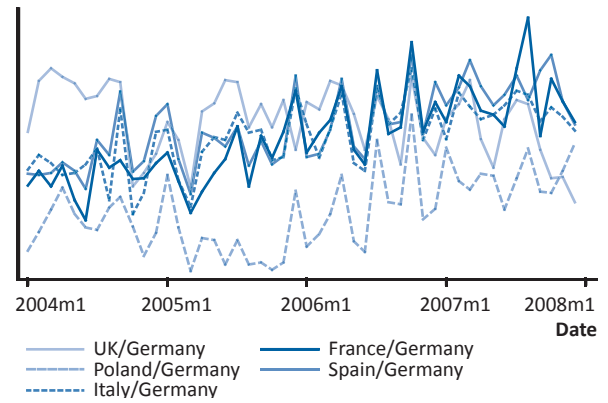


Figure 5: Average net prices of reels



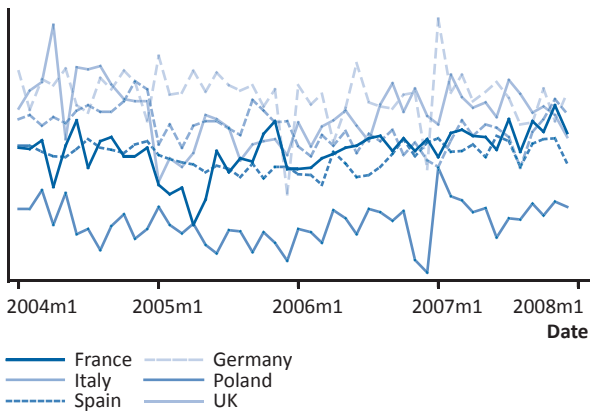
Source: Sales data from the five largest producers of carbonless paper

Figure 7: Average net country prices of reels relative to net prices of reels in Germany



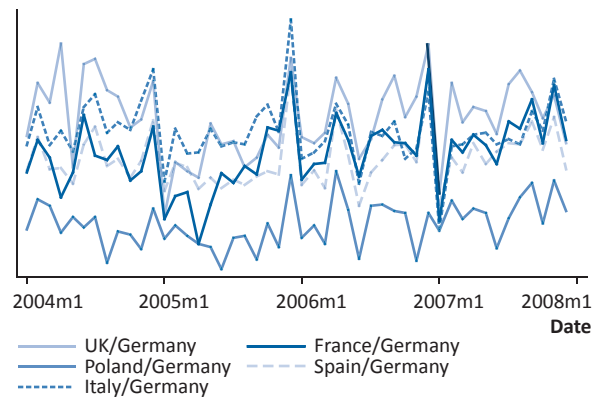
Source: Sales data from the five largest producers of carbonless paper

Figure 6: Average net prices of sheets



Source: Sales data from the five largest producers of carbonless paper

Figure 8: Average net country prices of sheets relative to net prices of sheets in Germany



Source: Sales data from the five largest producers of carbonless paper