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Econometric Evidence in EU competition law: an empirical and theoretical analysis

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1. Introduction

Competition authorities and litigants worldwide have increased the use of economic quantitative methods and economic expert witnesses as a means to produce and support evidence in merger and antitrust cases. By quantitative techniques we refer to techniques "designed to test an economic hypothesis to the exclusion of exploratory data analysis"[3]. The latter refer to descriptive statistics of industry data (retail scanner data, consumer panel data) or descriptive analysis of company data (transaction level data, bidding data, descriptive event analysis) that are often employed in antitrust and merger analysis. However, the issues raised by these industry data for causal inference are much less complex than econometrics or other inferential quantitative techniques, which will form the main object of this study.

Innovations in computing power and in econometric techniques have gradually transformed most areas of economics, including industrial organization, the area dedicated to understand and analyse the workings of markets and industries and the way firms compete with each other. The application of quantitative techniques to antitrust has arisen naturally from the need to answer the central questions of antitrust analysis, such as, market definition and market structure issues, analysis of pricing and non-pricing behaviour by firms, quantification of damages and efficiencies and dynamic issues of entry and product reallocation[4].

Quantitative techniques are those designed to test a hypothesis formulated based on economic theory. These techniques can range from simple statistical tests to complex structural econometric estimation models of demand and supply (e.g. demand system estimation). However, rarely will quantitative techniques alone decide matters on a particular case. Quantitative analysis interacts with qualitative analysis in a complex way and generally these two can be seen more as complements rather than substitutes. In any case, the weighting and sifting of evidence will always involve expert judgment on the part of the competition authorities.

The aim of this chapter is, on the one hand, to briefly describe the main aspects of the most commonly used quantitative techniques in antitrust analysis, and on the other hand, to quantify their use in EU merger and antitrust decisions from 2004 until 2011. Moreover, we also codify the Commission's opinion on the techniques utilized.

The rest of the paper is organized as follows. Section 2 provides a short review of the most commonly used quantitative techniques in competition law analysis in the EU[5]. Section 3 discusses the methodology used to collect data from EU merger and

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[3] OFT, Quantitative Techniques in Competition Analysis, October 1999, Research paper 18, p. 8

[4] P. Davis, On the role of empirical industrial organization in competition policy, (2011) 29 International Journal of Industrial Organization 232-328; P. Davis & Eliana Garcés, *Quantitative Techniques for Competition and Antitrust Analysis* (Princeton University Press, 2009).

[5] For some excellent analyses of the use of econometrics in US antitrust law, see ABA, Section of Antitrust Law, *Econometrics – Legal, Practical, and Technical issues* (ABA, 2005); J.B. Baker, Econometric Analysis in FTC v Staples , (1999) 18 Journal of Public Policy and Marketing 11-21; J.B. Baker, J. & T. Bresnahan, "Empirical Methods for Measuring Market Power," 61 *Antitrust Law Journal* 3 (1992); J. B. Baker & D.L. Rubinfeld, Empirical Methods in Antitrust Litigation: Review and Critique," 6 *American Law and Economics Review* 386 (1999); D. L. Rubinfeld, Econometric Issues in Antitrust Analysis, (2010) 166 Journal of Institutional and Theoretical Economics 62-77; D. L. Rubinfeld, Quantitative Methods in Antitrust, in 1 *Issues in Competition Law and Policy* 723 (ABA

antitrust decisions and some data considerations. Section 4 explores the substantive law framework for the assessment and evaluation of this quantitative evidence in EU competition law by the European Commission and the Courts, in particular topics relating to the standard of proof and evidential cogency and the interaction between the different concepts of causation in law and econometrics, whereas Section 5 provides a unique empirical analysis of the probative value of different kinds of econometric evidence, by performing for the first time a quantitative analysis of the opinion of the European Commission for the particular techniques used and their average evidential weight. The final part concludes.

2. Summary Description of Quantitative Techniques Used in Antitrust Analysis

There is a wide range of quantitative methods that have been used as a means to produce or support evidence in antitrust cases. As mentioned above, these can vary from fairly uncomplicated descriptive statistics to advanced structural econometric models of demand and supply. We classify quantitative techniques in four main categories: (a) statistical tests, (b) demand analysis, (c) accounting or stock market analysis and (d) any other technique. Below, we summarize the main elements of the most commonly used techniques in antitrust analysis.

2.1. Statistical Tests
2.1.1. Price Correlations

Correlation analysis rests on the intuitive assumption that the prices of goods that are substitutes should move together. It is a very popular technique mainly because of its simplicity and ease of calculation. Price correlation is frequently used to determine whether two products or two geographic areas belong to the same market. However, it is important to remember that correlation analysis does not allow causal inferences about a relationship between two variables to be made, but only provides suggestive evidence on their degree of association.

Correlation analysis is a statistical technique used to measure the degree of interdependence between two variables. Two variables are said to be correlated if a change in one variable is associated with a change in the other. When the changes in the two variables are in the same direction (for example, they both become positive or negative) then the correlation will be positive. When the two variables move in opposite direction, then the correlation will be negative. Lastly, there is the possibility that two variables are independent from each other in which case their correlation would be zero.

The degree of association between two variables is sometimes measured by a statistical parameter called covariance, which is dependent on the unit of measurement used. The correlation coefficient between two variables, x_1 and x_2, is,

Section of Antitrust Law 2008); G. Werden, Economic Evidence on the Existence of Collusion: Reconciling Antitrust Law with Oligopoly Theory, (2004) 71 *Antitrust Law Journal* 719

however, a standardized measure of association between two variables: $\rho=\sigma_{12}/\sigma_1\sigma_2$, where σ_{12} is the covariance between x_1 and x_2 and σ_1 and σ_2 are the square roots of the variances of x_1 and x_2 respectively. The correlation coefficient is a number ranging between -1 and 1. A coefficient of -1 implies perfect negative correlation, a coefficient of 1 implies perfect positive correlation, and a coefficient of zero implies no correlation.

The implementation of the price correlation test requires time series data with at least 20 observations. It is customary to compute the correlation coefficient using the natural logarithm (log) of the price series, both due to efficiency reasons and because the first log difference is an approximation of the growth rate. All statistical and econometric packages have in-built routines to compute correlation coefficients.

The intuition behind the price correlation test is that the price movements of goods that are considered "close" substitutes in the eyes of the consumers should be closely interrelated. Put it simply, the underlying idea is that prices of close substitutes will move together. However, there are a number of important limitations that one must keep in mind when trying to interpret a particular correlation.

First, even if the correlation coefficient is statistically different from zero, the economic interpretation of the test is not straightforward. As Stigler and Sherwin (1985) emphasize, this is due to the lack of an obvious cut-off point where it can be decided whether the estimated degree of interdependence between the prices can be taken as an indication of price uniformity.[6] Second, there can be many common factors influencing prices that could lead to erroneous conclusions. For example, assume that you find a high positive price correlation between breakfast cereals Rice Krispies and the rice brand Uncle Ben's. Most likely, this would not be because these two goods are close substitutes, but because both their prices are influenced by the common input price of rice. Unless the influence of common factors is purged, the use of the correlation coefficient as a test of price interdependence leads to wrong conclusions, regardless of the size or the statistical significance of the estimate. Third, price responses for some products or areas might be delayed due to the nature of the contracts signed. Contracts or prices among wholesalers are usually negotiated at discrete time intervals which may not be synchronised. That means that the analyst may find a low correlation using short run data, while in fact the two price series are highly correlated if you look at the long run. Finally, but very importantly, correlation does not imply a causal relationship between the two variables and great caution should be exercised in interpreting correlation results in an economic meaningful way.

2.1.2. Price Determinant Regressions

Moving beyond simple price correlations, the next most popular empirical method used is a price regression framework, where prices of products in a particular industry are regressed on a set of exogenous variables. The aim here is either to purge prices of effects other than competition, or to study the response of prices (and hence measure

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[6] Stigler, George J & Sherwin, Robert A, 1985. "The Extent of the Market," Journal of Law and Economics, University of Chicago Press, vol. 28(3), pages 555-85, October.

the intensity of competition) to an unpredictable event. An example of the first type of analysis is the so-called hedonic price regressions, where in a regression framework the analyst is trying to control for quality changes over time and over the product space due to either technological or subjective factors. Typical examples here would be products whose quality evolves dramatically over time, like cars or personal computers. An example of the second type of analysis would be the response of prices to new regulation or to an unpredictable input shock (like a spike in the price of oil).

We will describe now a general regression framework that could encompass many applications in this area. Consider a multi-firm, multi-product market, where the price of product j can be expressed as a function of:

$$\log P_{jt} = \alpha_1 + \sum_{k=1}^{K} x_{jk}\beta_k + \sum_{l=1}^{L} y_{jl}\gamma_k + \sum_{t=1}^{T} D_t\delta_t + \theta Z_{jt} + \varepsilon_{jt}$$

where x_{jk} is the kth characteristic of product j, y_{jl} is the lth input for product j, D_t is a time dummy and Z_{jt} is a exogenous event (for example, a new regulation). Product characteristics are included in order to control for quality differences over time, so that we can compare prices across products adjusted for quality improvements. For example, if the application is personal computers, product characteristics could include size of memory, speed, type of processor, weight, a DVD dummy etc. Similarly, inputs are there to control for common cost sources that will affect prices. Examples might be cost of labour and cost of basic inputs such as memory or type of processor. Time dummies are meant to capture any common influences over time across all products in the market (for example, impact of inflation, or the state of the economy overall). Finally, if an unexpected event (banking crisis or new product regulation) has occurred during our sample, we could also study its impact on prices.

Computation of price regressions requires a combination of time series and cross-sectional data on products' price, characteristics and inputs. It is advisable to have a large enough dataset (at least 30 observations plus as many observations as the number of regressors in the estimated equation). All econometric packages have in-built routines to compute multivariate regressions. Perhaps, special care would be needed in handling problems such as heteroskedasticity, or non-constancy of the error term variance, but again most packages have commands that allow to correct for such problems.

Typically the key output of a price regression exercise is to construct a price index (having control for quality, time and input effects) that would describe, for example, the evolution of average prices over time. This exercise, of course, requires detailed knowledge of the demand and supply conditions of the product and market for which the index is calculated, as any omitted variable would bias the results. Hence, a high adjusted-R^2 is usually a good measure of how well the model explains the variability in prices.

2.1.3. Dynamic Price Regressions

Dynamic price regressions and co-integrated analysis are sometimes used to determine the extent of a market and to examine the mechanisms by which price changes are transmitted across products or geographic areas. The way prices of a set of products adjust to either demand or supply shocks can be represented econometrically by what is known as error correction models (ECM). ECM can be used to test whether two or more series of price data exhibit stable long-term relationships and to estimate the time required for such relationships to be re-established when a shock causes them to depart from equilibrium. ECM models are a powerful econometric tool (mainly used in international macroeconomics and financial economics), however, for the purposes of an antitrust investigation this method is largely atheoretical and as a result great caution should be exercised when applied and particularly with the interpretation of the results.

Consider the following general-lag model (small letters indicate natural logarithms):

$$p_{1t} = \alpha_0 + \beta_0 p_{2t} + \beta_1 p_{2t-1} + \gamma p_{1t-1} + u_t$$

Subtracting p_{1t-1} from both sides and adding and subtracting $\beta_0 p_{2t-1}$ from the right-hand side, we get:

$$\Delta p_{1t} = \alpha_0 + \beta_0 \Delta p_{2t} - (1 - \gamma) \left\{ p_{1t-1} - \left[\frac{\beta_0 + \beta_1}{1 - \gamma} \right] p_{2t-1} \right\} + u_t$$

where $\Delta p_{1t} = p_{1t} - p_{1t-1}$ and $\Delta p_{2t} = p_{2t} - p_{2t-1}$ and u_t is a random error term with zero mean and constant variance. The long term difference between the two prices is β_0 and the last term, $(1 - \gamma) \left\{ p_{1t-1} - \left[\frac{\beta_0 + \beta_1}{1 - \gamma} \right] p_{2t-1} \right\}$, is called the error-correction term because it reflects the current "error" in attaining long-run equilibrium, as it measures the extent to which the two prices have diverged. The parameter γ has to be less than one for the system to be stable, that is, to ensure convergence towards the equilibrium. If γ were equal to zero, the adjustment would be instantaneous.

Error correction models are a powerful tool, as they allow the estimation of equilibrium relationships using time series of data that are non-stationary.[7] Two non-stationary time series are said to be co-integrated if they have a linear combination that is stationary. Engle and Granger[8] have supplied many examples of non-stationary series that might have stationary linear combinations and among them, they cited the prices of "close substitutes in the same market". Engle and Granger also showed that integrated series whose relationship can be expressed in the form of an ECM are co-integrated. Hence, the speed of adjustment of price movements to their equilibrium

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[7] Generally speaking, a stationary series has a mean to which it tends to return, while non-stationary series tend to wander widely; also, a stationary series always has a finite variance (that is, shocks only have transitory effects) and its autocorrelations tend to die out as the interval over which they are measured widens.

[8] Engle, R.F. and C.W.J. Granger, 1987, "Co-integration and Error Correction: Representation, Estimation and Testing", Econometrica, 55: 251-76.

levels can be estimated by an ECM even when prices are in levels rather than differences.

The data requirements for an ECM model are basically a long enough time series of products' prices. However, estimation is much more complicated and typically proceeds in different steps. First, the analyst would want to purge prices from the influence of any common factors in much the same way as in "price determinant regressions" discussed before. Second, the analyst would test for stationarity of the two price series using a unit root test. Third, provided that the data is non-stationary, then the analyst can test whether they are co-integrated. If evidence of co-integration is found, then we can conclude that the price movements tend to an equilibrium in the long run. If a simple ECM representation cannot be found, then co-integration analysis becomes even more sophisticated as a model that fits the particular data needs to be found. Specialized econometric packages like STATA have many in-built routines to compute ECM models.

It is obvious that this method is much more complicated and difficult to estimate compared to the previous ones. There are many practical issues involved, besides the ones discussed already, having to do with the lag structure used in each case, tests for autocorrelation and how to solve it and the correct way to calculate standard errors. But besides these econometric problems, this methodology remains useful but should be used with extra care as it is not based on a clear economic model. To put it differently, the fact that prices of two goods move together is not sufficient proof of existence that these two goods belong to the same relevant market. To prove that we need to go beyond statistical techniques and have a more coherent theory as to how the price of one good might respond to a price increase in another and to be able to quantify this much more directly.

2.2.   Demand Analysis

Most markets are characterized by products that are close, but not perfect, substitutes for each other. In markets like these with differentiated products, prices are set to balance the added revenue from marginal sales with the loss that would be incurred if they were to raise the prices. When two producers of close substitutes merge, for example, there is a strong incentive to raise unilaterally the price of at least one product above the pre-merger level. This is because those sales of one product that would be lost due to an increase in its price would be partly or totally recouped with increased sales of the substitute product. Whether such a price increase is profitable depends crucially on how close substitutes the products of the two producers are; the higher their substitutability, the higher is the likelihood that a unilateral post-merger price increase would be profitable.

Antitrust authorities dealing with mergers (and other antitrust cases) in differentiated product markets need information about the substitutability of all the products in a market. Economists use two very basic ideas to characterize the responsiveness of product's sales to a potential price increase. The first one is the own-price elasticity, which is the percentage decrease in a product's demand due to a

percentage increase in its price given the prices of all other products remain the same. The second is the cross-price elasticity, which is the percentage increase in a product's demand due to a percentage increase in a substitute product's price given the prices of all other products remain the same. Hence, quantification of the own and cross price elasticities in a market is critical from the policy makers point of view in order to assess the profitability and the overall impact of firms' strategies. The techniques that we analyse below aim at doing precisely that using different methodologies.

2.2.1. Survey and Experimentation Techniques

There are many situations in which raw price, quantity or estimates of elasticities between products are not available. In this case, the firms involved might consider "creating" such datasets from scratch. There are two possible methods of doing that: to conduct interviews with consumers and to create an experiment.

To carry out a survey, it is necessary to consider: (i) the objectives of the questionnaire, (ii) selecting a random sample of the population, (iii) test and pilot the survey before rolling it to the whole sample, and (iv) analyze the results. Let us focus the discussion here and assume that the objective is to get a sense of the own and cross price elasticities between a set of chosen products. With this objective in mind, the questions need to be phrased in the best possible way in order to elicit consumers' preferences. The main danger here of course is that consumers' responses might differ significantly from actual behaviour. Consumers often respond by projecting an "ideal" self (the one who exercises a lot, eats healthy food, etc), rather than the "real" themselves (the ones who actually doesn't do all the above). Sample selection is also crucially important, as we try to infer how the whole population would behave from a small sample of people. Given these considerations, survey techniques would provide us with some original data that can be counted and analysed using statistical methods.

To carry out an experiment, it is necessary to consider: (i) the objectives of the experiment, (ii) selecting a random sample of the population and divide them into a control and treatment group, (iii) administer the treatment, and (iv) measure and analyse the results from the two groups. The idea here is similar to the way scientists evaluate drugs – providing drugs to a randomly selected treatment group and comparing their outcome to the excluded control group. In terms of analysing elasticities, for example, a supermarket could administer random changes to prices in some stores, but not in neighbouring ones and measure and compare the sales across products and stores. Methodologically this is perhaps the best, most reliable way to generate original data. Its main disadvantage is that it is very expensive to administer. However, the advent of internet in some cases has reduced massively the cost of conducting experiments, so perhaps we will see more of them in antitrust cases in the near future.

2.2.2. Residual Demand Analysis

The residual demand facing a firm (or a group of firms) is the demand function, specifying the level of sales made by the firm as a function of the price they charge, net of the influence of the amount of product provided by all other firms in the industry. Following Landes and Posner (1981)[9] and Scheffman and Spiller (1987)[10], consider a market where a dominant firm is facing a market demand $D^{market}(p)$ and also a competitive fringe, who are willing to supply an amount based on the price offered in the market, $S^{fringe}(p)$. The residual demand is then the amount left to the dominant firm after the fringe has supplied any units they are willing to supply at that price:

$$D^{dominant}(p) = D^{market}(p) - S^{fringe}(p).$$

The estimation of the residual demand allows the analyst to understand the competitive behaviour of a firm. A firm operating in an environment where the constraints imposed by other firms are high, will be left with no power to raise the price above the competitive level. In other words, the fewer the competitive constraints from other products or firms, the less elastic the residual demand curve by the firm is going to be. This means that by reducing the quantity it supplies, the firm could cause a long-lasting price increase. Hence, the elasticity of the residual demand curve conveys invaluable information on the competitive situation within a market.

The dominant firm's price elasticity of demand is equal to the market demand elasticity, adjusted accordingly to take into account the supply response of the competitive fringe:

$$e_{demand}^{dominant} = \left(1 \Big/ \text{mkt share}^{dominant} \right) \left(e_{demand}^{market} - \text{mkt share}^{fringe} \times e_{supply}^{fringe} \right)$$

Note that the residual elasticity of demand increases as the elasticity of market demand increases or as the elasticity of supply from the fringe increases.

The key economic insight is that the residual demand function captures all the relevant information about the constraint imposed by other firms and expresses it in terms of the residual demand elasticity. If the product market in question is close to homogeneous (i.e. very little differentiation among products), then from an estimate of the elasticity of the residual demand the analyst can infer whether a firm or a group of firms could cause a significant and long-lasting price increase. If that is the case, then the product sold by these firms, or the geographic area in which they operate, constitutes an antitrust market. Residual demand analysis can be applied to any kind of market and with due modifications, as discussed by Baker and Bresnahan (1985)[11], this approach can also be taken in markets with differentiated product.

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[9] Landes, W., and R. Posner (1981), "Market power in antitrust cases", Harvard Law Review, 94: 937-996.

[10] Scheffman, David T & Spiller, Pablo T, 1987. "Geographic Market Definition under the U.S. Department of Justice Merger Guidelines," Journal of Law and Economics, vol. 30(1), pages 123-47, April.

[11] Baker, J.B. and T.F. Bresnahan, 1985, The Gains from Mergers or Collusion in Product Differentiated Industries, *Journal of Industrial Economics*, 35: 427-44.

To obtain an estimate of the own-price elasticity of the residual demand, data on price, quantity, demand and cost shift variable need to be gathered. In the most general form, assume that firm *i* has the following residual demand function:

$$Q_i = f(P_i, X, Z, Y)$$

where Q is the quantity, P is the price, X is a cost shift variable (could also be a vector) affecting only the firm's rivals, Z is a cost shift variable that only affects firm *i* and Y is a demand shift variable that affect consumers' behaviour (such as income or the price of complements etc.). In this case the price equation can be estimated by instrumental variable techniques. This requires first regressing the quantity sold on (X, Z, Y) and then use the fitted vales of $\widehat{Q}_i$ to estimate the following price equation (small letters indicate natural logarithms):

$$p_i = \alpha_0 + \alpha_1 \widehat{q}_i + \alpha_2 y + \alpha_3 x + u_i$$

In this case, the estimated price elasticity of the residual demand equation is α_1 and can be used to test whether it is statistically different from any pre-specified value.

In contrast to the empirical analysis of price movements, residual demand estimation stems from economic theory. The estimated own-price elasticity is directly derived from an equilibrium model of supply, demand and assumed mode of competition in a given market. However, it requires in-depth knowledge of the production and demand process. Cost and demand shift variables need to be chosen correctly for the whole approach to be consistently estimated. Moreover, the whole demand and supply identification relies strongly on functional form assumptions.

2.2.3. Critical Loss Analysis

Critical loss analysis, as developed by Harris and Simons (1989)[12], is a complementary tool that uses information about demand and the own-price elasticity to make inferences about the price constraints exerted by substitute products. Firms operating in markets where they possess some degree of market power will experience a loss in sales if they unilaterally raise the price for their product. This technique estimates the 'critical' loss in sales that would render unprofitable a unilateral price increase on behalf of a firm or group of firms. Assuming a benchmark homogeneous product market, the critical loss formula will be:

$$\%\text{Critical } \boldsymbol{Loss} = 100 \times \frac{\%\Delta\text{prices}}{\%\Delta\text{prices} + \%\text{Initial Price} - \text{Cost Margin}}$$

For example, consider a 5% increase in prices in a market where the current price-cost margin is 20%:

$$\%\text{Critical } \boldsymbol{Loss} = 100 \times \frac{5\%}{5\% + 20\%} = 20\%$$

In other words, if the quantity demanded falls by more than 20% following the 5% price increase, the price increase is not profitable. Notice that the higher the margin, the smaller the critical loss in sales it is going to be (if the margin is 60% for example,

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[12] Harris, B.C. and J.J. Simons, 1989, Focusing Market Definition: How Much Substitution is Necessary?, *Research in Law and Economics*, 12: 207-226.

critical loss would be 7.7%). This issue is related to the "cellophane fallacy"[13] because if the margin is high, it means that the firm is already exercising its market power. The "fallacy" in this case is to treat the elasticity and the margin as independent from each other, when we know from the theory that margins are inversely related to the own-price elasticity. Hence, if margins are high, this implies a low price elasticity, which in turn implies that the actual losses in case of a price increase would be small.

Estimation of the critical loss requires relatively little information. Given data on the initial price and some estimate of the margin, we can calculate the critical loss using a simple calculator. Of course, estimation of the actual loss in sales would be much more difficult as it would require estimation of the demand elasticity. Nevertheless, critical loss provides a good benchmark upon which the profitability of price increases can be assessed. In that spirit, critical loss analysis can also be used in terms of product characteristics other than price. For example, as reported in Davis and Garces (2009), in the Sportech/Vernons merger, Sportech's advisors presented a critical loss analysis evaluating whether it would be profitable to reduce the quality (size of the jackpot paid out) of the gabling product being sold.

2.2.4. Diversion Ratio and Upward Pricing Pressure

The diversion ratio tries to answer the following question: if the price of good 1 increases, what fraction of the lost sales will go to good 2? Diversion analysis usually relies on the Independence of Irrelevant Alternatives (IIA) assumption, which implies that the cross-price elasticities of demand between product 1 and all other products in a market is the same.[14] If the IIA holds, then the diversion ratio can be calculated by dividing the cross-price elasticity of demand between products 1 and 2 by the own-price elasticity of demand for product 1. However, even if we do not have data on elasticities, assuming that the IIA holds, we can express the diversion ratio in terms of market shares. If all the products in the market are either "close" or "distant" substitutes for each other, then the diversion ratio between products 1 and 2 is:

$$Diversion\ Ratio = (Market\ share_2)/(1 - Market\ share_1)$$

All other factors being equal, the lower the market share of product 2, the lower the diversion ratio. Or, alternatively, the higher the market share of product 1, the higher the diversion ratio. In other words, the more unequal the two firms are, the higher the diversion ratio would be.

Given the diversion ratio and a measure of firms' gross margin, we can then try to quantify the post-merger incentives of firms to raise prices. Under the assumption that the elasticity of demand is constant over the price range that includes the pre- and

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[13] The cellophane fallacy is based on the case U.S. vs. DuPont, 351 US 377 (1956) trying to establish whether cellophane represented a market. The key lesson from this hypothesis is that to evaluate the profitability of a price increase we need to use as a starting point the competitive prices and margins.
[14] For example, in the automobile industry, the IIA property would imply that a Fiat Punto would have the same cross price elasticity with a Honda Civic as well as a BMW 520.

post-merger prices, Farrell and Shapiro (2010)[15] provide test statistic that compares the upward pricing effect of a merger with the expected post-merger marginal cost efficiencies. In the symmetric case of Bertrand competition they find that there is upward pricing pressure if:

$$\frac{DR}{1-DR}\frac{Margin}{1-Margin} > Cost\ Efficiency$$

where, *Margin* is the pre-merger gross margin, *(price-marginal cost)/price*, *DR* is the diversion ratio between the two firms and *Cost Efficiency* is the predicted decline in marginal cost after the merger.

In the new US Horizontal Merger Guidelines the Gross Upward Pricing Pressure Index or GUPPI is defined as follows:

$$GUPPI\ \text{for product } 1 = \frac{Value\ of\ sales\ diverted\ to\ product\ 2}{Revenues\ on\ volume\ lost\ by\ product\ 1}$$

Although the Guidelines are not precise on this, they do state that a merger is unlikely to raise significant unilateral effect concerns if the GUPPI is "proportionately small", with some commentators arguing for that to mean 5% or less.[16]

The economic logic underlying both the diversion ratio and the UPP or GUPPI is clearly sensible and focuses on the incentives faced by the merging parties to raise prices. However, it is the application of these ideas that raises some important concerns especially with regard to the assumptions that need to be made in order to operationalize and quantify these measures. First, the formulas above assume that the diversion ratio from firm 1 to firm 2 is the same as from firm 2 to firm 1. They also assume that the gross margins of the two firms are the same. Of course, both these assumptions need to be checked in each merger case and if they do not hold then the formula needs to be adjusted accordingly.[17] Second, to allow for multi-product firms and non-Bertrand firm conduct, such as Cournot competition (Nash-in-quantities) and consistent conjectures the UPP formula becomes even more complicated as shown by Jaffe and Weyl (2010).[18] Third, the UPP is essentially a much-simplified merger simulation that allows only the price of one product to re-equilibrate, while holding all other endogenous prices, quantities, and elasticities constant at pre-merger levels. In other words, when the UPP uses "true" elasticities, it differs from a merger simulation only because of the former's non-reequilibration assumptions. However, to calculate the "true" elasticities some form of differentiated oligopolistic demand model (as we will analyse in the next section) needs to be estimated. Given that, the extra "cost" of running the full, rather than the one-product, merger simulation seems almost trivial.

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[15] Farrell, J. and Shapiro, C. 2010. "Antitrust evaluation of horizontal mergers: an economic alternative to market definition" The B.E. Journal of Theoretical Economics, Berkeley Electronic Press, vol. 10(1), pages 9.
[16] Salop, S., Moresi, S. and Woodbury,J. 2010. "Scoring unilateral effects with GUPPI: the approach of the new Horizontal Merger Guidelines" *CRA Competition Memo*.
[17] Bishop, S. and Walker, M. 2009. The Economics of EC Competition Law: concepts, application and measurement, Sweet & Maxwell.
[18] Jaffe, Sonia and Weyl, E. Glen (2010), "The First-Order Approach to Merger Analysis", Harvard Economics Department *Working Paper*.

Diversion and UPP analysis basically provides a very straightforward and quick way to estimate the likely effects from mergers between producers of substitute products, albeit under very restrictive assumptions. These assumptions need to be tested when data is available in each merger case and should not be used without great caution.

2.2.5. Differentiated Product Demand Models

Estimating demand elasticities and substitution patterns for differentiated product markets has become an essential component in examining policy questions regarding market power, mergers, and antitrust violations. Empirical models of demand took center stage during the last decade, as it became evident that theoretical analysis of those questions often provides ambiguous answers. Consistent demand estimation and accurate quantification of elasticities are important prerequisites for examining the firms' strategies impact on a market, the economy and evaluating different counterfactual policy scenarios. In what follows, we provide a very brief overview of the methods used in modeling demand for differentiated products in imperfectly competitive markets, by illustrating the main challenge faced when estimating demand and by surveying some of the recent methods put forward to solve them. We present mainly the intuition behind these models, referring the interested reader to the research papers cited therein for all the technical details.

The main problem faced by an analyst trying to estimate demand for differentiated products is the "dimensionality problem". Due to the large number of products, even if we were to assume a very simple and restrictive functional form for the demand function, the number of parameters will be too large to estimate. For example, a linear demand system, where $f(p)=Ap$, where A is $J{\times}J$ matrix of constants, implies J^2 parameters. The number of parameters can be reduced by imposing various assumptions (such as symmetry of the Slutsky matrix and adding up restrictions) given by representative consumer theory. However, the basic problem ("curse of dimensionality") still remains: the number of parameters to be estimated increases with the square of the number of products. This problem becomes even more severe if we attempt to use a flexible functional form that would allow to estimate better cross-price elasticities.

The literature provides various solutions regarding the dimensionality problem: (i) multi-level demand models, (ii) spatial models, and (iii) discrete choice models. The first two methods essentially solve the dimensionality problem by either imposing symmetry between the different products or by segmenting the market into smaller subgroups. The last class of models takes a more fundamental approach and project consumer preferences over the products' characteristics rather than the products themselves.

Multi-level demand models attempt to solve the dimensionality problem by dividing the products into smaller groups. Although originally these methods were developed for the estimation of broad categories of product (like food, shelter,

entertainment etc), Hausman, Leonard and Zona (1994)[19], Hausman (1996)[20] and Hausman and Leonard (2002)[21] use the idea of multi-stage budgeting to construct a multi-level demand system for differentiated products. The actual application involves a three stage system: the top level corresponds to overall demand for the product (for example, ready-to-eat cereal); the middle level involves demand for different market segments (for example, family, kids and adults cereal); and the bottom level involves a flexible brand demand system corresponding to the competition between the different brands within each segment.

The demand system applied has the Almost Ideal Demand System (AIDS) model formulation (see Deaton and Muellbauer, 1980[22]) at the lowest level: the demand for brand j within segment g in city c at quarter t is

$$s_{jct} = \alpha_{jc} + \beta_j log\left(y_{gct}/P_{gct}\right) + \sum_{k=1}^{J} \gamma_{jk} log p_{kct} + \varepsilon_{jct}$$

where s_{jct} is the dollar sales share of total segment expenditure, y_{gct} is the overall per capita segment expenditure, P_{gct} is the price index and p_{kct} is the price of the kth brand in city c at quarter t. This system defines a flexible functional form that can allow for a wide variety of substitution patterns within the segment.

The middle level of demand models the allocation between segments:

$$log q_{gct} = \alpha_{gc} + \beta_g log y_{Rct} + \sum_{k=1}^{G} \delta_k log \pi_{kct} + \varepsilon_{gct}$$

where q_{gct} is the quantity of the gth segment in city c at quarter t, y_{Rct} is the total product expenditure and π_{kct} are the segment price indexes.

Finally, at the top level demand for the product itself is specified as

$$log q_{ct} = \beta_0 + \beta_1 log y_{ct} + \beta_2 log \pi_{ct} + \delta Z_{ct} + \varepsilon_{ct}$$

where q_{ct} is the overall consumption of that good in city c at quarter t, y_{ct} is disposable real income, π_{ct} is the price index for this product and Z_{ct} are variables that shift demand including demographics and time factors.

The advantages of using this model to estimate demand for differentiated products are: (i) the model is closely linked to the neo-classical demand theory; (ii) it allows for a flexible pattern of substitution within each segment; (iii) it is relatively easy to estimate.

However, criticism of this method has several parts. First, although the demand within segments is flexible (the AIDS model allows for a second order flexible system), the segment division is potentially very restrictive. This practice has been defended on the grounds that one could test for the validity of the segmentation and

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[19] Hausman, J. A., Leonard, G. and Zona, J. D. (1994) "Competitive Analysis with Differentiated Products", Annales D' Economie at de statistique, 34, 159-180.
[20] Hausman, J. A. (1996) "Valuation of New Goods Under Perfect and Imperfect Competition", In T. F. Bresnahan and R. Gordon, eds., The Economics of New Goods. Chicago: National Bureau of Economic Research.
[21] Hausman, J. A. and Leonard, G. (2002) "The Competitive Effects of a New Product Introduction: A Case Study", The Journal of Industrial Economics, 3, 235-261.
[22] Deaton, A. and Muellbauer, J. (1980) "An Almost Ideal Demand System", American Economic Review, 70, 312-326.

that this segmentation is used by the "players" in the industry. Testing is promising in theory, but in practice it has little power since different segmentations of the market are very difficult to be rejected by the data. The notion of using the segmentation advocated by market participants has some appeal (although the relevance of segmentation used for marketing purposes is not always clear). In practice, however, even when analysing the same market, industry sources and researchers usually differ both on the number of segments they use and on how they allocate the different brands across segments. For example, Hausman (1996) uses only three segments when analysing the ready to eat cereal market, while Cotterill (1996)[23] uses four. Also, the allocation of products to different segments is highly subjective: brands within identical segments might not be the same across studies. Given that the cross price elasticity between brands in different segments will be low relative to brands within a segment, it is obvious that the a priori division of brands into segments will have important implications.

A second criticism is that the multi-level demand system does not fundamentally solve the dimensionality problem. The flexible functional form at the lowest level of demand is achieved by restricting attention to a small number of products. In a differentiated products market this is feasible only if the number of segments is large. In practice this is done by restricting attention in each segment to the "important" brands, usually measured by market shares. However, in many cases the main competitive threat to leading products comes from smaller brands with similar characteristics. Being able to divide the market into a sufficient number of segments and restricting attention to the largest brands within each segment are significant a priori constraints that may bias any subsequent analysis.

Finally, the lowest level of demand regresses expenditure shares on the prices of all brands in a segment. This implicitly assumes that the structure of the segments and the products that belong to each segment are essentially the same over time. If the products in a segment change over time, there is a serious problem with the estimation and the interpretation of the estimates. In industries, like the personal computer industry, where new brands are introduced very frequently this assumption would be highly problematic. This highlights the inherent inability of these models to deal with the important phenomenon of new products' entry or, more generally, technical change that alters product characteristics over time, since they do not provide a description of the underlying factors which make two products close substitutes.

In conclusion, the multi-level demand system has the advantages of being flexible at the lowest level of demand (as long as we work with a constant set of products) and easy to estimate, but requires division of the products into segments, and is workable only with a limited number of products.

Spatial (or distance metric) models constitute a recently proposed alternative that combines methodological elements from both the neo-classical demand and the

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[23] Cotterill, R. W. (1996) "High Cereal Prices and the Prospects for Relief by Expansion of Private Label and Antitrust Enforcement". Testimony offered at the Congressional Forum on the Performance of the Cereal Industry, Washington, D.C., March 12.

characteristics (discrete choice) approach. Consumers are assumed to have preferences over products directly, but cross elasticities between goods are parameterized flexibly in terms of the goods' characteristics.

Following Pinkse, Slade, and Brett (2002)[24], Pinkse and Slade (2004)[25], and Slade (2004)[26], brand model j demand would be written in matrix notation as follows:

$$q = Z\beta + Bp + \varepsilon$$

where q, p and ε are $J \times 1$ vectors of quantities, prices and error terms respectively, Z is the matrix of observed brand and market characteristics and the $J \times J$ matrix $B = \left[b\left(d_{ij} \right) \right]_{i,j=1,\ldots,J}$ is assumed to be a common (parametric or non-parametric) function of measures of distance in product-characteristic space. This model is based on a normalized-quadratic, indirect-utility function, in which the prices of the differentiated products as well as individual incomes have been divided by the price of the outside good. This utility is in Gorman polar form and can therefore be aggregated to obtain brand-level demands.

The advantages of this framework is that it is easy to estimate and allows for more flexible substitution patterns to be driven by how close products are in the characteristics space. However, it does not solve the fundamental dimensionality problem since in practice symmetry and other restrictions need to be imposed. Moreover, this model cannot be used for welfare analysis and it does not address the need to model consumer heterogeneity (consumers are assumed to have the same marginal utility of income).

Finally, an extensively used alternative to the classical market-level approach is discrete choice models. These models solve the dimensionality problem by modeling a product as a bundle of characteristics (Lancaster, 1971)[27]. Consumer preferences are defined over the characteristics space, rather than the products themselves, making this the relevant dimension for empirical work.

In discrete choice models the products' characteristics play two separate roles. First, they are used to describe the mean utility level across heterogeneous consumers. Second, the products' attributes guide substitution patterns: products with similar characteristics will be closer substitutes. In other words, discrete choice models operationalize the notion of "how close products are" with reference to the products' characteristics. On the one hand, this approach is more specific than previous models in the sense that the researcher needs to identify what are the relevant product attributes that drive substitution. On the other hand, this is more flexible because, unlike previous models, it is not constrained by a priori market segmentation, while still being able to take advantage of the information contained in these segments. For

[24] Joris Pinkse & Margaret E. Slade & Craig Brett, 2002. "Spatial Price Competition: A Semiparametric Approach," Econometrica, Econometric Society, vol. 70(3), pages 1111-1153, May.
[25] Pinkse, J. and Slade, M. (2004) "Mergers, Brand Competition, and the Price of a Pint", European Economic Review, 48 (3), 617-643.
[26] Margaret E. Slade, 2004. "Market Power and Joint Dominance in U.K. Brewing," Journal of Industrial Economics, Wiley Blackwell, vol. 52(1), pages 133-163, 03.
[27] Lancaster, J. (1971) Consumer Demand: A New Approach. New York: Columbia University Press.

example, Nevo (2000[28], 2001[29]) analysing the same market as Hausman (1996) uses both brand attributes (such as sugar, fat calories, fiber etc) and market segment information (kids, adults, all-family etc) as product characteristics. Therefore, discrete choice models' reliance on characteristics is not restrictive and provides a flexible framework for differentiated product markets.

A more serious problem with the discrete choice literature is the heavy reliance on an additive independent and identically distributed shock. Following Davis (2000)[30], a general version of a discrete choice model specifies that each consumer i=1,...,I solves the following indirect maximization problem

$$U_{ij} = f\left(x_{1j}, x_{2i}\right)\gamma_i(x_{2i}, v_i, \theta) + \xi_j + \varepsilon_{ij}$$

where x_{1j} denotes observed product characteristics (including the product's price), $I?_j$ denotes unobserved product characteristics, x_{2i} denotes observable consumer characteristics, v_i denotes unobserved consumer characteristics, $f(\cdot)$ is a known function, $\gamma_i(\cdot)$ is a function known up to a vector of parameters θ and ε_{ij} is an additive random term specific to both consumer and product.

This specification of consumer preferences incorporates the models used in many empirical studies of demand in differentiated product markets. More specifically, assuming that ε_{ij} is independently and identically distributed across products and consumers with type 1 extreme value distribution and that there are no unobserved consumer characteristics (v_i=0) corresponds to the multinomial logit model introduced by McFadden (1973)[31]. This model provides an extremely tractable representation of individuals demand functions, but has the undesirable property that the ratio of the choice probabilities of any two alternatives is independent of the existence and attributes of all other alternatives (independence of irrelevant alternatives (IIA)). This property means that a change in an attribute of one alternative will change the probabilities of all other alternatives proportionally, keeping the ratios of the choice probabilities the same. In the multinomial logit model different consumers will have different ranking of the products, but this difference is only due to the i.i.d shock. Therefore, this model a priori restricts consumers to substitute towards other brands in proportion to market shares and does not allow for flexible substitution patterns between goods to be determined by the data.

To alleviate this problem, shocks to individual utility need to be correlated across brands. Intuitively, we would expect that the second-choice of consumers that decide to no longer buy an IBM ThinkPad notebook, for example, would be different than the average consumer. In particular, they will more likely substitute towards another laptop with similar characteristics, rather than a desktop. Subsequent research

[28] Nevo, A. (2000) "Mergers with Differentiated Products: The Case of the Ready-to-eat Cereal Industry", RAND Journal of Economics, 31 (3), 395-421.
[29] Nevo, A. (2001) "Measuring Market Power in the Ready-to-Eat Cereal Industry", Econometrica, 69, 307-342.
[30] Davis, P. (2000) "Empirical Models of Demand for Differentiated Products", European Economic Review, 44, 993-1005.
[31] McFadden, D. (1973) "Conditional Logit Analysis of Qualitative Choice Behavior", in P. Zarembka, eds., Frontiers of Econometrics, New York, Academic Press.

tried to circumvent the IIA property by introducing such correlation across products either through the additive separable term, ε_{ij}, or through consumer observed, x_{2i}, and unobserved, v_i, heterogeneity.

Models, which allow ε_{ij} to be correlated across products rather than independently distributed, are nested in the generalised extreme value model introduced by McFadden (1981)[32]. The most popular example of these models is the nested logit model, in which all brands are grouped into pre-determined exhaustive and mutually exclusive sets and ε_{ij} is decomposed into an i.i.d shock plus a group specific component. This implies that correlation between brands within a group is higher than across groups; buyers of IBM ThinkPad are more likely now to substitute towards other laptops. However, substitution within the group is still driven by market shares; if some laptops are closer substitutes to IBM ThinkPad than others, this will not be captured without further segmentation.

The main advantages of the nested logit is that it is easy to compute and allows for more flexible substitution patterns. It has been used to describe various industries such as automobiles (Verboven, 1996)[33] or personal computers (Foncel and Ivaldi, 2005)[34]. However, as in the case of multi-stage budgeting, the a priori division of products into groups is not always clear. Moreover, the segmentation does not fully account for the substitution patterns: given the assumption of i.i.d shocks within a group, elasticities among those products still have the problems associated with the simple logit model. In addition, in the nested logit the order of the nests matters. The Principles of Differentiation General Extreme Value (PDGEV) model introduced by Bresnahan, Stern and Trajtenberg (1997)[35] overcome this last problem. In modelling demand for personal computers, they segmented the market along two dimensions (branded vs generic and frontier vs non-frontier technology) without ordering them. With the exception of dealing with the problem of ordering the nests, this model retains all the advantages and disadvantages of the nested logit.

An alternative way to avoid the IIA property is to allow the correlation across products to be a function of both product and consumer characteristics. Given that consumers have intrinsic preferences over the products' characteristics, it is more likely to substitute towards products with similar characteristics. Moreover, we would expect consumers with similar demographics to have a similar ranking of products and therefore similar substitution patterns. The random coefficient multinomial logit model with unobserved product characteristics presented by Berry, Levinsohn and

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[32] McFadden, D. (1981) "Econometric Models of Probabilistic Choice", in C.F. Manski and D. McFadden, eds., Structural Analysis of Discrete Data, MAss.: MIT Press.

[33] Frank Verboven, "International Price Discrimination in the European Car Market" (1996), RAND Journal of Economics, 27 (2), 240-268.

[34] Foncel, J. and Ivaldi, M. (2005) "Operating System Prices in the Home PC Market", Journal of Industrial Economics, 53(2), 265-297.

[35] Bresnahan, T., Stern, S. and Trajtenberg, M. (1997) "Market Segmentation and the Sources of Rents from Innovation: Personal Computers in the late 1980s", RAND Journal of Economics, 28, S17-S44.

Pakes, or BLP, (1995)[36] provides a framework that incorporates both unobserved and observed consumer heterogeneity.

BLP combined many advances both in the discrete choice literature (random coefficient multinomial logit) but also in the empirical industrial organization literature (Bresnahan, 1987[37]; Berry, 1994[38]) and present a model that allows for flexible substitution patterns that depend on product and consumer characteristics without any reliance on a priori market segmentation. These advantages, however, come at a higher computational cost compared with the other discrete or continuous models. Subsequent research (Nevo, 2001[39]; Petrin, 2002[40]; Berry, Levinsohn and Pakes, 2004[41]) extended the BLP framework in various dimensions to incorporate more observable consumer heterogeneity.

Despite its wide applicability, this approach has also its critics: discrete choice model are unusable in some markets precisely because of the need for attributes that describe the product. For example, Hausman (1996) claims: "Indeed, it is difficult to conceive how I would describe Apple-Cinnamon Cheerios in terms of its attributes-perhaps the volume of apples and cinnamon along with other ingredients. Thus, it is readily recognized that for highly differentiated products, the discrete choice model specification based on product attributes may not be usable." Other relevant examples, where it is difficult to define a product in terms of its attributes, might include perfumes, wines etc. Hence, despite many advances, these models are not a panacea and still require careful modeling.

2.3.   Other Techniques
2.3.1. Bidding Studies

In many markets transactions among firms are based on a bidding procedure. The underlying economics of these environments are not that different from other markets, but the auction format and the particularities of each auction (reservation prices, entry requirements etc.) means that specialized analysis is required before reaching any conclusions on the firms' market power. A particular concern in many auctions is the possibility of collusion. Since auctions are essentially mechanisms for buyers to reveal their willingness to pay for an object (a rare painting, a contract, a power plan, or a government bond just to give a few examples) and given the important

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[36] Berry, S., Levinson, J., and Pakes, A. (1995) "Automobile Prices in Market Equilibrium", Econometrica, 63, 841-90.

[37] Bresnahan, Timothy F, 1987. "Competition and Collusion in the American Automobile Industry: The 1955 Price War," Journal of Industrial Economics, Wiley Blackwell, vol. 35(4), pages 457-82, June.

[38] Berry, S., Levinson, J., and Pakes, A. (1995) "Automobile Prices in Market Equilibrium", Econometrica, 63, 841-90.

[39] Nevo, A. (2001) "Measuring Market Power in the Ready-to-Eat Cereal Industry", Econometrica, 69, 307-342.

[40] Petrin, A. (2002) "Quantifying the Benefits of New Products: The Case of the Minivan", Journal of Political Economy, 110, 705-729.

[41] Steven Berry, Jim Levinsohn, and Ariel Pakes (2004), "Estimating Differentiated Product Demand Systems from a Combination of Micro and Macro Data: The Market for New Vehicles," Journal of Political Economy, vol. 112, no. 1,1, pp. 68-105.

informational asymmetries they may exist, when some bidders might have superior information compare to others, antitrust authorities try to prevent bid rigging in order to stop or prevent the anti-competitive behavior of a cartel of bidders. Empirically, given the many formats an auction can take (orally ascending or descending, first price or second price sealed bid and all their permutations), there is not an all-encompassing econometric framework, but instead the details of each auction need to be studied in isolation and the empirical model need to be adjusted according to the information available to the bidders at the time.

2.3.2. Stock Market event studies

Stock markets' reactions to news can be a particularly valuable source of information that may lead to inferences about the nature of a merger or any other corporate announcement. Eckbo (1983)[42] and Stillman (1983)[43] were the first to present the rationale behind the analysis of stock markets' reactions based on financial theory. Put it simply, if the stock market is assumed to be efficient, so that asset prices reflect the true underlying value of a company, then when a merger between two companies takes place, there are two possible outcomes in the product market. First, if market power increases substantially after a merger, the product price will increase and so will profits for both the merger partners and the other firms operating in the market, at least in the short run (that is, prior to entry by new players). This implies that, on the assumption that the stock market is efficient, both the merging firms and horizontal rival firms in the industry should earn positive abnormal returns when the anti-competitive merger is announced. Also, when steps are taken by the authorities to investigate the merger, negative abnormal returns should be observed.

Second, if the merger generates cost efficiencies, then the merged firm will be more profitable, than the sum of the pre-merger entities, all other factors being equal; such higher profitability, however, will not extend to other firms in the industry. This implies that the merging partners should gain positive abnormal returns around the date of the merger announcement, and negative abnormal returns around the date when antitrust investigations are announced. The situation for rival firms is, however, more complex. If the market expects the cost efficiencies to be easily passed along to other players in the industry, then rival firms should also earn positive abnormal results when the merger is announced and negative returns when legal proceedings are announced by the authorities. Otherwise, negative abnormal returns can be expected for the rivals at the time the merger is announced and positive returns when the investigation is announced.

Summarising, observing positive abnormal returns for the merging partners at the time of the merger announcement does not allow the analyst to distinguish between a merger which is expected to raise prices and one which is expected to lower costs.

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[42] Eckbo, B.E., 1983, Horizontal Mergers and Collusion, *Journal of Financial Economics*, 11: 241-73.

[43] Stillman, R., 1983, Examining Antitrust Policy Towards Horizontal Mergers, *Journal of Financial Economics*, 11: 225-40.

Likewise, observing positive abnormal returns for the horizontal rivals does not make it possible to discriminate between the two hypotheses of a price-increasing versus cost-reducing merger. However, observing insignificant or negative abnormal returns for the rivals around the announcement date is a sufficient condition to conclude that the market expects the merger to be cost-reducing, not price-increasing.

The above-mentioned hypothesis is tested by using time series stock-price data for rival firms, and comparing their actual stock price returns around the announcement date with a counterfactual measure of what the return would have been had the merger not taken place, and summing over to obtain the cumulative abnormal returns. The counterfactual return for an asset can be calculated based either on the mean-adjusted return model (MARM);[44] or on the market model;[45] or the capital asset pricing model (CAPM);[46] or the market index model.[47] These tests hinge upon the idea that the capital market is efficient. Most studies in this area though show only a weak or semi-strong for of efficiency. Most importantly, these tests rely on the reactions of the stock market *after* an event (or its announcement). However, antitrust authorities need to make decisions before such announcements are made. Hence, financial analyses like these are perhaps complementary to examining competition and market power in an industry, but they can hardly be substitutes given their post-event nature and capital market efficiency reliance.

2.3.3. Cost analysis – Production determinant regressions

Costs are a key component of profitability, and as such it should perhaps not be surprising that knowledge of an industry's or a firm's cost function is often very important for competition analysis. Cost considerations are important in both merger and regulatory contexts. In merger investigations, one reason for approving a horizontal merger even if it is likely to increase market power can be if unit costs are likely to go down. One reason they might is if a merger generates substantial economies of scale. Similarly, in regulatory contexts, regulators often choose to set prices as a function of some measure of costs. In doing so, regulators face the complex task of getting appropriate and meaningful data, devising a relevant cost measure, and estimating its value.

For some purposes, we may "only" need estimates of the marginal or average cost of production and, if so, such estimates can potentially be retrieved from company records or industry estimates. In such cases there may be no need to actually estimate a cost function. However, on other occasions, we want to know whether the marginal cost varies with the quantity produced, and in particular whether we have

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[44] According to the MARM, the counterfactual return from an asset is simply the average return over a specified period.

[45] The market model return is the predicted value from a regression of actual returns on an intercept and the returns on a market index.

[46] The CAPM requires estimating the predicted values from a regression of actual returns on the returns on a risk-free asset and on the difference between the return on a market index and on the risk free asset.

[47] The counterfactual return for the market index model is simply the market index itself.

economies or diseconomies of scale as firm size varies. In this case, the economists' traditional approach requires making assumptions about the potential form of the cost function and estimating the cost model's parameters. While "econometric" cost function estimation is perhaps most familiar to economists, "engineering" cost estimation can also prove very effective. One way to get engineering estimates is to perform detailed interviews with the technical personnel at plants and firms to get hands-on estimates of costs and scale effects.

The "traditional" economic approach to estimate a production function such as $Q = f(I_1, I_2, I_3, ..., I_m, u; \alpha)$, where Q is the quantity produced, $I_1, I_2, I_3, ..., I_m$ are inputs such as capital, labour, material etc, u the unobserved econometric error and α the parameters to estimate, is to write the following equation (lower letters indicate taking natural logarithms):

$$q_i = \alpha + \alpha_L l_i + \alpha_K k_i + \alpha_M m_i + u_i$$

where l, k, m are labour, capital and material choices for firm i. Consider a data set consisting of a large number of firm-level observations on outputs and inputs and suppose we are attempting to estimate the production function There are four issues that are likely to arise: endogeneity, functional form, technological change, and multiproduct firms.

First, the problem of endogeneity may arise because OLS estimation, even if the true model is assumed linear in parameters and the unobserved (productivity) term is assumed additively separable, productivity must not be correlated with the independent variables in the regression, i.e., the chosen inputs. We will face an endogeneity problem if, for example, the high-productivity firms, those with high unobserved productivity u_i, also demand a lot of inputs. If we do not account for this endogeneity problem, our estimate of the coefficient on our endogenous input will be biased upward. To solve this problem by instrumental variable regression we would need to find an identifying variable that can explain the firm's demand for the input but that is not linked to the productivity of a firm. Recent advances in the production function estimation literature have included the methods described in Olley and Pakes (1996)[48], who suggest using investment as a proxy for productivity and use it to control for endogeneity. Levinsohn and Petrin (2003)[49] suggest an alternative approach, but in an important paper Ackerberg et al. (2006)[50] critique the identification arguments in those papers, particularly Levinsohn and Petrin (2003), and suggest alternative methodologies.

A second consideration is that we must carefully specify the functional form to take into account the technological realities of the production process. In particular, the functional form needs to reflect the plausible input substitution possibilities and the plausible nature of returns of scale. If we are unsure about the nature of the returns

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[48] Olley, S. G., and A. Pakes. 1996. The dynamics of productivity in the telecommunications equipment industry. *Econometrica* 64:1263–97.

[49] Levinsohn, J., and A. Petrin. 2003. Estimating production functions using inputs to control for unobservables. *Review of Economic Studies* 70:317–41.

[50] Ackerberg, D., K. Caves, and G. Frazer. 2006. Structural identification of production functions. UCLA Working Paper.

to scale in an industry, we should adopt a specification that is flexible enough to allow the data to determine the existence of scale effects. Clearly, we want to use any actual knowledge of the production process we have before we move to estimation, but ideally not impose more than we know on the data.

Third, particularly when the data for the cost or production function estimation come from time series data, we will need to take into account technological change going on in the industry. Technological progress will result in new production and cost functions and the cost and input prices associated with the corresponding output cannot therefore immediately be compared over time without controlling for such changes. For this reason, one or more variables attempting to account for the effect of technological progress is generally included in specifications using time series data. Moreover, if firms are using different technologies, then it would be important to attempt to account for such differences.

Fourth, when the firms involved produce more than one product or service, costs and inputs can be hard to allocate to the different outputs and constructing the data series for the different products may turn into a challenge. Estimating multiproduct cost or production functions will also further complicate the exercise by increasing the number of parameters to estimate.

A final alternative approach to cost estimation is known as the "engineering" approach. This approach to determining the nature of scale economies was pioneered by Bain (1956)[51]. It is based on interviews with engineers familiar with the planning and design of plants and produces direct and detailed industry specific data. As the name suggests, the objective is to determine the shape of the cost function or the nature of the production function by collecting specific and detailed information first hand from people knowledgeable of the cost and scale implications of their businesses.

2.3.4. Industry Specific Model Simulation

As the name suggests, this is an all-other-methods encompassing category that we frequently observe in reports or industry analyses of merger or antitrust cases. Here a case-specific theoretical or empirical model is detailed with the aim to prove a particular point. Such models are frequently employed when severe data limitations make any of the previous approaches difficult to implement and particular assumptions related to the industry structure and competition have to be made. There is a large heterogeneity on the difficulty and sophistication of the empirical methods employed under this category and can vary between a very simple simulation of a theoretical model's parameters to a fully-fledged structural empirical investigation.

3. A primer on the role of quantitative evidence in EU competition law

Econometric techniques may be used in a variety of competition cases, in both merger control and antitrust. We will briefly summarize the type of quantitative techniques

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[51] Bain, J. S. 1956. *Barriers to New Competition*. Cambridge, MA: Harvard University Press.

employed in proceedings relating to the main categories of competition law violations. We will first examine the practice of the European Commission, before exploring how the European courts have addressed quantitative evidence, either in actions for annulment of the Commission's decisions, or in preliminary ruling procedures.

3.1. Quantitative evidence in EU Commission's decisions

Merger control is by far the area where the Commission most often employs econometric evidence. More recently, the Commission has started to expand the use of quantitative evidence in other areas of EU competition law, most notably, for decisions involving abuse of a dominant position and cartels.

3.1.1. Econometric techniques in EU merger control

Econometric techniques are often used in merger control for the delineation of product but also geographic markets, but also for the competitive assessment of the merger, in particular for the identification of unilateral (non-coordinated) effects.

3.1.1.1. Econometrics and market definition

Econometric estimates of demand elasticities are typically considered more informative than descriptive economic statistics (e.g. market shares, barriers to entry, concentration indexes), although at the same time they can be more data demanding and can rely on a large set of assumptions that need to be made in order to estimate the appropriate model[52]. There exist several indirect empirical methods to identify substitute products that act as competitive constraints and may limit the market power of the entity resulting from the merger. The most frequently used price tests include the hypothetical monopolist test, price correlation analysis, stationarity analysis and shock analysis. The aim is to understand the trends in the prices of potential substitutes and hence the existence of a competitive relation with the products/services of the merged entity.

The hypothetical monopolist test assesses whether a profit-maximizing monopolist on a candidate market may impose a small but significant and non-transitory increase in price (SSNIP test). The tool is referred to by the European Commission's guidelines on market definition[53]. Yet, its use requires information on price elasticities, which is often unavailable; hence, it has only been used in a few cases[54].

For instance, in its recently published decision *Unilever/Sarah Lee*, the Commission proceeded in applying a SSNIP test of the gender segments (male/non-male) deodorants in order to find if these could be separate relevant markets for

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[52] OECD, DAF/COMP(2011)23, p. 139.

[53] Commission notice on the definition of relevant market for the purposes of Community Competition law [1997] OJ C372/5, para. 15-17.

[54] Danish Crown/Flagship Foods, para. 9; Heineken/Scottish & Newcastle Assets; Panassonic/Sanyo; Dow/Rohm and Haas; Akzonobel/Rohm & Haas Powder Coating Business and most recently, Unilever/Sara Lee, COMP/M.5658 (November 17, 2010)

competition law purposes. The Commission employed a merger simulation model showing that that the profits of a hypothetical monopolist of the male (or non-male) segment would increase if the prices of all male (or non-male) deodorants increased by 5%. These results supported the conclusions of the market investigation and confirmed that a hypothetical monopolist in the non-male market would not be constrained by the male deodorant products, thus indicating that those products belonged to a distinct relevant market[55]. The Commission was able to use a SSNIP test, having already estimated a demand system with elasticity parameters, building on the simulation model. Implied marginal costs and margins were also calculated for all products before and after the 5% price increase and these margins and quantities were used to calculate the implied total variable profits pre- and post-SSNIP prices.

In the absence of information on price elasticities, critical loss, correlation analysis, stationarity analysis and/or shock analysis might provide some less information-intensive alternatives.

The Commission has employed critical loss analysis mostly for assessing the anticompetitive effects of mergers, rather than in the step of market definition[56]. On the contrary, price correlation analysis, and occasionally stationarity analysis have often been used by the Commission for the purpose of market definition[57]. Correlation analysis examines if the prices of any two substitute products follow a similar trend over time, the correlation indicating the degree to which the prices of the two products are related: a high correlation and positive co-efficient (+1) indicating that the price trends are almost identical. This does not necessarily mean that the two products should be included in the same relevant market; after all the co-efficient indicates price trends and there might exist significant quality differences between the products or differences related to the existence of a strong brand name. In order to assess whether the prices of two products are sufficiently correlated and thus form part of the same market, the Commission uses as a benchmark the correlation between two products that are accepted as being in the same market. In the absence of such benchmark, a view must be taken on what level the correlation coefficient is high enough to indicate that two products are in the same market. If the two prices move perfectly "in step", then the correlation coefficient is one; if there is no association between the prices, the correlation coefficient becomes zero. Account should also be taken of the risk of spurious correlation, for example because both products use the same inputs and thus an increase in the price of the input will create the same trend of price increase for both products. Yet, although not constituting conclusive evidence that the two products form part of the same relevant market, the absence of price correlation indicates that there is no competitive relationship between the two

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[55] Ibid., para. 94.

[56] Intel/Mcafee; KLM/Martinair; Lufthansa/SN Airholding

[57] BP/Nova Chemicals/JV; Johnson & Johnson Guidant; Maersk/Ponl; Reckit/Benckiser/Boots; Seagate/Maxtor; Abbott/Guidant; Arjowwiggins/M-Real Zanders Reflex (with stationarity analysis); Yara/Kemira/Growhow; Osram/SunnyWorld; Owens Corning/Saint Gobain/Vetrotex; ABF/GBI Business; Arsenal/DSP (with stationarity analysis); Nordic Capital/Convatec (with stationarity analysis); APMM/Broström; Iberia/British Airways.

products. In some instances, correlation analysis has also been used in order to define geographic markets[58].

Stationarity analysis attempts to mitigate these defects, by observing the development of the price ratio of two products in two different geographic markets over a certain period of time. In case the price ratio remains static, there is only one relevant market including both products. Stationarity analysis tests whether the "law of one price" holds between the products, under the assumption that if products are close substitutes, then their prices can only deviate from each other for short periods of time. Stationarity tests do not require use of any benchmarks, hence, it becomes important to look at the results of both these types of analysis together, as just evidence that prices move together over time is not conclusive evidence of strong competitive constraints between two products. The Commission's Notice on the definition of the relevant market raises the possibility of using price elasticity as a means of defining markets, although, it does not indicate the degree of price elasticity required for the two products to form part of the same relevant market:

> "There are a number of quantitative tests that have specifically been designed for the purpose of delineating markets. These tests consist of various econometric and statistical approaches estimates of elasticities and cross-price elasticities for the demand of a product, tests based on similarity of price movements over time, the analysis of causality between price series and similarity of price levels and/or their convergence. The Commission takes into account the available quantitative evidence capable of withstanding rigorous scrutiny for the purposes of establishing patterns of substitution in the past"[59].

In any case, econometrics constitute only one type of evidence used for the purpose of market definition, among an array of qualitative evidence, such as evidence of past substitution between the two products, the views of customers and competitors, marketing studies, consumer surveys, barriers and costs associated with switching demand.

In *Arsenal/DSP*, which concerned the acquisition of a paper plant by one of the world's largest manufacturers of specialty paper, the Commission used both correlation analysis and stationarity analysis techniques to examine the extent to which prices moved together over time. The Commission found that reels and sheets were not part of the same market, as the correlation coefficients were clearly not in the range normally considered to indicate that two products are in the same relevant market[60]. It also found that the correlation co-efficients were significantly below the correlations between paper products, which were included in the same market. The stationarity tests found that there was a clear upward trend in the prices of reels

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[58] Ineos/Kerling; Ryanair/Aer Lingus (where the Commission performed an extensive price-correlation analysis to determine whether two or more airports in the vicinity were substitutable, although the quantitative evidence had an auxiliary character in the conclusions reached by the Commission, as there was ample qualitative evidence originating from a customer survey and research into travel costs and time for each of the particular airports).

[59] Commission's notice on the definition of relevant market for the purposes of Community Competition law, op. cit., para. 39.

[60] In general, this is variable and depends on the type of product.

relative to the prices of sheets, which suggested that the "law of one price" did not hold in this case. The decision also discusses extensively the correlation and stationarity analysis presented by one of the merging companies with the aim to contest the Commission's analysis. The Commission observed that the merging party's econometric analysis was subject to a large number of methodological shortcomings, in particular, the statistical tests were not implemented properly, and the analysis was not in accordance with the Commission Notice on the definition of the relevant market for the purposes of Community law[61]. Yet, despite the econometric evidence pointing towards the existence of two separate markets, the Commission also examined if both products were part of a wider overall market, by looking to a market survey and further correlation analyses. The issue of market definition was thus left open, as in both cases the merger would have led to a significant impediment to effective competition.

Shock analysis requires little data as it is based on natural experiments, and thus does not constitute an econometric technique as such: the test consists in examining the price trends of the products involved following a sudden and unexpected fluctuation in demand or supply (e.g. new technology, the introduction of a new product). The Commission mentions this alternative technique in its Notice on relevant market definition, where it is observed that

> "[…] it is possible to analyse evidence relating to recent past events or shocks in the market that offer actual examples of substitution between two products. When available, this sort of information will normally be fundamental for market definition. If there have been changes in relative prices in the past (all else being equal), the reactions in terms of quantities demanded will be determinant in establishing substitutability. Launches of new products in the past can also offer useful information, when it is possible to precisely analyse which products have lost sales to the new product"[62].

The technique has also been used in a number of cases, most notably in *Ryanair/Aer Lingus*, where the Commission examined the vigorous reaction of Ryanair to the entry of new competitors in the carrier services located in the Republic of Ireland in comparison to its relatively less vigorous response to the entry of new carriers operating out of the Belfast airports as indicating that the two markers were separate[63]. In *Astra/Zeneca*, the European Commission also referred to new entry as a starting point for the investigation of the competition constraints each party posed to the other with regard to the treatment of various gastro-intestinal diseases[64].

3.1.1.2. Econometrics and competition assessment in EU merger control

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[61] Arjowwiggins/M-Real Zanders Reflex, para. 57.

[62] Commission notice on the definition of relevant market for the purposes of Community Competition law, para. 38.

[63] Commission Decision of 27.6.2007 in Case No COMP/M.4439 – Ryanair/Aer Lingus, para. 107, footnote 105.

[64] Commission Decision of 15 June 2005 in Case No. COMP/A.37.507/F3 – *AstraZeneca*.

The passage from the dominance test to the significant impediment of effective competition (SIEC) test, following the adoption of the new Merger Regulation 139/2004, led to an increasing use of econometric evidence in EU merger control as a means to identify directly the existence of anticompetitive effects[65]. Until then, although the Commission had made use of econometric evidence in the competition assessment step of merger control in rare occasions[66] (it made more use of them in the step of market definition), the structuralist nature of the dominance test prevalent at the time led to the use of descriptive statistics (market shares, concentration indexes, HHI) rather than inferential statistics and econometrics, which have a more prospective nature, in order to provide evidence that the merger will create or will expand a dominant position. The use of econometric tests was also thought of as a way to engage in a more economics-oriented definition of the dominance criterion, which was for historic reasons linked to the static interpretation that was given to it by the case law of the European Courts on Article 102 TFEU[67].

Obviously, the move to a different substantive standard in EU merger control does not affect the content and methodologies followed by these econometric techniques, nor does it affect the choice of the adequate technique[68]. Yet, the SIEC standard might increase the instances in which the Commission relies on econometric evidence in order to prove the anticompetitive effects of a merger, in view of the relatively less important role market shares and other structural factors now play in EU merger control. Indeed, the revised substantive standard displaces the focus to establishing a theory of harm, on which the Commission's assessment and overall narrative of anticompetitive effect will be based, rather than describing the structural conditions of the market and inferring from a high level of concentration or high market shares the existence of an anticompetitive effect, as was previously the case with the dominance substantive test. The requirement of a substantiated theory of

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[65] U. Schwalbe & D. Zimmer, *Law and Economics in European Merger Control* (OUP, 2009), p. 192.

[66] See, for instance, Volvo/Scania, para. 71-75 (where the econometric study of the Commission commissioned to professors Ivaldi and Verboven was considered as "a valuable supplement to the way the Commission has traditionally measured market power", indicating that recourse to this type of quantitative evidence is required when "the customer base for a product is very fragmented so that reaching a satisfying segment of customers through survey-based methods is difficult". Because of the novelty of the approach, as relying on a quantitative study was "a relatively new development in European merger control", the Commission decided not to base its assessment on the results of the study). For a commentary, see M. Ivaldi & F. Verboven, Quantifying the effects from horizontal mergers in European competition policy, (2005) 23 International Journal of Industrial Organization 669-691; See also, Commission Decision of 2.9.2003 in Case No. COMP/M.3083 – GE/Instrumentarium [2004] OJ L 109/1, para.125, 168 (the Commission used in this case multivariable linear regressions). For commentary, see S. Bishop & A. Lofaro, "Assessing Unilateral Effects in Practice: Lessons from GE/Instrumentarium", (2005) 26(4) *European Competition Law Review* 205-208.

[67] On the cross-fertilization of merger control and Article 102 TFEU in the interpretation of the dominance criterion from an economics perspective, see I. Lianos, 'Lost in Translation', (2009) 62(1) Current Legal Problems 346-404; G. Monti, The New Substantive Test in the EC Merger Regulation – Bridging the Gap Between Economics and Law?" (2007-2008) 10 Cambridge Yearbook of European Legal Studies pp.263-286.

[68] I. Kokkoris, Do merger simulation and critical loss analysis differ under the SLC and dominance test?, (2006) ECLRev 249-260.

harm thus substitutes the presumption of the anticompetitive effect of the merger because of the structuralist characteristics of the market in this case. In other words, causality cannot be inferred from the descriptive statistical data on the structure of the market (market concentration). One must infer that a causal relationship exists between the different data only on the basis of a theory of harm that would *explain* the relationship between the different variables.

In EU merger control, the Commission refers to two main theories of harm: non-coordinated effects and coordinated effects, which will thus form the theoretical underpinning of the econometric tests and methodologies used to establish the causal relationship between the different variables[69].

The area of unilateral or non-coordinated effects has been the domain of predilection for the use of econometric techniques. The theory of unilateral effects regroups situations where the merger might lead to monopoly or dominance or it might lead to non-coordinated effects[70]. In all these cases the merging firms may find it profitable to alter their behaviour unilaterally, following the acquisition, by elevating the price and suppressing output, by acting independently of the remaining firms[71]. Unilateral effects that do not reach the level of dominance were recently included in the scope of EU merger control, following the adoption of a new substantive test, that of significant impediment of effective competition (SIEC) which expanded the EU merger control's scope beyond the situations where the merging firms acquired a dominant position[72]. As it has been remarked elsewhere, "although the competition agencies in the US and Europe have published guidelines spelling out the conditions for the unilateral (non-coordinated) effects theory to build an inference of anticompetitive effects in differentiated product markets, the courts have not yet explicitly accepted an independent evidential value for the theory", thus pushing the competition authorities to rely on a wealth of empirical evidence and quantitative techniques in this case[73]. The development of new approaches, such as "upward pricing pressure" (UPP), challenges the "market definition paradigm" and enables the Commission to proceed to a direct estimation of non-coordinated effects, focusing on

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[69] Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings, [2004] OJ C 31/5, para 22 (hereinafter EU horizontal merger guidelines). For non-horizontal mergers, see Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings, [2008] OJ C 265/6.

[70] European Commission, Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings [2004] OJ C 31/5 (hereinafter EU horizontal merger guidelines).

[71] US DOJ & FTC, 1992 Horizontal Merger Guidelines, available at http://www.ftc.gov/bc/docs/horizmer.htm (hereinafter US Horizontal Merger Guidelines)

[72] Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings [2004] OJ L 24/1, Article 2(2).

[73] I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

the firm's incentives to change their prices post-merger[74]. Although this technique has been referred to in the US horizontal merger guidelines[75], it has not yet been used at the time of writing this chapter in EU merger control.

In practice, two methods are mainly used in order to assess whether a particular merger is likely to cause substantial unilateral effects or whether these are negligible. First, regression analysis attempts to identify the competitive interrelations between firms from past data and estimate the intensity of competition through diversion ratios in local markets. Second, merger simulation models may also provide reliable projections of the effects of the merger on price or quantity for a short term (2-3 years after the merger).

Structural models, such as simulation, are designed "to capture the key economic elements of the real world, abstracting from those elements that are not crucial", the choice of the key elements being dependent on the model specification[76]. The advantage of merger simulation is that it incorporates efficiencies as the model usually takes into account the extent to which the claimed efficiencies are likely to reduce incremental costs post-merger. The model is partly based on data and partly on assumptions. Simulation is particularly useful for mergers of firms producing differentiated goods. For example, one of the first steps consists in estimating market shares and own or cross-price elasticities of demand pre-merger from retail supermarket scanner data or manufacturer level data[77]. These estimated elasticities are then combined with observed data on price, quantities or market shares to calibrate the "demand system". There are various demand systems: the linear and log-linear, the Antitrust Logit Model (ALM), the Almost Ideal Demand System (AIDS), the Nearly Ideal Demand System (NIDS), nested logit models, from which the competition authority will choose one, on the basis of the parameters to be determined and the nature of the demand. The second step includes the calibration process, which involves some degree of subjective judgment as it essentially involves the determination of the parameter values of the model indirectly from "casual

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[74] Joseph Farrell and Carl Shapiro, Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition, (2010) 10(1) The B.E. Journal of Theoretical Economics (Policies and Perspectives), Article 9.

[75] The newly published US new hypothetical monopolist test (HMT) incorporates the use of a UPP screen: . U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines (2010), 4.1.1., *available at* http://ftc.gov/os/2010/08/100819hmg.pdf; Carl Shapiro, *The 2010 Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years*, (2010) 77 Antitrust L.J. 701-759; Serge Moresi, The use of Upward Pricing Pressure Indices in Merger Analysis, (February 2010) Antitrust Source 1-12; Steven C. Salop & Serge Moresi, Updating the Merger Guidelines: Comments (Nov. 9, 2009), *available at* http://www.ftc.gov/os/comments/horizontalmergerguides/545095-00032.pdf.; For a critical perspective, see James A. Keyte & Kenneth B. Schwartz, Tally-Ho! UPP and the 2010 Horizontal Merger Guidelines, (2011) 77 Antitrust L.J. 587-650.

[76] Gregory K. Leonard & J. Douglas Zona, "Simulation in Competitive Analysis", in Chapter 59, ABA Section of Antitrust Law, *Issues in Competition Law and Policy* (2008), 1405. For a survey, see Oliver Budzinski & Isabel Ruhmer, "Merger Simulation in Competition Policy: A Survey", Joint Discussion Paper Series in Economics, No 07-2008, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1138682

[77] Gregory Werden & Luke Froeb, "The Effects of Mergers in Differentiated Products Industries: Structural Merger Policy and the Logit Model", (1994) 10 *Journal of Law, Economics & Organization* 407.

empiricism or unrelated econometric studies", chosen with the view "to guarantee that the model precisely mimics some particular feature of the historical data", that is the prices and market shares prevailing on the market or expected to prevail in the near future[78]. The next step of the simulation model estimates the price changes post-merger (that is the new equilibrium in the post-merger situation in the light of the empirical data) that would be consistent with the merged firm's maximizing profits for all the brands it owns, while incorporating merger-related costs changes and the likely reaction of competitors to the changed competitive environment. The post-merger prices and quantities estimated with the simulation are then compared with the pre-merger data in order to provide an estimate of the non-coordinated effects.

Yet, simulation has also been criticized for abstracting too much from the actual details of the industry under consideration. The Logit Model, often used in merger control, is based on strong assumptions concerning the form of the demand or the fact that firms are price setters, and its utility in complex data settings, when market shares pre-merger are asymmetric and there are post-merger synergies, has been questioned[79]. Furthermore, simulation cannot generally take into account dynamic aspects of competition, such as the repositioning of products by competitors, new market entry or non-price competition. There is also little empirical evidence of the accuracy of merger simulation in predicting the effects of actual mergers. The little relative use of merger simulation is not only due to the methodological weaknesses of the method but also to institutional factors, as the European courts have generally been more reticent to accept predictive evidence as opposed to evidence of past events or current events, and this affects the success of predictive quantitative methods, such as merger simulation[80]. The use of quantitative methods in unilateral effects cases may also be explained by the more solid grounding of the theory in the economic profession (in comparison to co-ordinated effects)[81], and the intrinsic relation between econometric methods and non-coordinated effects theory.

Without mentioning simulation explicitly, the Commission's Guidelines on horizontal mergers seem to acknowledge the need for econometric techniques in the

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[78] Kevin D. Hoover, "Facts and artifacts: Calibration and the empirical assessment of real-business-cycle models", (1995) 47(1) *Oxford Economic Papers* 24, at 25.

[79] See, Douglas D. Davis & Bart Wilson, "Differentiated Product Competition and the Antitrust Logit Model: An Experimental Analysis", (2005) 57 *Journal of Economic Behavior & Organization* 89.

[80] Case C-12/03 P, *Commission v. Tetra Laval* [2005] ECR I-987, para 42; With the exception of the polypropylene case, Case T-10/89, Hoechst AG v Commission, [1992] ECR II-629, para 164 (mentioning the Commission's argument on the "limits to the possibilities offered by econometric methods as regards the simulation of competitive prices" in order not to take into account the expert's report) and the Opinion of Advocate General Vesterdorf in Case T-1/89, Petrofina SA v. Commission, [1991] II-867 (noting the "methodological problems" associated with price simulation).

[81] See, for example, Janusz Ordover, "Coordinated Effects", ", in Chapter 57, ABA Section of Antitrust Law, *Issues in Competition Law and Policy*, Vol. II (ABA, 2008), at 1359, at 1360 ("as compared to unilateral effects analyses, there is much less analytical rigor and much more reliance on a broad range of qualitative indicators when gauging the likelihood of coordinated effects". *Contra,* Malcolm B. Coate & Jeffrey H. Fischer, "Daubert, Science, and Modern Game Theory: Implications for Merger Analysis", above, at 3-4.

assessment of the possible non-coordinated effects of a merger[82]. Since the entering into force of Regulation 139/2004, the Commission has employed simulation analysis in a number of cases[83].

However, simulation has also been used in the context of the application of the previous EC merger regulation 4064/89: *Oracle/PeopleSoft* was the first case in which the Commission's use of econometric methods was particularly decisive for the outcome of the case. As there was some doubt as to the creation of a dominant position for the merged entity, its competitor SAP continuing to lead some of the relevant markets, the Commission did not examine the structural evidence, but proceeded immediately with a simulation model. The following excerpt of the Commission's decision is of particular interest for the evidential value of the simulation method in general:

> "As a general matter Oracle submits that the use of simulation models is controversial due to the unavoidable need to make simplifying assumptions. In this respect simulation models can at best be seen as a crude indicator rather than solid evidence. The Commission agrees that the use of simulation models depends critically on the ability of the model to adequately capture the fundamental mechanisms that drive the behaviour of the different market participants and that, in principle, the assessment as to whether that is the case in any particular case may be a subject of debate. For models to be mathematically tractable it is necessary to make simplifying assumptions and in this process it is important to ensure that the essential mechanisms that are left in the model adequately reflect the reality.
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> But the debate over which simplifications to accept in the model should not obscure the fact that any prospective analysis of the effect of a merger will inherently be based on assumptions. A prediction of the effect of a merger made within the framework of a model is based on a high degree of transparency regarding the logical consistency of the prediction as well as its underlying assumptions. A prospective analysis made outside the framework of an economic model based on qualitative assessment is equally, though in a less transparent and implicit way, based on a number of assumptions and may therefore equally be subject to the same kinds of criticisms
>
> The Commission therefore maintains as a general point that this kind of simulation model can be a useful tool in assisting the Commission in making the economic assessment of the likely impact of a merger.
>
> In this particular case, it is clear that the simulation model was based on the assumption of only three bidders being present in the market. In the light of the findings with regards to the market definition, this assumption cannot be upheld. The Commission has found that it would not be appropriate to rely on

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[82] Guidelines on the assessment of horizontal mergers under the Council regulation on the control of concentrations between undertakings [2004] OJ C 31/5, para. 29.

[83] Vattenfall/Elsam and E2 assets; Dong/Elsam/Energi E.2; T-Mobile Austria/Tele.ring; ; EDF/British Energy; RWE/Essent; EDF/Segebel; Kraft Foods/Cadbury; Unilever/Sara Lee.

the results of the model in order to demonstrate the harmful effects of the merger on a more broadly defined market".[84].

The Commission has been more reticent to employ simulation techniques in more recent mergers, although simulation has been used.

In *Unilever/Sara Lee,* which concerned the sale of branded deodorants in a range of EU countries, the Commission estimated one and two-level nested logit models for deodorants, with nests for male and non-male deodorants, and sub-nests depending on whether the deodorant was presented as skin friendly. The Commission then combined the estimated elasticities of demand with standard supply-side assumptions (i.e. static Bertrand competition) to simulate the price effects of the merger. The methodology employed gave to the Commission the possibility to look to compensating efficiency gains that would offset anticompetitive effects, in particular a substantial decrease in the post-merger marginal costs. The nested logit model used relied overall on simplifying assumptions, a crucial feature of which is that within each nest, switching between individual brands is proportional to brand market share. Hence, the Commission employed in this case a two-level nest structure, which subdivided the male and non-male deodorants according to some further product characteristic, that is whether or not the male or non-male deodorants are branded as being "skin-friendly", thus reducing reliance on market shares, as the assumption that consumers switch between products in proportion to market shares is limited to a narrower product set (e.g. non-male skin friendly deodorants). Yet, even with this modification, the nested logit model failed to take into account important aspects of differentiation across brands (such as the format of the deodorant roll-on versus aerosol, fragrance etc). The model could not thus identify the competitive interaction between brands within each category, as the simulation relied on estimates of substitution across all brands. It did not also include elements of dynamic competition, such as entry, product repositioning or retailer buyer power. The Commission recognized these limitations of the simulation method, yet it considered that the "estimated effects are consistent with the rest of the available evidence and of a sufficient magnitude to be assigned a certain weight in the analysis"[85]. It is noted in the decision that given the time frame of the investigation, it would have been prohibitively complex to introduce these additional factors into the model and the assessment was carried out by using the other qualitative and quantitative evidence on file[86].

The decision is also noteworthy for the importance awarded by the Commission to statistical reliability and robustness checks, which were particularly necessary in this case in view of the inherent limitations of the econometric evidence presented. According to the Commission,

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[84] Commission Decision of 26.10.2004 in Case No. COMP/M.3216 – Oracle/PeopleSoft, para. 193-196.
[85] Unilever/Sara Lee, para. 182.
[86] Ibid., para. 10.

"(a)s a general comment, it has to be noted that econometric modelling can always be subjected to rigorous and formal scrutiny and in this sense it is a special tool for competition policy analysis. In fact, econometrics is not only a methodology to formulate and estimate models built on assumptions, but also a methodology to apply formal statistical tests to assess the performance, robustness and reliability of these models. This double sidedness of econometrics is an inherent feature of the discipline. The immediate opportunity to test the results distinguishes econometrics from most other tools used in competition policy analysis.

As a consequence of this more formal and more rigorous testing, it is more likely that the limitations of econometric evidence are revealed. In fact, all econometric models (and, for that matter, all economic models) are approximations, which use a number of assumptions. Moreover, the models deliberately focus only on a limited range of the observed economic phenomena, leaving many of the features of the modelled markets/industries/economies unexplained. Hence, it is always possible to find weaknesses and even flaws in an econometric analysis.

The inherently imperfect nature of econometric models, however, should not lead to the automatic rejection of this type of evidence in competition policy analysis. The results of robustness checks and formal tests should rather determine how much weight, relative to other tools in the analysis, is to be given to the econometric evidence in the assessment of the case at hand"[87].

The Commission performed a robustness test of the simulated prices increases looking to alternative nesting and data choices, proceeding to a calibration adjustment of demand using observed costs data, a practice that it has also followed in some recent cases in which the post-merger price effects were simulated[88]. The decision also includes an extensive discussion of the criticisms to the Commission's simulation by the economic consultancy advising Unilever: the robustness of the nested logit model used by the Commission was challenged with the argument that no weight should be assigned, for the purposes of the competitive assessment, to any inferences relying on the estimates by the Commission of demand elasticities[89]. However, the Commission found that the results of the simulation were sufficiently robust to be informative about the likely unilateral effects of the transaction, thus positively evaluating the evidential contribution of the simulation method in this case.

In other instances, the Commission has employed the tool of critical loss analysis for assessing the unilateral effects of mergers[90]. In *Lufthansa/SN Airholding*, the Commission examined a merger between Lufthansa and SN Brussels Airlines. The parties had submitted quantitative evidence based on critical loss analysis, both for market definition purposes and for the competition assessment of the merger. The

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[87] Ibid., para. 122-124.
[88] See, EDF/British Energy; Kraft/Cadbury.
[89] Unilever/Sara Lee, para. 110-119.
[90] KLM/Martinair; Lufthansa/SN Airholding; Intel/Mcafee

Commission noted that "because of its simplicity, critical loss analysis relies on numerous assumptions and its use has been subject to significant debate (notably for industries with high fixed costs like the airline industry)". Indeed, according to the Commission, "calculation of the critical loss is highly dependent on the margin and therefore, dependent on how the price and the variable cost are calculated". In addition, the assumption in critical loss analysis that a single price is charged to all customers does not fit well with the characteristics of the airline industry where price discrimination is prominent, and the calculation of avoidable costs is notoriously complex[91]. Hence, the Commission concluded that "in view of these methodological problems", the use of critical loss analysis was not appropriate. Questions were also raised on the implementation of the critical loss analysis in this case, in view of the fact that the questions in the survey were not appropriate to evaluate the actual loss to be compared to the critical loss. The Commission's reticence to accept critical loss analysis might also reflect the criticisms expressed to this methodology in the economics community[92].

Econometrics has also been employed for assessing the possibility of foreclosure in vertical mergers[93]. In *Itema Holding/Barcovision*, a vertical merger between Itema and Barcovision, the Commission performed an econometric estimation of the downstream demand on the basis of the transaction-level data provided by the parties but found that the econometric results were inconclusive[94]. Although the data gathered during the investigation provided detailed and accurate information on the sales of the different companies, the Commission was unable to obtain precise and robust elasticity estimates due in particular to the lack of appropriate instruments. As it was impossible to estimate econometrically own-price and cross-price elasticities, the Commission used an approximation of own-price elasticities based on the Lerner index and a wide range of alternative switching parameters were considered in order to derive cross-price elasticities on the basis of the own-price elasticity parameters. For the purpose of the incentives calculation, it has been assumed that in reaction to a price increase from one manufacturer, all customers switch to another manufacturer, i.e. they do not reconsider their decision of purchasing the product. This was consistent with statements from the customers' survey. Based on this econometric analysis, the Commission found that foreclosure would not be profitable for Itema and the impact on downstream customers would be very limited. The Commission noted that the conclusion that foreclosure would not be profitable for the merged entity was robust to a wide range of alternative parameters, in particular regarding alternative switching parameters. The Commission has also taken into account in its calculations the elimination of double mark-ups for the

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[91] For a similar conclusion, in the context of the airline industry, see KLM/Martinair.
[92] See, for instance, Daniel P. O'Brien and Abraham Wickelgren, "A Critical Analysis of Critical Loss Analysis", (2003) 71 *Antitrust Law Journal* 161; Ioannis Kokkoris, "Critical Loss, critically Ill?", (2005) 9 *European Competition Law Journal* 517; Gregory Werden, "Beyond Critical Loss: Properly Applying the Hypothetical Monopolist Test, *GCP Magazine*, February 2008-II; Joseph Farrell and Carl Shapiro, Improving Critical Loss Analysis, Competition Policy Center, Paper CPC07-079 (2007).
[93] Thales/Finmeccanica/AAS/Telespazio; Itema Holding/Barcovisio; IPIC/Man Ferroostal AG
[94] Itema Holding/Barcovisio, para. 76.

merged entity seeking to optimise profits (as an efficiency gain), although the parties did not claim such elimination (or any other efficiency).

In some cases, the Commission proceeded to a direct evaluation of the competitive constraints that the parties exert to each other using regression analysis[95]. This is generally possible when one compares market configurations where the undertakings compete against each other with configurations where they do not. Unlike structural simulation models, this methodology does not rely on assumptions regarding the nature of competition in the industry[96]. In *StatoilHydro/ConocoPhillips,* regarding the acquisition by StatoilHydro of Jet petrol stations in Scandinavia owned by the US company ConocoPhillips, the Commission gathered evidence from its market investigation (the views of the competitors of the new entity) and from the internal documents of the parties, as well as econometric studies (regressions) in order to examine the competitive constraint each party exercised on each other. It also conducted a customer survey in selected jurisdictions[97]. The acquired company, Jet, was indeed perceived to be an independent competitor in the Swedish retail fuel market, having a strong brand image and being viewed by StatoilHydro as its most efficient competitor (as it followed from StatoilHydro's internal documents and information gathered during the market investigation). The Commission also relied on econometric analysis of the fuel prices charged by individual fuel stations managers in order to compete effectively with their competitors in their catchment area in order to examine the extent of the competitive constraint that Jet placed on StatoilHydro's fuel stations. A competitive constraint would be assumed to exist if StatoilHydro's prices would be systematically lower whenever Jet fuel stations were in the vicinity. This required from the Commission the collection of data on pump prices at StatoilHydro's fuel stations and on the location of Jet's fuel stations relative to those of StatoilHydro's. Of course, other factors that could influence pump prices were also considered, such as labour costs, the location of the stations in densely populated areas or isolated urban areas. The Commission proceeded in this case to extensive data gathering, collecting information on the daily prices of diesel and petrol at StatoilHydro's stations for a period of three years and identifying each competitor situated in the vicinity of StatoilHydro's fuel stations. It then used pooled cross-sectional multiple regression to model the relations between StatoilHydro's fuel prices (the dependent variable), in view of the presence of Jet fuel stations in the vicinity and other factors affecting pump prices - e.g. StateHydro had submitted data on each fuel station's characteristics, such as if it was manned or unmanned (independent variables). The regression models were estimated for both Norway and Sweden for diesel and 95 octane petrol separately and three different regression specifications were estimated for each country and each product in order to ensure the robustness of the results. The Commission concluded that both StatoilHydro's diesel and petrol

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[95] StatoilHydro/ConocoPhillips; Syniverse/BSG.

[96] OECD, p. 258.

[97] StatoilHydro/ConocoPhillips; For a commentary see, Jerôme Cloarec, Dag Johansson, Philippe Redondo, Daniel Donath, Elzbieta Glowicka, Fuel for Thought – StatoilHydro/ConocoPhillips (Jet), (2009) 1 Competition Policy Newsletter 71-76.

prices in both jurisdictions were lower by up to 5% whenever a Jet fuel station was at the vicinity, thus indicating that Jet exercised an important competitive constraint on StatoilHydro's pricing. The Commission confirmed these finding with further customer surveys of a representative sample of the whole population, which indicated that consumers were price-sensitive and in their large majority believed that the proposed merger and the disappearance of the Jet brand was likely to reduce competition in the retail fuels market. These findings completed the Commission's usual market investigation, which usually relies on the data provided by the parties in their CO notification form and views from other market participants (most frequently competitors and some few large customers). It is noted that in this case, there were no large customers, as most consumers in the retail market were individuals, hence the need to use a consumer survey.

Parties also often submit econometric evidence with the aim to challenge the findings of the Commission's market investigation[98]. In *Ryanair/Aer Lingus*, the acquisition by the low cost air carrier Ryanair of Aer Lingus, Ryanair had submitted econometric evidence (price regression analysis) intending to show that Ryanair's prices on "monopoly routes" were not higher or even lower than on routes where it faces competition, thus proving that a price increase as a result from the merger should be excluded by the fact that such price increases would contradict Ryanair's strategy to optimise the number of passengers on its flights ("load factor")[99]. The Commission found, however, that Ryanair and Aer Lingus exercised a competitive constraint on each other and that they reacted directly on each other's pricing behaviour. This finding was based on some internal documents of the parties to the transaction indicating that Aer Lingus and Ryanair took into account the prices of the other when setting prices on a respective route, the parties' promotions and advertising campaigns but also the Commission's own analysis of the econometric evidence submitted by the parties. In particular Annex IV of the Commission's decision includes developments on the motivations for the use of econometric analysis in this case, the strengths and limitations of particular methodologies. Furthermore, in this Annex the Commission reviewed the econometric evidence submitted by the Merging Parties, presented the results from its own price regression analysis and discussed a number of technical issues in more detail in reaction to the comments received by Ryanair and Aer Lingus in their response to the Statement of Objections. In particular, the Commission verified if Ryanair's regression analysis results were robust to small changes in the specification used, following what it discarded the cross-section analysis submitted by Ryanair as meaningless and biased because it did not control for important factors. The Commission gave the technique serious consideration and re-run the regression correcting some methodological errors. It concluded nevertheless that neither Ryanair's nor its own *cross-section*

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[98] Ryanair/Aer Lingus ; Syniverse/BSG ; Votorantim/Fischer/JV
[99] Ryanair/Aer Lingus. For a commentary, see Migeul de la Mano, Enrico Pesaresi and Oliver Stehmann, Econometric and survey evidence in the competitive assessment of the Ryanair-Aer Lingus merger, (2007) 3 Competition Policy Newsletter 73-81.

analysis was robust to the necessary standard. Indeed, no definite conclusions could be derived from *cross-section* regressions in this case given the impossibility to control for unobserved factors that affected prices and differed across routes, the small number of observations, the sensitivity of the results to the month considered or the fact that the inclusion of statistically insignificant explanatory variables sometimes affected the coefficients of other variables[100]. The Commission proposed instead to use a fixed-effects regression analysis, which can mitigate the omitted variable bias that affects *cross-section* regressions, because of unobservable cost or demand factors whose variation across routes would be likely to affect fares. The results of this fixed-effects regression analysis did not clearly establish an impact of Aer Lingus's pricing on Ryanair prices. Yet, despite these inconclusive results, the Commission inferred the existence of such an impact, based on economic theory, qualitative evidence (internal documents, conduct of the firms on the market) and indications that Ryanair might also be constrained on parameters of competition other than price. The econometric evidence was complemented with a wealth of additional evidence, such as a passenger survey.

There are no instances where econometric evidence was used to prove the likelihood of tacit collusion in coordinated effects cases. The Commission usually relies on the economic theory of tacit collusion and market characteristics to infer the likelihood of collusion and establish a coherent "narrative" on how coordination would operate[101]. Coordinated effects are based on a more dynamic model of "an equilibrium outcome of repeated interactions, where each interaction is just a play of the static Cournot or Bertrand game"[102]. The fact that firms interact repeatedly may enable them to realize more profitable and less competitive outcomes relative to what would have been the case in a single play game and also "affects firms' incentives and ability to implement and sustain a collusive outcome"[103]. The Commission merely employs descriptive statistics on market data and economic theory (from a game-theoretic framework) to assess the likelihood of collusion. Theoretically, simulation techniques could be used; however, as it is recognized by a recent report of the OECD,

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[100] Ibid., para. 468.

[101] OECD, p. 246. On the importance of "narratives" in competition law evidence, see I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

[102] Janusz A. Ordover, "Coordinated Effects", in Chapter 57, ABA Section of Antitrust Law, *Issues in Competition Law and Policy*, Vol. II (ABA, 2008), at 1359, 1362.

[103] Ibid. As it is noted by Oliver Budzinski & Arndt Christiansen, "Simulating the (Unilateral) Effects of Mergers: Implications of the Oracke/PeopleSoft case", (August 15, 2006). Available at SSRN: http://ssrn.com/abstract=924375 at 3 (also published as Oliver Budzinski & Arndt Christiansen, "The Oracle/PeopleSoft Case: Unilateral Effects, Simulation Models and Econometrics in Contemporary Merger Control", (2007) 34(2) *Legal Issues of Economic Integration* 133), "the decisive difference, therefore, lies in the nature of strategic relationship between the merging firms and the remaining competitors. It is crucial that unilateral effects do not require the other firms in the market to also raise their prices (as with coordinated effects)".

"merger simulations models for coordinated effects cases remain a significant distance away from being usable in actual mergers. Given the lack of clarity in some of the underlying economics of coordinated effects, this should not come as a surprise"[104].

In contrast to non-coordinated cases, where there is a unique equilibrium pre- and post-merger, which is possible to identify and compare with the use of econometric techniques, in coordinated effects merger cases, the analysis focuses on the conditions for the existence of coordinated equilibria post-merger[105]. Yet, there are multiple equilibria from which the players can choose and game theory does not permit any inferences on which of these will be effectively chosen. The use of econometric techniques is thus limited and what counts is substantiated evidence that additional coordinated equilibria will exist post-merger. This is difficult to apply in practice in view of the need for detailed information on a number of factors, not readily available in most cases.

3.1.2. Econometric evidence and abuse of a dominant position

The use of econometric techniques in abuse of dominance cases has traditionally focused on the step of the definition of a relevant market[106]. As in merger control, the Commission has employed quantitative techniques, such as the hypothetical monopolist test relying on historic sales records or supermarket scanner data, and critical loss analysis to define the relevant product market. It is reminded that the operation of market definition is an essential step in the analysis of the existence of a dominant position under Article 102 TFEU. As it is explained by the Commission's Guidelines on Market Definition:

"(m)arket definition is a tool to identify and define the boundaries of competition between firms. It serves to establish the framework within which competition policy is applied by the Commission. The main purpose of market definition is to identify in a systematic way the competitive constraints that the undertakings involved face"[107].

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[104] OECD, p. 35.

[105] Ulrich Schwalbe & Daniel Zimmer, Law and Economics in European Merger Control (OUP, 2009), p. 302.

[106] See, Commission Decision of 24.3.2004 in Case No Case COMP/C-3/37.792 – Microsoft, para. 353-358 (correlation co-efficients used by the Commission to examine whether workloads on operating systems imposed by different computing tasks are correlated, the information has been used for the purposes of market definition); Commission Decision of 15.6.2005 in Case No COMP/A. 37.507/F3 – AstraZeneca, para. 75-76 * 458-487 (correlation study of demand study substitution submitted by the complainant and used for product market definition. The Commission found the results of the study "not irrelevant" as "subsidiary evidence" but also noted its methodological weaknesses and found that the econometric study submitted by the defendants ("a refined SSNIP test") was more sophisticated, although it noted that it was also of "inconclusive" nature).

[107] Commission note on the definition of the relevant market for the purposes of Community competition law [10997] OJ C 372/2, para. 2.

The competitive constraints an undertaking faces is a useful information on the existence (or not) of a dominant position[108]. The assumption is that the ability to price above long-run marginal costs or to maintain the price above the competitive levels produces consumer harm and reduces social welfare[109]. Dominance for the purposes of EU competition law has been defined by the CJEU in the *United Brands* and *Hoffman-La Roche* cases as:

> "a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording it the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers".[110]
>
> "such a position does not preclude some competition … but enables the undertaking … if not to determine, at least to have an appreciable influence on the conditions under which that competition will develop, and in any case to act largely in disregard of it so long as such conduct does not operate to its detriment".[111]

The definition of dominance appears thus to contain two conditions: (i) the ability to prevent effective competition being maintained on the relevant market; and (ii) the power to behave to an appreciable extent independently of competitors, customers and consumers. This differs from the economists' idea of a firm whose conduct is not closely constrained by competing products, as it requires evidence of "substantial market power", as opposed to market power, for the European Commission to intervene[112]. The definition also emphasizes more the behavioural aspects of dominance as it focuses on the extent of a firm's competitive constraints or ability to act in ways that a competitively constrained firm could not. Yet, in practice, the EU competition case law has largely relied on structural aspects, such as the existence of a high market share, probably as a way to simplify an otherwise overly complex operation, during the first decades of EU competition law[113].

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[108] The hypothesis is that the existence of demand constraints affects the degree an undertaking can act independently of its customers and thus a useful method to assess its market power: Gregory Werden, Demand Elasticities in Antitrust Analysis, (1998) 66 Antitrust L. J. 363, 380-384.

[109] Ibid., p. 371-373; Lawrence J. White, Definition in Monopolization Cases: A Paradigm is Missing NYU, (2005) Working Paper No. EC-05-18. Available at SSRN: http://ssrn.com/abstract=1282542

[110] Case 27/76, *United Brands company and United Brands Continental v Commission*, [1978] ECR 207 at paragraph 65; and Case 85/76, *Hoffman-La Roche & Co v Commission* [1979] ECR 461 at paragraph 38.

[111] *United Brands*, above at paragraph 113; and *Hoffman-La Roche*, above, at paragraph 39.

[112] In its most recent documents, the Commission embraced this more economics-oriented definition of the concept of dominant position in other areas than EU merger control, by equating dominant position to substantial market power. See, Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article [102 TFEU] to abusive exclusionary conduct by dominant undertakings, [2009] OJ C 45/7, para. 19, "dominance entails that these competitive constraints are not sufficiently effective and hence that the undertaking in question enjoys substantial market power over a period of time".

[113] On a comparison with the role of structural factors in other competition law regimes (in the EU high market shares have more evidential weight than in other jurisdictions) see, Brian A. Facey & Dany H. Assaf, Monopolization and Abuse of Dominance in Canada, the United States and the European Union: A Survey, (2002) 70 Antitrust L.J. 513, 537-538.

The primary indicator of dominance is usually the market share of the undertaking on the relevant market (i.e. the percentage that the sales of the undertaking represent in relation to the whole market turnover). The Court of Justice held in *Hoffmann-La Roche* that

> "the existence of a dominant position may derive from several factors which taken separately are not necessarily determinative but among these factors a highly important one is the existence of very large market shares"[114].

Market shares provide a starting point for the assessment of the existence of a dominant position, but also very high market shares provide in themselves virtually conclusive evidence that a firm is dominant.

The CJEU stated in *Hoffmann-La Roche* that

> "although the importance of the market shares may vary from one market to another the view may legitimately be taken that very large market shares are in themselves, and save in exceptional circumstances, evidence of the existence of a dominant position"[115].

In *AKZO Chemie BV*, the CJEU went even further by establishing a refutable presumption of market power, in case the undertaking in question had a market share of more than 50% of the relevant market[116]. For market shares lower than 50%, the analysis is merely qualitative, as besides structural factors, such as market shares or other concentration measures, the Commission and the Courts examine the existence of barriers to entry and expansion, vertical integration or the existence of buying power.

This structural approach in market definition is, however, at odds with the principal aim of defining a dominant position in competition law. As it is rightly explained by Baker and Breshahan,

> "[…] the ultimate economic question in antitrust litigation is almost never whether a firm or a set of firms have market power. The case almost invariably concerns an economic objection to the challenged conduct – an agreement among rivals, a merger, exclusionary tactics, and the like – that turns on whether the conduct has increased (in a retrospective case) or is likely to increase (in a prospective case) market power. Accordingly the economic question is not the level of market power but the change. Antitrust law at times relies upon presumptions that if the level of market power is high, various types of conduct will increase it, and if the level of market power is low, they will not. That is, in legal terms, anticompetitive effect is at times inferred from proof of market power. Whether or not such inferences are justified empirically, they shift attention from the ultimate economic question of whether market power has increased. […] [I]t is important not to lose sight of the ultimate question. Accordingly, when it is possible, economic methods should be used to assess changes in market power, examining a historical

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[114] Case 85/76 *Hoffmann-La Roche v. Commission* 1979] ECR 461, at para.
[115] Ibid., at para.
[116] Case C-62/86 AKZO Chemie BV v. Commission [1991] ECR I-3359.

counterfactual without the challenged practices in a retrospective case or providing an analysis of the change in incentives in a prospective one"[117].

The inquiry over the existence (or not) of a dominant position is thus linked to the question of the <u>abusive conduct</u> (and that of the <u>likely effects</u> of the adopted practice on the market). A structural approach does not address the last two issues, as it focuses only on market structure, building from the finding of a concentrated market a heroic inference tree of anticompetitive effects. Econometric evidence may enable the Commission and the Courts to focus on the essential question, and avoid the usual type 1 and 2 errors that might result from the more impressionistic approach of the structural method. This will also avoid the criticism often expressed to the structural method of establishing dominance, first defining a relevant market, then assessing market shares and barriers to entry, that outcomes might be manipulated through the chosen market definition, narrower or broader than what it should be.

Some national competition authorities have indicated that alternatively they can rely on direct evidence of substantial market power, by measuring the ability of the undertaking to price above competition levels or examining the undertaking's profitability or by determining whether an undertaking's performance is indicative of market power[118]. The Commission has also occasionally looked to evidence of high profits as an indication of dominance: e.g. in *Microsoft* the Commission concluded its discussion of barriers to entry by pointing to Microsoft's high profitability (an 81% profit margin for Windows) as "consistent with its near-monopoly position in the client PC operating system market".[119] The Commission has nevertheless expressed some caution on a possible overreliance on econometric evidence for establishing dominance:

> "(q)uantitative analysis should never determine on its own the existence of dominance but it can be very useful to lend additional credibility to a qualitative assessment. Also it can work as a useful check since a qualitative assessment that does not match the date should be reconsidered"[120].

We have not found any case during the examined period, where the Commission relied on econometric evidence to assess the existence of a dominant position, with the exception of course of the evidence used for the step of market definition. Although some of these methods have been criticized[121], it is expected that the

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[117] Jonathan B. Baker & Timothy Bresnahan, Economic Evidence in Antitrust: Defining Markets and Measuring Market Power, in Paolo Buccirossi (ed.) Handbook of Antitrust Economics (MIT Press, 2008), 1, 15

[118] OFT 415, Assessment of Market Power (2004), at 27, available at http://www.oft.gov.uk/shared_oft/business_leaflets/ca98_guidelines/oft415.pdf .. See for a thorough analysis of these methods: Jonathan Baker & Timothy Bresnahan, Empirical Methods of Identifying and Measuring Market Power, (1992) 61 Antitrust L.J. 3.

[119] Commission Decision of 24.3.2004 in Case No COMP/C-3/37.792 – Microsoft, para 464.

[120] OECD, Evidentiary Issues in Proving Dominance (2006), FAD/COMP(2006)35, at 202.

[121] In particular, persistent and high profitability as direct evidence of a dominant position: George J. Benston, Accounting Numbers and Economics Values, (1982) 27 Antitrust Bulletin 161; Andrea Coscelli & Geoff Edwards, Dominance and Market Power in EU Competition Law Enforcement, Chapter 8 in I. Lianos & D. Geradin, Handbook in EU Competition Law: Vol. 1, (Edward Elgar, forth. 2013).

building of econometric capacity at the European Commission and national competition authorities' level will increase the use of direct evidence of dominant position in the future, although this will be mainly used as subsidiary evidence.

Yet, the most remarkable recent development in the enforcement of Article 102 TFEU is the use of econometric evidence in establishing the existence of an abuse. This is particularly the case for pricing abuses, where the Commission has in some cases proceeded to examine whether the dominant undertaking's pricing was excessive in the context of a margin squeeze case[122], or in order to apply the new test ("as efficient competitor" analysis) introduced by the Commission's priority guidance on the legality of rebates[123].

In *Intel,* the Commission found that Intel had abused its dominant position by providing rebates to computer manufacturers (original equipment manufacturers) on condition that they bought all or almost all of their x86 central processing units (CPU) from Intel and by providing direct payments to a major retailer (Media Saturn Holding) in order to stock only computers with Intel's CPUs. Intel had also made direct payments to OEMs to halt or delay the launch of products containing a competitor's x86 CPUs. The Commission performed an economic analysis with the aim to establish if a competitor that is "as efficient as" Intel could compete with Intel in this market. The "as efficient as" competitor test is an hypothetical exercise which analyses if a competitor who is as efficient as Intel but who has lower sales base than Intel would be able to compensate the OEMs for the loss of Intel's rebates (as they will not be purchasing Intel products) without having to offer the CPUs at a price below a measure of viable costs or being required to meet a higher share of its customer's needs for CPUs than is realistic to expect. Indeed, as a dominant undertaking, Intel has the advantage to spread the costs of the rebate across a significantly higher amount of purchases than its competitor AMD, hence it might be uneconomical for AMD, also if it is an "as efficient as competitor", to compensate customers for the loss of the Intel rebate, even if it's costs are lower than those of Intel. In conclusion, the "as efficient as" test examines the "merit" of the foreclosed rival: competition law should apply only when there is a likelihood that "as efficient as" competitors will be excluded.

The analysis takes into account the following factors: what is the contestable share – the amount of sales that can realistically be switched to a new competitor in any given period and what is the relevant measure of costs to be maintained viably in the market (average avoidable costs – AAC). The assumption is that in order to be

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[122] Commission Decision of 4.7.2007 in Case No COMP/38.784 – Wanadoo España vs. Telefónica , para 606-609 (regression analysis was submitted by a party for the empirical estimation of factors affecting prices, using a fixed effects specification. The Commission noted specification problems, in particular inappropriate set of explanatory variables, very small variations of the explanatory variables during the timeframe examined, multicollinearity problems, statistical insignificance of the results and high R squared. The Commission noted that no conclusions could be drawn by the study).
[123] Commission Decision of 13.5.2009 in Case No COMP/C-3 /37.990 – Intel, para. 1065-1081; Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article [102 TFEU] to abusive exclusionary conduct by dominant undertakings, [2009] OJ C 45/7, para.23-27.

viable in the long run, a company must cover at least the total cost of producing its output. In the presence of high fixed costs, as in the computer processors industry, this implies that prices on average must be significantly above marginal costs for a company to cover its total costs and, thus, to remain viable. Average Avoidable Costs (AAC) operates as a benchmark to assess the exclusionary effect of Intel's rebate schemes: if an as efficient competitor is forced to price below AAC, this clearly means that competition is foreclosed because the as efficient as competitor incurs losses by making (incremental) sales to customers benefiting from the dominant firm's rebates[124]. Hence, it becomes important to examine if each category of costs is avoidable and could thus be included in the AAC benchmark or unavoidable, thus leading to their exclusion from it. The dominant undertaking has the incentive to characterize as much of its costs as unavoidable. The plaintiff has the opposite incentives.

In this case, Intel presented an expert report, which used some quantitative analysis (regression) in order to determine whether a given cost component could be considered avoidable or unavoidable, by examining the extent to which changes in output affect changes in cost. The expert based his analysis on a combination of qualitative evidence, quantitative evidence and economic judgment, with more emphasis on qualitative analysis, and consideration of quantitative evidence, at a second stage, as supporting or contradicting the qualitative evidence. The Commission discussed extensively and critically this quantitative evidence and its assumptions:

> "Regression analysis is intended to show conditional correlation between variables. It is the relevance of the statistical assumptions that allows an interpretation of the estimated coefficients in terms of their correspondence to economic parameters. In particular, wrong assumptions will lead to spurious results. Well known issues for empirical work are, for instance, the risk that certain relevant variables are omitted, the risk that the apparent conditional link or lack thereof is hidden by a higher level process simultaneously conditioning the two variables, and the risk of wrongly specifying the temporal dependence between the variables"[125].

The Commission highlighted the risk of omitted variables (a variable which is correlated with the variables assessed for a conditional link but not present in the regression calculation) and the issue of simultaneity or interdependence of variables (the fact that two variables whose correlation is assessed are jointly determined in a common process due to the choices of the firm), which were particularly prominent in this case: indeed, the expert's report performed successive regressions with only one independent variable at the time (hence his calculations were prone to the issue of omitted variables)[126] and it inferred correlations between variables that were jointly

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[124] Ibid., para. 1037.
[125] Ibid., para. 1067.
[126] Ibid., para 1068-1069.

determined in a common process, hence underestimating the overall correlation[127]. Furthermore, the expert report based its analysis on time series, which was found by the Commission as being inappropriately applied in this case (as it did not take into account rigidities in the variation of some variables) and which, in general, requires "special care"[128].

The Commission concluded that the regression analysis method employed in this case had "many methodological shortfalls which cast serious doubt on its capability to serve as a reliable tool to distinguish avoidable and unavoidable costs" and its application was "biased towards finding costs to be unavoidable" as "the lack of a statistically significant positive correlation can be used to overturn other evidence suggesting that a cost is avoidable", while "a statistically significant positive correlation will not be used to overturn other evidence suggesting that the cost is unavoidable (if the coefficient is small)"[129]. The Commission even expressed doubts as to the inferences to be drawn in general by regressions: on the one hand, the lack of a statistically significant correlation does not necessarily mean that a relationship (between the variables) does not exist, as this result might be due also to "the lack of a sufficiently rich dataset necessary to allow the relationship to be conclusively identified"; on the other hand, a statistically significant coefficient does not prove that in reality no relationship exists, although the probability of the lack of a relationship, when the result is very significant statistically, is very small[130]. The regression analysis presented by Intel led also to unexpected results, indicating that there were important biases in the estimation and misspecifications in the statistical model used; hence, according to the Commission, "common scientific sense" should have led Intel to question the validity of its model, "rather than unquestionably decide that the cost category is unavoidable, which is to its benefit"[131]. Yet, even if the Commission doubted the reliability of the study as evidence, it carefully examined the analysis and discussed the problems it spotted. The Commission also adapted a mathematical formula, proposed by a party's expert report, in order to calculate the "required share" that an entrant with a unit cost of AVC (average variable costs) should obtain in order to be able to compete against Intel's conditional rebates[132]. On the basis of this formula, the Commission was able to derive the minimum required share that an OEM (original equipment manufacturer) should switch to an equally efficient competitor to Intel that offered the x86 CPUs processors at AAC (average avoidable costs) in order to overcome the loss incurred by the rebate awarded to match Intel's offer.

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[127] Ibid., para. 1071.
[128] Ibid., para. 1072-1073.
[129] Ibid., para. 1077.
[130] Ibid., footnote 1395.
[131] Ibid., para. 1080.
[132] Ibid., para. 1157.

3.1.3. Econometric evidence and cartels

Economic evidence is considered as a form of circumstantial/indirect evidence (to be distinguished from direct evidence, such as contemporary documents, minutes or notes of meetings, corporate statements etc), traditionally used in antitrust investigations against cartels in order to examine if collusion has been reached and that price fixing is feasible[133]. According to the Commission, "the notion of indirect or circumstantial evidence […] comprises of evidence which is appropriate to corroborate the proof of the existence of a cartel by way of deduction, common sense, economic analysis or logical inference" from demonstrated facts[134]. The category of economic evidence usually refers to economic theory and models of collusive behavior as well as evidence relating to market structure conducive to collusion, such as high concentration, high barriers to entry, the nature of the product (homogeneous and standardized etc), and economic theory on the role of facilitating practices. Although the use of indirect evidence by the European Commission (and economic evidence in particular) is common practice in cartel investigations, it almost always completes some direct evidence of the cartel infringement. It is well known, that parallelism of behaviour in price increases is only an indication and does not constitute as such evidence of collusion[135].

In *Woodpulp II*, the CJEU has also adopted a very strict standard of proof for assessing economic evidence of cartels: as the Commission's efforts to rely on economic evidence in addition to evidence of a parallel pricing conduct were subject to the high standard that concertation should be the "only plausible explanation" for such conduct[136]. The Court noted that "the Commission [had] no documents which directly establish[ed] the existence of concertation between the producers concerned", thus over-emphasizing direct evidence of concertation. It is reminded that in this case, the Court had commissioned an expert report, which came to the conclusion that the uniformity of prices could be explained by the natural operation of the wood pulp market and that such uniformity of prices was in some respects inconsistent with the operation of a cartel, although it also observed that this did not *per se* prove the absence of concertation for the purposes of Article 101 TFEU[137]. As a result of this restrictive case law of the CJEU, the Commission cannot rely on economic evidence only (including econometric evidence) in order to prove a cartel, but combines different pieces of evidence (direct and indirect), examined "not in isolation but in their entirety" and never "divorced from their context"[138].

The Commission has made use of quantitative evidence in some cartel (or in general Article 101 TFEU) cases during the examined period[139].

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[133] OECD, DAF/COMP/GF(2006)7, p. 20.

[134] OECD, DAF/COMP/GF/WD(2006)15, p. 5.

[135] Case 48/69 ICI [1972] ECR 619, para. 66-68.

[136] Joined cases C-89/85, C-104/85, C-114/85, C-116/85, C-117/85 and C-125 to 129/85, A. Ahlström OY and Others v. E.C. Commission [1993] 4 CMLR 407 (*Woodpulp II*)..

[137] Opinion AG Darmon in *Woodpulp II,* above, para. 334.

[138] OECD, DAF/COMP/GF/WD(2006)15, p. 7.

[139] *An industry specific model simulation*: Commission Decision of 19.12.2007 in Case COMP/34.579-*Europay Mastercard International; Price determinants regressions:* Commission Decision of

In the *PO/Copper plumbing tubes*[140] decision, regarding a price fixing cartel in the European market for water, heating and gas tubes, two undertakings members of the cartel submitted econometric studies (price determinant regressions) so as to prove statistically, as well as economically, that the price effects of the infringement were insignificant, in order to show that the cartel had no or only a limited impact on the market, due to various factors, such as overcapacity, buyer power, difficult economic conditions and loose implementation of the agreements. It is well known that cartels are restricting competition by their object: their anticompetitive effects are thus presumed and it is sufficient for the plaintiff to prove coordination between competitors on prices or output without any need to examine the actual or potential effects of the cartel for Article 101(1) TFEU to apply[141]. Yet, it is sometimes useful to examine the actual effects of the cartel in order to calculate the antitrust fines. These are determined according to the gravity and duration of the infringement. In assessing the gravity of the infringement, the Commission used to take account of its nature, the size of the geographic market but also its actual impact on the market, where this could be measured[142]. The first expert econometric study submitted by one of the undertakings examined discussed whether and to what extent the prices it charged increased as a result of the discussions and contacts among copper tube producers in the 1990s[143]. A second econometric study was presented by another of the undertakings in question, which compared on the one hand the price level in periods without discussions to those with discussion (comparison over time) and included several variables to control for shifts in demand and cost factors as well as a time trend[144]. The Commission received the raw data and estimation procedures employed by the parties and, to the Commission's words, "after a careful investigation" of the econometric evidence, it came to the conclusion that the reports did not disprove the serious price effects derived from the Commission's own calculations but mostly by pieces of direct evidence (such as contemporaneous statements, notes and internal

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3.09.2004 in Case COMP/38.069 – *Copper Plumbing Tubes;* Commission Decision of 19.12.2007 in Cases No COMP/34.579 – *Mastercard*, COMP/36.518 *Eurocommerce*, COMP 38.580 *Commercial cards;* Commission Decision of 12.10.2011 in Case COMP/39.482 – *Exotic fruits (Bananas).* In all these cases, the quantitative techniques were submitted by the parties, with the Commission examining it in depth.

[140] Commission Decision of 3.09.2004 in Case COMP/38.069 – *Copper Plumbing Tubes.*

[141] Hence, the Court rejected the use of econometric evidence of the pricing practices by one of the cartelists in order to prove that it interrupted its participation in the cartel, the Court noting that "the Commission is not required to prove the actual effects when finding an infringement": Case T-110/07, *Siemens AG v. Commission*, [2011, not yet reported], para 138.

[142] Guidelines on the method of setting fines imposed pursuant to Article 15 (2) of Regulation No 17 and Article 65 (5) of the ECSC Treaty [1998] OJ C-9/3, at p. 3; The reference to the actual impact on the market has been replaced in the most recent guidelines with a more economics approach focusing on on the value of the sales of goods or services to which the infringement relates, as well as the relative gravity and duration of the infringement as a basis for setting the fine: Guidelines on the method of setting fines imposed pursuant to Article 23(2)(a) of Regulation No 1/2003 [2006] OJ C 210/2, recital 5 and para. 19.

[143] *Copper Plumbing Tubes*, para. 612.

[144] Ibid., para. 625.

memos), as well as some additional circumstantial evidence (market data on prices and profits)[145].

The Commission went even further and examined thoroughly the internal validity of the reports submitted. With regard to the first study, the Commission found that it did not feature enough control variables, it did not include robustness tests and that it did not check for collinearity problems (which could be related to the fact that the study found the price increases to be statistically insignificant)[146]. Furthermore, the expert's report had some important unexplained counterintuitive results (the copper-tube price was found to be negatively related to copper price). The Commission re-run the model with slight changes in its functional form and obtained very different results. It found that the study tried to "hide" significant price increases in certain countries, during specific periods of time, by presenting average price increases across many countries and for a long period. These aspects led the Commission to broadly discard the conclusions of this study[147].

With regard to the second study, the Commission noted some very restrictive and arbitrary assumptions, which could lead to an underestimation of price increases[148]. The time period covered by the study was very short and its price predictions significantly diverted over time from the actual prices. The study found only an explanatory variable with a robust sign (the raw material price), thus failing to capture the effects of any other factors on the price of the product. It also lacked important control variables. The Commission re-run the model of the study with some more realistic assumptions regarding the effects of the cartel coordination (time-variable intensity of cooperation, instead of constant) and obtained more realistic results. Hence the conclusions of this study were also ignored.

In *Bananas*, a case involving the discussion and disclosing of pricing intentions (information exchange) between competing leading brands of bananas importers in eight Member States, the cartelists produced econometric studies purporting to show that their conduct did not have any effects on the market[149]. Although the Commission noted that the exchange of information in question was anticompetitive by object and that it was not required to prove the existence of anticompetitive effects[150], it accepted to examine the "economic arguments" of the parties (a price determinants regression)[151]. These econometric studies were considered at the stage of the examination of the existence of a cartel infringement under Article 101(1) TFEU, rather than at the stage of setting fines like in the *PO/Copper plumbing tubes* Commission decision.

The Commission proceeded again to a thorough analysis of the internal validity of both studies submitted. With regard to the first study the Commission noted

[145] Ibid., para. 633-655.
[146] Ibid., para. 656.
[147] Ibid., para. 659.
[148] Ibid., para. 665.
[149] Commission Decision of 12.10.2011 in Case COMP/39.482 – *Exotic fruits (Bananas)*
[150] Ibid., para. 350.
[151] Ibid..

methodological problems in the econometric techniques, such as the omission of relevant variables, the incomplete description of the model and its assumptions, the lack of stationarity tests and the lack of robustness checks[152]. With regard to the second study, its conclusions were equally discarded as it did not use proper regression techniques to support some arguments and they were serious flaws in the analysis submitted. The methodology was not properly described and most of the regression variables turned out to be insignificant "or only significant at a 10% level, which cannot be considered as highly relevant"[153].

A similarly (bad) luck awaited the quantitative study submitted by one of the cartelists in the *LCD panel* producers' price fixing cartel[154]. The cartelists had submitted an econometric study using regression analysis in order to examine whether prices charged for the product were higher during the alleged cartel period, with the aim to support the argument that the prices discussed at the cartel meeting were not actually implemented[155]. As in the *PO/Copper plumbing tubes*, the issue was the determination of the amount of the fines. The Commission "carefully analyzed" the study before concluding that there were issues of endogeneity bias, omitted variables, selection bias (due to the definition of product groups for which regressions were run), misspecifications and other methodological flaws, hence rejecting the arguments based on the study[156].

In contrast to the weak probative value of econometric evidence in the proof of cartels, econometrics has an important role to play in the detection and investigation of cartels and also in the context of actions for antitrust damages following a cartel infringement. Econometric techniques using a structural approach (focusing on markets with traits thought to be conducive to collusion) have been used to help provide information as to where cartels may be located, as well as logit models or OLS predicting the probability or the number of cartels likely to exist in a specific industry[157]. Some authors have also emphasized behavioural approaches to detecting cartels, which also require the use of econometric techniques[158].

Quantitative economic analysis includes as a first step an industry analysis with a scoring approach (looking to different variables, such as indicators of price,

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[152] Ibid., para 352.

[153] Ibid., para. 353.

[154] Commission Decision of 19.12.2007 in Cases No COMP/34.579 – *Mastercard*, COMP/36.518 *Eurocommerce*, COMP 38.580 *Commercial cards*.

[155] Ibid., para 414.

[156] Ibid., para. 415.

[157] OFT773, Predicting cartels (Economic discussion paper, March 2005). For an overview, see Patrick Rey, On the Use of Economic Analysis in Cartel Detection, in Claus-Dieter Ehlermann & Isabela Atanasiu (eds.), Enforcement of Prohibition of Cartels, European Competition Law Annual 2006 (Hart Pub., 2007), pp. 69-82; Paul A. Grout & Silvia Sonderegger, Structural Approaches to cartel Detection, in Claus-Dieter Ehlermann & Isabela Atanasiu (eds.), Enforcement of Prohibition of Cartels, European Competition Law Annual 2006 (Hart Pub., 2007), pp. 83-104.

[158] Joseph E. Harrington, Jr, Detecting Cartels (Department of Economics, John Hopkins University, 2005), available at http://econ.jhu.edu/wp-content/uploads/pdf/papers/wp526harrington.pdf ; Joseph E. Harington Jr., Behavioral Screening and the Detection of Cartels, in Claus-Dieter Ehlermann & Isabela Atanasiu (eds.), Enforcement of Prohibition of Cartels, European Competition Law Annual 2006 (Hart Pub., 2007), pp.51-68.

transparency, concentration and entry) in order to exclude from the sample cases where cartel activity is relatively improbable and, as a second step, a critical event analysis (with a focus on exogenous shocks or structural breaks) testing the collusive against the competitive scenario. The OECD has reported a number of EU member States where cartel investigations were triggered based exclusively on economic indicators[159]. However, in general, relying only on economic evidence (including econometrics) for apportioning the standard of proof for the prohibition of cartels has not yet been a winning strategy, most probably in view of the criminal nature in some member States of cartel infringements, the reticence of the courts to examine in depth econometric evidence (see Section 3.2.) and the different standards of proof for establishing collusion or causation of harm and standards of proof in the quantification of damages in cartel cases[160] (see Section 4).

This might change, as econometric techniques are now frequently used for evaluating damages for antitrust infringements (mostly cartels), hence establishing some degree of understanding, if not familiarity, of the courts in econometric techniques and thus leading to an increased interaction between econometric conventions and the legal standard of proof. Although the development of EU competition law in damages actions for antitrust infringements is relatively recent and still under-developed, there are some indications that quantitative techniques will be widely used in evaluating damages, hence promoting also the use of these techniques in the proof of cartels. In a nutshell, the empirical techniques available for the evaluation of damages include[161]:

(i) comparator-based approaches: before and after approaches (time-series) or approaches comparing prices in the cartelized market with those in 'similar' uncartelised markets in other geographic regions (cross-sectional approaches) or difference in differences approaches. These approaches involve the estimation of the correlation between the pre-cartel prices in the cartelized or similar markets and the post-cartel prices in these markets, cross-sectional econometrics, time-series econometrics and panel data regression;

(ii) financial cost-based approaches: which construct a "but for" cartel price "bottom up", by measuring the relevant costs and comparing the average of marginal unit costs plus a reasonable mark-up with actual prices. This also involves some form of quantitative methods (bottom-up costing, valuation);

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[159] See, for instance, the Italian baby milk case (where a cross-country price benchmarking was used): OECD, DAF/COMP/GF(2006)7, pp. 22-24. See also the Dutch shrimps case (structural indicators were employed): Joseph E. Harrington, Jr, Detecting Cartels, above, pp. 3-4.

[160] Hans. W. Friederiszick & Lars-Hendrik Röller, Quantification of harm in damages actions for antitrust infringements: insights from German cartel cases, (2010) 6(3) Journal of Competition Law & Economics 595-618.

[161] Jonathan Baker and Daniel L. Rubinfeld, Empirical Methods in Antitrust Litigation: Review and critique, (1999) 1 American Law and Economics Review 386-435; Oxera, Quantifying Antitrust Damages Towards Non-Binding Guidance for Courts, Study prepared for the European Commission, DG COMP (2009), p. v (comparative table).

(iii) <u>market-structure based approaches</u>: these involve the use of simulation models in order to estimate the losses incurred, using different models of oligopolistic behavior.

Yet, these various methods, some of which could also be employed in theory for calculating fines and hence in the context of public enforcement[162], are mostly of interest for the private enforcement of EU competition law by national courts.

3.2. Econometric evidence in the courts

As all substantive competition law provisions of the Treaty have direct effect, national courts are actively contributing to the enforcement of EU competition law, and complement the judicial review role of the General Court and that of the CJEU in public enforcement, as well as the important role played by the CJEU in the interpretation of all provisions of EU competition law (through the preliminary ruling procedure). This study will focus on the role of the European courts (General Court, CJEU), a complementary study on national courts being in preparation by the authors, although some examples deriving from the practice of national courts will also be examined in this study.

Depending on the type of judicial proceedings, control of legality or interpretation of a provision of EU competition law, the courts face different limitations as to their ability to "hear" and examine econometric evidence.

There are two routes to contest the legality of the acts of the EU institutions. First, Article 263 TFEU provides that the Court may review the legality of the decisions or acts of the Commission that are capable of affecting the interests of individuals. Challenges are made at first instance to the General Court and appeals on points of law can be made from the General Court to the CJEU. The role of the CJEU on issues of evidence is limited as provided that the evidence has been properly obtained and the general principles and the rules of procedure in relation to the burden

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[162] One of the main differences between the evaluation of fines and that of damages is that, first, courts have in general a broad discretion and are free to choose which methodology is best suited to the facts of the case, while the discretion of the Commission is limited with regard to the method of evaluation of fines (self-limitation through the joint effect of the guidelines on the method of setting fines (above) and the principle of legitimate expectations, as well as limitations through the operation of the proportionality principle e.g. final amount of the fine shall not, in any event, exceed 10 % of the total turnover in the preceding business year of the undertaking or association of undertakings participating in the infringement, as laid down in Article 23(2) of Regulation No 1/2003). Second, fines generally aim at deterrence, while damages are perceived in Europe as mostly inspired by the principle of compensation, although, of course, the right to compensation may also have a deterrent effect. See, White paper on Damages Actions for breach of the EC antitrust rules, COM(2008) 165 final, p. 3. Thirdly, the calculation of damages for cartel infringements provides also the possibility to take into account of potential positive effects of cartels to consumers (efficiency gains), "like for instance, lower transportation costs or higher supply reliability", which if significant would "have to be balanced against the potential negative effects to customers" in order to calculate the Factual damages: Hans. W. Friederiszick & Lars-Hendrik Röller, Quantification of harm in damages actions for antitrust infringements: insights from German cartel cases, (2010) 6(3) Journal of Competition Law & Economics 595-618.This is of course impossible in the context of calculating fines, because of the principle of deterrence. It follows, that the potential scope of intervention of econometric techniques will be more limited in the calculation of fines, should the Commission move to a more economics approach.

of proof and the taking of evidence have been observed, "it is for the [General Court] alone to assess the value which should be attached to the evidence produced to it"[163]. The CJEU maintains, however, a role to play when the evidence adduced before the General Court has been distorted. Secondly, national courts can request the CJEU to make a preliminary ruling on the interpretation of EU law, where such ruling is necessary to enable that court to give judgment. The interpretation of the EU law may indirectly raise the issue of the legality of the act of an EU institution under primary EU law and thus lead to an indirect control of the legality of the act.

The issue of judicial review of the Commission's decisions is thoroughly examined in a separate chapter of this volume but it is recognized that the intensity of the judicial review by the General Court is still limited in presence of a complex economic and technical appraisal by the Commission, although there is some recent case law indicating that, although accepting the margin of discretion of the Commission "with regard to economic matters", the Court is moving towards a more intensive review of the Commission's decisions even for complex economic and technical assessments, at least with regard to Commission's decisions on fines[164].

With regard to the general limitations faced by the General Court, despite not being empowered to "remake" the impugned decisions, by substituting its own assessment of the facts and evidence for that of the Commission (it is a judicial review procedure not an appeal procedure), the Court has closely monitored the Commission's decisions. Although it is acknowledged that its review powers are limited to a "manifest error" type of review, it is emphasized that the Court has held the Commission to a high standard in respect to the statement and the appraisal of the facts, the sufficiency and soundness of the evidence and to the quality of its reasoning. The judicial control of the appropriateness of the amounts of fines is more intensive, following the interplay of Article 261 TFEU and of Article 31 of Regulation 1/2003. Pursuant to these provisions, the Court of Justice is endowed with *unlimited jurisdiction* to assess the appropriateness of, and if necessary to vary, downward or upward, the amount of the fine imposed by the Commission. The Court is not able to impose a different fine but to rule on existing fines set by decisions of the Commission. However, in its most recent case law, the Court of Justice prescribed rigorous standards of judicial review for the decisions of the Commission by the General Court and established its full jurisdiction to review decisions in which the

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[163] Joined cases C-403/04 P & C-405/04 P, *Sumitomo Metal Industries Ltd and Others v. Commission*, [2007] ECR I-729, para. 38.

[164] See, Case C-368/10 P, *Chalkor AE Epexergasias Metallon v European Commission*, December 8, 2011, not yet officially published, paras 54 & 62, noting (62) that "(i)n carrying out such a review, the Courts cannot use the Commission's margin of discretion – either as regards the choice of factors taken into account in the application of the criteria mentioned in the Guidelines or as regards the assessment of those factors – as a basis for dispensing with the conduct of an in-depth review of the law and of the facts". Yet, in this case the General Court had repeatedly recited that its competence was merely to verify that the Commission had acted within the scope of its own Guidelines, not to consider whether the fines were fair and proportionate. The case also involved the review of the level of fines. See also, Case C-389/10 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published; Case C-272/09, *P KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published.

Commission imposes fines. In particular, the Court held that "the Courts cannot use the Commission's margin of discretion - either as regards the choice of factors taken into account in the application of the criteria mentioned in the Guidelines (of the Commission) or as regards the assessment of those factors - as a basis for dispensing with the conduct of an in-depth review of the law and of the facts".[165]

With regard to "complex economic and technical assessments", the Commission was recognized a discretion, over which the Courts only exercise a limited review for a "manifest error" of appreciation[166].

In the *Microsoft* case, the Court seems to have introduced some distinction between the standard of judicial review for economic versus technical assessments. For the former, the General Court noted that the "review of complex economic appraisals made by the Commission is necessarily limited to checking whether the relevant rules on procedure and on stating reasons have been complied with, whether the facts have been accurately stated and whether there has been any manifest error of assessment or a misuse of powers"[167]. For the latter, the Court observed that "insofar as the Commission's decision is the result of complex technical appraisals, those appraisals are in principle subject to only limited review by the Court, which means that the Community Courts *cannot substitute their own assessment of matters of fact for the Commission's*"[168]. The Court continued by observing that with regard to *both* economic or technical matters, the Courts "must not only establish whether the evidence put forward is factually accurate, reliable and consistent but must also determine whether that evidence contains all the relevant data that must be taken into consideration in appraising a complex situation and whether it is capable of substantiating the conclusions drawn from it"[169]. These paragraphs may be interpreted as indicating that the Court has some leeway in substituting its own assessment of matters of fact regarding complex economic assessments, as this is explicitly excluded for technical assessments, but not mentioned for economic assessments. Certainly, the Court uses the expression "limited review" for complex economic assessments as well, but explains that this "does not prevent the Community judicature from examining the Commission's assessment of *economic data*"[170]. In its most recent cases, the Court of Justice prescribed rigorous standards of judicial review for the decisions of the Commission by the General Court, recognizing that "whilst, in areas giving rise to complex economic assessments, the Commission has a margin of

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[165] See, Case C-368/10 P, *Chalkor AE Epexergasias Metallon v European Commission*, December 8, 2011, not yet officially published, para. 62. See also, Case C-389/10 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published; Case C-272/09 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published.

[166] Case 42/84, *Remia* [1985] ECR 2545, para 34; Joined Cases 142/84 & 156/84, *BAT and Reynolds v. Commission* [1987] ECR 4487, para. 62; Case C-7/95, *John Deere v. Commission* [1998] ECR I-3111, para. 41, noting that "(d)etermination of the effects of an agreement on competition constitutes a complex economic appraisal ".

[167] Case T-201/04, *Microsoft v. Commission* [2007] E.C.R. II-3601, para. 87.

[168] Ibid., para 88 (emphasis added).

[169] Ibid., para. 89.

[170] Ibid., para. 482 (on economic data related to market definition)

discretion with regard to economic matters, that does not mean that the Courts of the European Union must refrain from reviewing the Commission's interpretation of information of an economic nature"[171].

A similar distinction between economic and "technical" evidence appears in the Court's judgment in *Ryanair v. European Commission*[172]. The Court recognizes that it must take account of the margin of discretion recognized to the Commission, "implicit in the provisions of an economic nature which form part of the rules on concentrations", however, it repeats that this does not mean that it should refrain from reviewing the Commission's interpretation of information of an economic nature: "(n)ot only must they establish, in particular, whether the evidence relied on is factually accurate, reliable and consistent but also whether that evidence contains all the information which must be taken into account in order to assess a complex situation and whether it is capable of substantiating the conclusions drawn from it"[173]. It is noteworthy that the Court adds an additional reason for exercising a strict scrutiny by noting that "where the institutions have a power of appraisal, respect for the rights guaranteed by the legal order of the European Union in administrative procedures is of even more fundamental importance", citing, among these guarantees, "the duty of the Commission to examine carefully and impartially all the relevant aspects of the individual case, the right of the person concerned to make his views known and also his right to have an adequately reasoned decision"[174]. We examine the intensity of the review exercised by the Court in this case later in this section.

In the meantime, the following question arises: Should there be a slight distinction between economic and technical assessments, with regard to the extent of deference by the Courts to the Commission's margin of discretion? As the Courts are required to review more rigorously economic assessments, it is important to examine if econometric evidence (which combines economic theory and statistics) can be characterized as being closer to complex economic evidence or to merely "technical" evidence. This question will not be examined in this study, but should the Court pursue the distinction between the assessment of "economic" versus "technical" evidence, the issue will certainly be raised. The difficulties of classifying different kinds of complex assessments by the Commission as "economic" or "technical" may be the main reasons for not following such an approach. Yet, introducing such a distinction could also question the reasons why the Commission benefits from such margin of discretion with regard to economic and technical assessments. Is this related to the Commission's superior or trans-disciplinary expertise or "particular competence", as a specialized competition authority? [Yet, one may object that it

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[171] See, Case C-368/10 P, *Chalkor AE Epexergasias Metallon v European Commission*, December 8, 2011, not yet officially published, para. 62. See also, Case C-389/10 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published; Case C-272/09 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published.

[172] Case T-342/07, *Ryanair Holdings plc v. European Commission* [2010] ECR II-3457, para. 38 distinguishing between the econometric evidence and "non-technical" evidence.

[173] Ibid., para. 30.

[174] Ibid., para. 31.

remains possible for the Courts to commission expert reports, although, as we will see, they have rarely used this option.] Is it related to the limited time the Courts dispose to examine the facts of the case, thus forcing them to conduct a cursory review of very complex matters? [Yet, this would negate the main reason for having a judicial review: the need to ensure that the assessment of facts by the Commission remains of high quality.] Is it finally related to the perception that the Commission should benefit from a margin of discretion in order to pursue the appropriate competition *policy*, in view of the information it has access to on the overall economic conditions reigning in the Internal Market, thus information which is not limited to the relevant market in question (as it is the case for any competition *law* case subject to judicial review by the courts) but covering micro- and macro-effects at a wider level? [Yet, if that were the case, the Courts would have recognized a wider discretion to the Commission with regard to economic assessments, as opposed to technical ones, and not the opposite, as it seems they have, if our interpretation of the EU Courts' case law introducing a distinction between the two proves to be correct.]

Assuming that econometric evidence can be characterized as a "complex economic assessment" or that the same standard applies to both economic and technical assessments, it is important to examine how the courts have dealt in practice with quantitative techniques, looking to the few cases where such evidence was discussed by the EU courts.

In *Hoechst AG v. Commission,* the applicants for the annulment of the Commission's decision in the polypropylene cartel, had relied on a market study which included an econometric analysis of price competition in order to prove that there was no agreement on prices between them, following different meetings between the cartelists and that the undertaking's behaviour on the market did not correspond to what they allegedly agreed to in their meetings. The Commission denied that this price competition analysis "was conclusive", noting "the limits to the possibilities offered by econometric methods as regards the simulation of competitive prices and the impossibility of determining the share of general overheads borne by each product"[175]. The General Court limited itself to note that "the Commission took full account of the applicant's arguments regarding the effects of the cartel on the market and that it stated conclusively in the Decision the reasons which led it to consider that the conclusion drawn by the applicant from the [economic] study were unfounded", thus not engaging with the substance of the analysis[176].

In merger control, the Commission benefits from a margin of appreciation for the broader category of "assessments of economic nature", hence not just complex economic assessments, as in antitrust cases[177]. The EU Courts had initially adopted an

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[175] Case T-10/89, *Hoechst AG v. Commission*, [1992] ECR II- 629, para. 164.

[176] Ibid., para. 313. See also, Case T-25/99, *Roberts v. Commission* [2001] ECR II-1881, para. 51 & 69 (the Court referenced the economic expert hired by the applicants. The evidence was rather substantial notwithstanding the expert, so it had little reason to give him much of a say in the ultimate proceedings).

[177] Joined cases C-68/94 and 30/95 *Kali & Salz* [1998] ECR I 1375, paras 223-224 cited by Heike Schweitzer, chapter in this volume.

approach to the breadth of their scrutiny which was largely consistent with that applicable to Articles 101 and 102 TFEU decisions[178]. However, in more recent cases, such as the *Airtours*, *Schneider,* and *Tetra Laval* appeals, the EU Courts signalled a move toward a more exacting and intensive standard of review[179]. It was held in *Tetra Laval* that although the Commission enjoyed a relatively wide margin of appreciation when reviewing notified concentrations, this did not mean that the EU Courts did not possess the power to scrutinize carefully its decisions[180]. Instead, the Court emphasized that, due to the "forward looking nature" of the merger assessment, its scrutiny would have to encompass an exhaustive judgment of the reliability and sufficiency of the evidence, and of its ability to support the Commission's conclusions[181].

Of particular interest for econometrics is also the *Schneider Electric v. Commission* judgment, where the General Court, after analysing the econometric data put forth by both parties in order to estimate the elasticity of demand, rejected Schneider 's challenge to the Commission's decision[182].

> Commenting on these cases, Yves Botteman noted that
>
> "[Schneider and Airtours] illustrate the fact that European Courts have not yet delved deeply into considerations that relate to how the econometric models are constructed and which parameters have (and should have) been taken into account. Rather, the Courts so far have reviewed the extent to which an economic study supports the argument that either the Commission or a party is trying to put in the administrative or judicial proceedings. This interpretation is consistent with the ECJ's approach in Tetra, which would limit the scope of judicial review to reviewing Commission's interpretations of information of an economic nature"[183].

Indeed, the evidential requirements of the Courts towards the Commission have increased. In *GE v. Commission*, the General Court noted that "(i)t is not enough for the Commission to put forward a series of logical but hypothetical developments which, were they to materialize, it fears would have harmful effects for competition on a number of different markets" but "rather, the onus is on it to carry out a *specific analysis* of the likely evolution of each market on which it seeks to show that a dominant position would be created or strengthened as a result of the

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[178] *Inter alia*, Case T-102/96, *Gencor v Commission*, [1999] ECR II-753 at para. 165.

[179] Case T-342/99, *Airtours v. Commission* [2002] ECR II-2585, paras 127, 167, 210; Case T-310/01, *Schneider Electric v. Commission* [2002] ECR II-4071; Case C-12/03, *Commission v. Tetra Laval* [2005] ECR I-987, paras 39, 42-44.

[180] Case C-12/03, *Commission v Tetra Laval*, [2005] ECR I-987, para. 39.

[181] *Id.*, para. 44.

[182] Case T-310/01, *Schneider Electric v. Commission* [2002] ECR II-4071, para. 142. According to the Court, "Schneider did not show that the Commission, for the purposes of assessing the impact of the transaction, was wrong to use the test of price sensitivity of overall demand for low-voltage electrical equipment instead of relying on cross-elasticity of demand (which has not been proved) on the part of switchboard assemblers and installation engineers".

[183] Yves Botteman, Mergers, Standard of proof and Expert Economic Evidence, (2006) 2(1) Journal of Competition Law and Economics 71-100, at 86.

merger and to produce *convincing evidence* to bear out that conclusion".[184] This evolution opens the door to the development of the use of econometric evidence by the Commission in merger control, in view also of the Court's judgment in *Impala*, where the Court accepted that evidence of a collective dominant position may be established "indirectly on the basis of what may be a very mixed series of indicia and items of evidence relating to the signs, manifestations and phenomena inherent in the presence of a collective dominant position", thus indicating the Court's openness to indirect evidence, including quantitative techniques[185].

The recent *Ryanair* judgment of the General Court illustrates the intensity of judicial review in merger decisions on econometric evidence, analysed in this case as "technical" evidence[186]. The case concerned an action for annulment by Ryanair against the Commission's decision prohibiting the merger between Ryanair and Aer Lingus[187]. This was the first prohibition decision of the Commission since 2007, and the judgment of the General Court was awaited with great interest, in particular in view of the extensive use of quantitative evidence by the Commission and Ryanair in the decision and their submissions. We have already examined the different types of quantitative analysis employed by the Commission in this case and will focus now on the intensity of the judicial review exercised by the Court. Ryanair was relying on quantitative evidence and various econometric studies in order to challenge the inferences the Commission made from "non-technical evidence" (arguing that conclusions should be drawn solely from the technical evidence) as well as criticizing the Commission's own econometric studies on different grounds. With regard to the first issue the Court noted the following:

> "the assertion that the 'non-technical evidence' cannot be taken into account unless it is supported by 'technical evidence' cannot be upheld. There is no need to establish such a hierarchy. It is the Commission's task to make an overall assessment of what is shown by the set of indicative factors used to evaluate the competitive situation. It is possible, in that regard, for certain items of evidence to be prioritised and other evidence to be discounted"[188].

Econometric evidence and empirical analysis are thus among the "relevant factors" in analyzing the anticompetitive effects of the merger, without, however, been recognized a primary evidential role[189].

As to the second issue Ryanair criticized the Commission's econometric analysis for confusing statistical and economic significance, for making the wrong inferences from the econometric evidence, for producing results in contradiction with economic principles, for not being robust and for applying inconsistent standards in accepting or rejecting factual evidence[190]. The Court examined each of Ryanair's arguments by

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[184] Case T-210/99, *GE v. Commission* , [2006] 4. C.M.L.R. 15, para. 429. Emphasis added.
[185] Case C-413/06 P, *Impala v. Commission* [2008] 5. C.M.L.R. 17, paras 104 & 129.
[186] Case T342/07, *Ryanair Holdings plc v. European Commission* [2010] ECR II-3457, para. 132.
[187] See, *supra,* for our analysis of the Commission's decision.
[188] Ibid., para. 136.
[189] Ibid., para. 116.
[190] Ibid., para. 140-144.

referring to the content of the contested decision, assessed "in the light of the case-law on the Commission's margin of discretion with regard to economic natters"[191]. According to the Court, the Commission had carefully examined this evidence in its decision and had explained the limitations of econometric studies and its reluctance to draw firm conclusions from them. The results of the quantitative evidence were also confirming and complementing the conclusions derived from the qualitative evidence[192]. The Court found that the Commission has not exceeded the limits of its discretion, as it had made reference to Ryanair's arguments in the text of the decision or its Annex and that it carried out a "detailed examination of all the econometric data submitted by the parties" and of their observations and "performed further tests and extensions" of the regressions included in its statement of objections in order to address Ryanair's observations[193]. Although the Court took pains to examine each of the arguments of Ryanair with regard to the econometric evidence[194], at no point it engaged in an in-depth analysis of the internal and external validity of the studies, by looking, for example, to their reliability, objectivity and robustness. This might be due to the often repeated statement by the Court that Ryanair did not show that the Commission had exceeded its margin of discretion in economic matters, although the "technical" character of the evidence presented might be another explanation for the abstention of the Court to engage more actively with the validity of the econometric evidence. In addition to the issue of the appropriate degree of deference to the Commission in technical assessments, the Court may have also lacked the capacity to perform such extensive analysis, in view of its choice not to appoint an expert to assist it in the examination of the evidence[195].

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[191] Ibid., para. 147.

[192] Ibid., para. 163 & 183..

[193] Ibid., para. 179.

[194] See, para. 139-195.

[195] According to article 25 of the Statute of the Court of Justice, the Court may at any time entrust any individual, body, authority, committee, or other organisation it chooses with the task of giving an expert opinion. The CJEU may order, as a measure of inquiry and after hearing the Advocate general, the commissioning of an expert's report (Article 45 of the CJEU Rules of procedure). Similarly, according to article 65(d) of the Rules of procedure of the General Court, the Court may request the commissioning of an expert's report. Furthermore, according to Article 70 of the Rules of procedure of the General Court, the Court may order that an expert's report be obtained. "The order appointing the expert shall define his task and set a time-limit within which he is to make his report. After the expert has made his report, the General Court may order that he be examined, the parties having been given notice to attend. Questions may be put to the expert by the representatives of the parties". Either of the parties may request the appointment of a neutral expert. The appointed experts are not instructed by the parties but by the judge. The EU Courts may also commission an expert's report *ex officio* (see, Art. 49(1) of the CJEU Rules of Procedure; Art. 70 of the General Court's Rules of procedure). The expert operates under the supervision of the Judge Rapporteur. The process is, to some degree, adversarial in the sense that the parties should be able to follow the neutral expert's work (e.g. be shown the documents he has taken into account) or should have the opportunity to make their views known during the preparation of the expert's report and put questions to the expert in particular if the report is likely to have a preponderant influence on the assessment of the facts by the court (Art. 49(5) of the CJEU Rules of Procedure).

It is reminded that the possibility of engaging a court-appointed expert has been rarely used by the European Courts[196]. In *Woodpulp II*, the Court decided to obtain two experts' reports asking them if the economic evidence presented by the Commission justified the conclusions drawn in its decision on the parallelism of prices and if on the basis of the existing documentation, the characteristics of the natural operation of the wood pulp market should lead to a differential price structure, or whether, and for what reasons, it should lead to a uniform price structure and whether the characteristics and the functioning of this market during the period covered by the decision differed from its characteristics and functioning prior and after to that period (thus applying a comparator-based approach)[197]. The court appointed an expert economist as it was confronted, according to the Opinion of Advocate General Darmon, with "a substantial body of economic argument, referring at times to theoretical models which, whilst doubtless familiar to an economist", were nevertheless "at any rate, of manifest complexity"[198]. The Court relied on the assessment of the economic evidence by its experts (accountancy and economic experts), which was inconclusive, as they did not rule out concertation but they also found legitimate reasons for the conduct under examination, to conclude that concertation was not the only plausible explanation for the parallel conduct and thus to annul the Commission's decision[199]. Commenting on the possible implications of this case for the assessment by the EU Courts of economic/econometric evidence in merger control, Botteman explains that

> "(t)o some extent, the use of econometric expert opinions in Woodpulp II was motivated by the fact that the Commission's case rested on a limited set of facts, i.e. parallelism in prices meant that concert between the pulp producers was at play, that needed to be tested against the possibility that the normal operation of the market was a more plausible explanation for the uniformity of prices than a

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[196] Eric Barbier de la Serre & Anne-Lise Sibony, Eric Barbier de la Serre & Anne-Lise Sibony, Expert Evidence Before the EC Courts, (2008) Common Market L Rev 941, at 949, document 25 cases overall (including competition law cases). The European Courts have ordered an expertise in the *Dyestuffs* and the *Wood Pulp* cases. In *Dyestuffs*, the Court ordered an expert's report after it had appointed two experts following the common agreement between the parties on the names of the two experts. Case 48/69, ICI v. Commission [1973] ECR 619, 726-727 (*Dyestuffs*). The two neutral experts who were finally appointed by the Court (Horst Albach and Wilhelm Norbert Kloten) were different from the ones the parties had initially suggested in their submissions: Friederich A. von Hayek for the applicants and Erhard Kantzenbach for the European Commission.

[197] Joined Cases C-89/85, C-104/85, C-114/85, C-117/85, and C-125/85 to C-129/85, A Ahlström Osakeyhtïo and others v. Commission (Woodpulp II) [1993] ECR I-1307, [1993] 4 C.M.L.R. 407, 427.

[198] Opinion AG Darmon , in Joined Cases C-89/85, C-104/85, C-114/85, C-117/85, and C-129/85, above, para. 333.

[199] The Court seems to have relied on the expert's report for some of its factual inferences (e.g. para. 101, "(i)t is apparent from the expert's report, together with the ensuing discussion, that the experts regard the normal operation of the market as a more plausible explanation for the uniformity of prices than concertation" and para. 126). In contrast, after examining in great detail the court experts' reports and the arguments submitted or presented at the oral hearing by the Commission and the parties employing an adversarial approach (para. 334-430), AG Darmon concluded in his Opinion that although the expert economists' report found that the uniformity of prices on the wood pulp market could be explained by the natural operation of the market, their conclusions raised a number of questions and suggested to the Court not to base its judgment on their report (para. 432-433).

concerted action. Given that merger investigations are more and more data- and facts-intensive, it is unclear whether the Courts would appoint their own experts. In this regard, recent practice of the [General Court], e.g. in the Microsoft appeal, indicates that when cases are factually well prepared by both sides, there is no need to call independent experts to testify before the Court"[200].

Notwithstanding the limitations of judicial review of the Commission's decisions in economic and technical matters, set by the previous case law, EU Courts may be inspired by the intensity of review exercised by some national courts towards economic and econometric evidence, although one should also take into account the different institutional contexts.

The most recent German Cement cartel case and the judicial scrutiny exercised by the Higher Regional Court Düsseldorf (OLG), which has specialized chambers for antitrust matters, to the decision of the Federal Cartel Office to impose a fine for additional earnings related to a cartel in the cement industry (making use of the possibility offered to the FCO by German law to order the disgorgement of benefits) illustrates the different approaches that EU and national courts may take with regard to the assessment of econometric evidence[201]. Contrary to the EU competition law framework, the German Higher Regional Court fully reviews decisions taken by the FCO with regard to both the fact finding by the authority and the legality of the act in terms of merits. Hence, the FCO does not benefit from any margin of discretion. The Court may amend or replace such decisions at its discretion. In the cement cartel case, the Court reviewed the fines both under the law applicable in 2003 (when the decision of the FCO was adopted, which provided for disgorgement of profits-related fines of up to three times the additional proceeds obtained through a cartel) and under the currently applicable law (adopted in 2005 and amended in 2007, which provides that fines may not exceed 10% of the enterprise's total turnover in the preceding year), the Court choosing to rely on the latter. As the fines aimed to skim-off additional earnings related to the infringement, the economic evidence presented at the Court resembled to that usually submitted for the evaluation of antitrust damages. The OLG appointed an expert and quantified the additional earnings based on the econometric assessment submitted by the expert. With regard to the standard of proof, the OLG has a broad discretion to choose the best suited methodology so that the results are conclusive and economically reasonable. With the help of the expert, the Court identified the appropriate methodologies: among the different ones available for the evaluation of damages, the expert ruled out comparator-based geographical yardstick methods, as there were significant differences in market characteristics between the different regions and countries. The expert suggested instead a during-and-after time series

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[200] Yves Botteman, Mergers, Standard of proof and Expert Economic Evidence, (2006) 2(1) Journal of Competition Law and Economics 71-100, at 87, note 58.

[201] The FCO may skim-off economic benefits related to the infringement. This is possible for both proceedings concerning Administrative fines (Section 81-4 GWB post-2005 or Section 81-2 GWD pre-2005) applying to cartels and administrative proceedings for non-cartel activity (which are dealt under section 34 GWB). The economic benefits to be disgorged not only encompass the net revenue generated because of the infraction, but also (the monetary value of) any other benefits such as the improvement of an undertaking's market position.

approach, which involved the choice of an appropriate reference period (the period not influenced by the cartel). The Court followed the expert's suggestions on the design of the empirical method for the estimation of additional earnings. The court expert then proceeded to the application step, carrying out the analysis using data submitted by the parties, before performing robustness checks, allowing the various parties (the FCO, the defendants, the public prosecutor) to put forward additional questions and criticisms[202]. These were extensively discussed in the judgment, although the OLG did not perform a control of the external validity of the evidence. The Court did not explain why it relied only on the time series method, but only included some discussion of why it did not follow the regional yardstick analysis. This may be owed to the fact that the Federal Court of Justice (BGH) had indicated in an earlier case that yardstick approaches (i.e. the comparison to the development of comparable markets) was a superior approach compared to model-based approaches[203].

The court's review cannot of course be transformed to a methodological check exercise in econometrics. There is a fundamental trade-off to be made between accuracy and practicality.

4. Econometric evidence meets evidence law and theory

The aggregation, the weighing and the evaluation of econometric evidence in competition law proceedings raises important challenges for regulatory authorities and courts. As it is the case for economic theory (economic authority), econometrics are based on strict assumptions and methodological rules. The use of quantitative methods generally refers to the application of a statistical model to the data at hand (observations). A statistical model is simply a set of compatible probabilistic assumptions, the assumptions being modelling choices made by a researcher concerning the distribution of the data to be modelled, the dependence of each observation on another, and how the parameters of that distribution change over observations or time. The goals of the modelling process are description and inference. How well a model accomplishes these goals is a direct function of how appropriate its assumptions are for a particular data set.

The assessment of quantitative evidence requires, as it is the case for all types of evidence, the evaluation of the total strength of the evidence and the decision to attach a specific weight to types/methods of quantitative evidence implying the existence of different outcomes for each type. It is thus important to determine a point where evidence will be deemed sufficient and a decision will be reached. It is possible to distinguish two steps in this process. Initially, the decision-maker will assign

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[202] For a description of the different steps of the procedure in the German cement cartel case, see Hans. W. Friederiszick & Lars-Hendrik Röller, Quantification of harm in damages actions for antitrust infringements: insights from German cartel cases, (2010) 6(3) Journal of Competition Law & Economics 595-618; Niels Frank & Rainer P. Lademann, Economic Evidence in Private Damage Claims: What Lessons can be Learned from the German Cement Cartel Case?, (2010) 1(4) Journal of European Competition Law & Practice *360-366.*

[203] BGH (2007), Judgment of the German Federal Court of Justice (BGH) of June 19, 2007, KRB 12/07.See, Niels Frank & Rainer P. Lademann, above, p. 366..

weight to the specific quantitative method. This is a concrete analysis that takes, for instance, into account the specific characteristics of each case, the availability of facts and the perception (by the decision-maker) that the specific method will produce accurate predictions. Then, comes the evaluation of the evidence collected according to a specific forensic standard. In common law jurisdictions, we usually refer to this standard as the standard of proof, which refers to the quantity/quality of evidence needed in order to persuade a decision-maker that an allegation is true. The determination of the standard of proof is an abstract operation, in the sense that it is determined *ex ante* for all cases or categories of cases. Nevertheless, the two steps of the analysis are linked by the requirement of evidential cogency: what will be deemed persuasive according to the required standard of proof depends on the evidential weight the decision-maker will award to the specific method or combination of methods/facts.

We will first explore the issue of the standard of proof in EU competition law, in order to examine how evidential cogency may impact on the reception of quantitative evidence in EU competition law. We will then turn to the specific characteristics of econometric evidence and its hybrid nature in the context of legal proceedings.

4.1. Standard of proof/persuasion in EU competition law

While EU competition law has so far adopted clear rules as to the allocation of the burden of persuasion (burden of proof) in EU competition law proceedings[204], the same is not true for the determination of a point where evidence will be deemed

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[204] One could distinguish between the legal burden of proof and the evidential burden of proof. Regulation 1/2003 established clear rules as to the legal burden of proof in the enforcement of Articles 101 and 102 TFEU. According to Article 2, "the burden of proving an infringement of Article [101](1) or of Article [102] of the Treaty shall rest on the party or the authority alleging the infringement". Once the Commission or the plaintiff has established a *prima facia* case, "the undertaking or association of undertakings claiming the benefit of Article [101](3) of the Treaty shall bear the burden of proving that the conditions of that paragraph are fulfilled". The case law has also clearly set the evidential standard of proof in the context of Article 101 TFEU (see, Case T-110/07, *Siemens AG v. Commission*, [2011, not yet reported], para 43, "the Commission must prove the infringements of Article 101(1) TFEU found by it and adduce evidence capable of demonstrating to the requisite legal standard the existence of the circumstances constituting an infringement" and para. 176 "[…] the apportionment of the burden of proof is likely to vary […] inasmuch as the evidence on which a party relies may be of such a kind as to require the other party to provide an explanation or justification, failing which it is permissible to conclude that the burden of proof has been discharged"), that of Article 102 TFEU (see, Case T-201/04, Microsoft v. Commission [2007] ECR II-3601, para 688, "although the (legal) burden of proof of the existence of the circumstances that constitute an infringement of Article [102 TFEU] is borne by the Commission, it is for the dominant undertaking concerned, and not for the Commission, before the end of the administrative procedure, to raise any plea of objective justification and to support it with arguments and evidence. It then falls to the Commission, where it proposes to make a finding of an abuse of a dominant position, to show that the arguments and evidence relied on by the undertaking cannot prevail and, accordingly, that the justification put forward cannot be accepted") and merger control (Case T-87/05, *EDP v. Commission* [2005] ECR II-3745, para. 61, "it is for the Commission to demonstrate that a concentration cannot be declared compatible with the common market". The notifying parties bear an initial evidentiary burden, as they are required to submit a substantial amount of information, in particular the efficiency gains of the merger, which are "put forward by the undertakings concerned", at the moment of notification: Regulation 139/2004, Merger Regulation, [2004] OJ L 24/1, recital 29).

sufficient to carry the conviction of the authority or the judge (standard of proof or the degree of necessary persuasion), which constitutes a question governed by national law[205]. National courts and competition agencies remain subject to the standard of proof required under their own domestic law. Yet, as far as the application of EU competition law is concerned, the European Courts have touched upon the issue of the integration, weighing and evaluation of evidence, hence developing principles of EU evidence law that would be applicable, as a result of the supremacy and pre-emption principles of EU law, to all instances of implementation of EU competition law by the Commission, or by national competition authorities and courts. This was either done by treating issues of evidence as matters of substantive law requiring interpretation by the EU Courts, rather than as a procedural matter, left to the principle of procedural autonomy of Member States[206], or by subjecting the national legal systems of proof to the discipline of the principles of equivalence and effectiveness of EU law[207].

4.1.1. Standard of proof: a contested concept in EU competition law

Evidence law theorists usually establish a distinction between "the assessment of the probative value or force of the parts" (probative force) and "the weight of the whole of evidence." (weight)[208] Usually, both evaluations are not regulated by rules: there are no formal rules of weight and the probative force of one or more pieces of either sort of evidence depends upon complex considerations, which are quite difficult to formalize.

> Anderson, Schum and Twining distinguish among the following issues:
> "1. How can we express assessments of weight (the vocabulary of evaluation, analogous to a marking scheme)?
> 2. What are the standards for decision of factual issues (cf. the pass mark)?

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[205] See, recital 5 in the preamble to Regulation 1/2003 which states that proof of an infringement of arts 101(1) and 102 TFEU must be furnished "to the requisite legal standard", without prejudice to the national legal provisions on the standard of proof".

[206] See, for instance, the position of the Court of Justice in Case C-8/08, *T-Mobile Netherlands BV and others v. Raad van bestuur van de Nederlandse Mededingingautoriteir*, [2009] ECR I-4259, paras 51-53, with regard to the presumption of a causal connection between the concerted practice and the market conduct of the undertakings participating in the practice, in order to presume that undertakings that have participated in meetings have taken into account the information exchanged in their future conduct in the market, and thus fulfil both the intentional and material elements of the concept of concerted practice in EU competition law [On the interplay of the intentional and material elements of "concerted practice", see I. Lianos, La "confusion des infractions" de l'article 81§1: quelques interrogations sur l'utilité de la notion d'infraction unique, Revue Trimestrielle de Droit européen , 2000, pp. 239-271]. The Court noted that the presumption of intrinsic to the concept of concerted practice in article 101(1) TFEU, and consequently "forms an integral part of applicable " substantive EU law (para. 52).

[207] See, the discussion by AG Kokott, Case Case C-8/08, *T-Mobile Netherlands BV and others v. Raad van bestuur van de Nederlandse Mededingingautoriteir*, [2009] ECR I-4259, paras 82, 83 & 87. According to the AG, the principle of equivalence requires national principles on the standard of proof not to be less favourable than those governing similar proceedings under national competition law. The principle of effectiveness requires States not to impose criteria for proof of an infringement of Articles 101 and 102 TFEU that are so onerous as to render such proof impossible in practice or excessively difficult", and in particular the positive requirement to national courts not to ignore "the typical characteristics of evidence adduced in determining infringements of the competition rules".

[208] T. Andreson, D. Schum and W. Twining, *Analysis of Evidence* (CUP, 2nd ed., 2010), p.224.

3. How can judgments of weight and probative force be combined?

4. What are the criteria for evaluating the probative force of individual items of evidence or the weight of a 'mass' of evidence in a given case (cf reasons for awarding or debiting marks or awarding a particular overall grade)?

5. To what extent could the law of evidence prescribe rules of weight or evaluation (cf marking rules)?".[209]

The first and the fourth issue relate to the question of "what are the conventions for expressing decisions or judgments about probative force or weight, independently of any particular criteria for arriving at such decisions or judgments"; The second and the third issue focus on "what are the criteria or standards the decision-maker is to use in making the required decisions and judgments"; Finally, the fifth issue relates to "what, if any, is the legal significance of the various criteria and standards?" [210]. The concept of the standard of proof strictly refers to the fifth issue, although it might have some influence on the second issue. On the contrary, the first, third and fourth issues are outside the scope of this concept as such, and will not be examined in the following section.

Examining the common law of evidence from the perspective of continental-civil law tradition, Damaśka observed that three of the common law features stand out as typical: "the complexity of common law regulation (of evidence); a preoccupation with shifting the material for the fact-finder to hear and see; and an aspiration to structure the analysis of evidence"[211]. It is the first and the third features, which relate to the question of what is frequently called in the common law tradition as "standard of proof" that we will explore in the remainder of this section.

The common law prescribes clear marking rules (for the evaluation of evidence), which take the form of standards of proof. Usually there are different standards of proof, which denote "objective degrees of cogency" and "subjective degrees of persuasion or belief".[212] In English law, there are two standards:

"under the standard commonly prescribed for civil cases, the fact-finder must determine whether the plaintiff has proved all the elements of the ultimate probandum by a preponderance or on the greater weight of the evidence or whether, on a balance of probabilities, the elements of the ultimate probandum are more probably true than not. On the criminal side, the fact-finder must determine whether the evidence establishes the elements of the offense and the defendant's guilt beyond a reasonable doubt".[213]

Of course, there are various degrees of proof within each standard, the standard depending on the subject matter or as Denning L.J. put it "a degree of probability which is commensurate with the occasion"[214]. Hence, some authors have

[209] Ibid., p. 228.

[210] Ibid., p. 229.

[211] M.R. Damaśka, *Evidence Law Adrift* (Yale University press, 1997), p. 8.

[212] Ibid., p. 242.

[213] Ibid., p. 242. Emphasis added.

[214] *Bater v. Bater* [1951] P. 35, 36-37, cited by T. Andreson, D. Schum and W. Twining, Analysis of Evidence (CUP, 2nd ed., 2010), p. 243.

concluded that in common law jurisdictions, the standard of proof is probabilistic, as civil claims have to be proved by preponderance of the evidence[215]. The required standard of probability is set by the law "at levels that serve the system's aims"[216]. Hence, each standard of proof is set through a decision procedure rule aiming to keep the sum of the expected costs of false acquittals and false condemnations to a minimum, the assumption being that each type of error has the same cost (in criminal proceedings the cost of false condemnation is perceived as higher, thus explaining the choice of the higher in terms of probability standard of proof of beyond reasonable doubt)[217]. The common law system evolved towards the lower standard of probability of the preponderance of the evidence, the emergence of the civil jury acting as "a proximate cause" for the development of the probabilistic nature of judicial decision-making, as this was the only way available to judges to provide judicial instruction to juries while pursuing error minimization[218]. However, "beyond reasonable doubt" does not involve proof to an "absolute certainty"[219].

On the contrary, the concept of standard of proof is "unfamiliar" to most continental legal systems[220]. This issue is often related to the principle of free evaluation of evidence, which can be contrasted to the exclusionary view of the rules of evidence in common law, the jury's discretion being somehow limited by more formal rules of evidence, although this does not go as far as a system of *preuve légale*, where the weight of each class of evidence will be determined by the law[221]. In civil law jurisdictions the standard, if there is any, is profoundly subjective and relates to the *intime conviction* of the judge, that is, "an inner, deep-seated, personal conviction of the judge", without distinguishing between criminal and civil cases[222], as common law systems do. In addition, in a limited number of civil law matters, of particular gravity for the defendant, common law requires the plaintiff to meet the intermediate standard of "clear and convincing evidence"[223]. Hence, one can schematically oppose two views of the standard of proof: that of the anglo-american law, which is more objective, as it refers to probabilities or the "logical provability" of the propositions,

[215] K. M. Clermont & E. Sherwin, A Comparative View of Standards of Proof, (2002) 50 Am. J. Comp. L. 243

[216] Ibid., p. 251.

[217] Ibid., p. 253.

[218] Ibid,, p. 258.

[219] *The Queen v. Lifehus* [1997] 3 S.C.R. 320, para. 39.

[220] E. Gippini-Fournier, The Elusive Standard of Proof in EU Competition Cases, ; E. Sherwin & K.M. Clermont, A comparative view of standards of proof, [2002] 50 American Journal of Comparative Law 243.

[221] See, M.Taruffo, Rethinking the Standards of Proof, (2003) 51(3) The American Journal of Comparative Law 659, at 666, noting that the principle of intime convinction and the principles concerning the free evaluation of evidence have a negative function, that is "excluding the application of rules of legal proof (i.e. rules determining in general and binding terms the probative force of specific items of evidence), vesting the court with the power to determine the weight of proofs on the basis of a discretionary evaluation", but do not have a positive function, that is, prescribing by themselves any positive standards of proof".

[222] E. Sherwin & K.M. Clermont, op. cit.,p. 246.

[223] C.Engel, Preponderance of the Evidence versus *Intime Convinvtion* - A Behavioural Perspective on a Conflict between American and Continental European Law, Max Planck Institute for Research on Collective Goods Bonn 2008/33, p. 4.

on the assumption that individual judgment is error prone and hence in need for some rational limitation, and the more subjectivist civil law standard of proof, whose crucial feature is "the psychic state of taking a fact for true", largely relying on a test built on the éthos, experience and intuition of the judge[224].

The choice between the civil law approach to evidence evaluation and that of the common law is a subject of controversy[225]. But, does the debate have any practical relevance? A high standard of proof coupled with a burden of proof requiring plaintiffs to prove the elements of their claims may indeed make it difficult for plaintiffs to succeed. Yet, as it has been noted, "(b)ecause parties can select cases for trial (the so called selection effect), mainly cases that fall close to whatever standard of proof applies will proceed to trial" and "other cases will tend to settle", hence the result will not be that different under any standard of proof[226]. Presumptions and other rules of evidence evaluation might also offer additional instruments to influence the outcome of the case.

Turning to EU competition law, it is clear that (i) the EU courts and the Commission adhere to the principle of free or "unfettered evaluation of evidence"[227], but they have generally avoided to use systematically the concept of "standard of proof", although more recent cases have referred to the concept more frequently, in particular in its probabilistic dimension; (ii) the requirement of a sufficient degree of evidence varies according to the context and the stage of the proceedings; and, (iii) presumptions play a considerable role in mitigating the subjectivity of the standard of *intime conviction* to which EU courts adhere to.

As to the first issue, Eric Gippini Fournier observes that the expression 'standard of proof' had not appeared in competition judgments of the EU courts before *Sumitimo*[228]*, Tetra Laval*[229]*, Bertelsmann/Sony*[230] and *GlaxoSmithKline*[231], the

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[224] C.Engel,, op. cit., p. 5.

[225] E. Sherwin & K.M. Clermont, op. cit.,p. 273 note that (i) the common law obtains more accurate results as it engages directly with the most probable state of affairs, while civil law outcomes flow from rules allocating the burden of proof; (ii) the common law enables courts to maintain a more impartial stance towards litigants and thus to better control judicial bias, while in civil law jurisdictions the system cannot regulate or modulate the judge's appreciation because the question of the standard of proof remains hidden; (iii) the common law is better placed to handle statistical evidence. On the contrary, M. Taruffo, op. cit., criticizes Sherwin and Clermont for having relied exclusively on the French model of civil procedure, thus ignoring influential models, such as those of Germany and Spain, which do not follow the subjectivist view of the French system, although they do not also adhere to the probabilistic approach of the common law systems. They also remark that in civil law countries the burden of proof is usually considered a matter of substantive law, not a matter of procedural law, hence the courts are not vested with the discretionary power to allocate the burden of producing evidence. In EU law, see, however, the distinction between legal and evidential burden of proof, op. cit, and accompanying text. C.Engel, op. cit., p. 11, also questions the objectivist model of E. Sherwin & K.M. Clermont, offering a behavioural perspective on decision-making under uncertainty. He notes that empirical evidence shows that "judges and jury members do simply not act like miniature scientists", that decision-making is "explanation based", rather than probabilistic and that judges and jurors combine the evidence with their world knowledge and with their expectations of what constitutes an adequate explanation in the respective area of life.

[226] E. Sherwin & K.M. Clermont, op. cit.,p. 263.

[227] See, for instance, Case T-110/07, *Siemens AG v. Commission* [2011, not yet published], para.50.

[228] Joined cases C-403/04 P and C-405/04 P, *Sumitomo Metal Industries v. Commission*, [2007] ECR I-729

few other instances where the expression "standard of proof" has been used relating to "an approximate translation" in the English version of the judgment, the term not appearing as such in the official French version[232]. After reviewing the case law of the EU courts, Gippini-Fournier concludes that "the approach of the EU Courts to the assessment of evidence is better understood from the perspective of continental law systems", where the question of how much evidence is required before a judge can conclude that a party has met its burden of proof "does not typically receive an *ex ante* abstract answer in terms of probability", but it is the standard of *intime conviction*, without the law framing "how strong this personal *conviction* of the judge should be"[233].

Indeed, the EU courts have not so far engaged in a probabilistic approach to evidence evaluation[234]. In a number of Articles 101 and 102 TFEU cases, the EU courts have suggested that the Commission is subject to a standard of "convincing evidence"[235], or they have employed a variety of related expressions, such as "sufficiently precise and coherent proof", "convergent and convincing" or "cogent" evidence[236], "specific and credible evidence indicating with reasonable probability that" the event or effect occurred[237], or "precise and consistent evidence [...] to support the firm conviction that the alleged infringements constitute appreciable

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[229] C-12/03 P, *Commission v. Tetra Laval BV*, [2005] ECR I-987

[230] Case C-413/06 P. *Bertelsmann and Sony v. Impala*, [2008] ECR I-4951

[231] Case T-201/04, *Microsoft Corp. v. Commission*, [2007] ECR II-3601.

[232] E. Gippini-Fournier, op. cit., p.

[233] Ibid., p.

[234] On the concept of the standard of proof in EU competition law, see, David Bailey, 'Standard of Proof in EC Merger Proceedings: A Common Law Perspective', Common Market Law Review 40 (2003): 845; Tony Reeves & Ninette Dodoo, Standards of Proof and Standards of Judicial Review in EC Merger Law, in 2005 Annual Proceedings of the Fordham Corporate Law Institute, ed. Barry E. Hawk (Juris Publishing, 2006), 117; .,; Yves Botteman, op. cit.; Nigel Parr & Euan Burrows, Burdens and Standards of Proof in European Community Competition Law, in Issues in Competition Law and Policy ABA Antitrust Section, (2008), 159; E. Gippini-Fournier, op. cit.

[235] Joined cases 29/83 & 30/83, *CRAM and Rheinzink v. Commission* [1984] ECR 1679, para. 20; Joined cases C-89/85, C-104/85, C-114/85, C-116/85, C-117/85 and C-125/85 to C-129/85, *A. Ahlström Osakeyhtiö v. Commission* [1993] ECR I-1307, para. 70 & 127 (("a firm, precise and consistent body of evidence"); Case C-12/03 *Commission v. Tetra Laval* [2005] ECR I-987, para. 41 (merger control). & 193; Case T-30/91 *Solvay SA v. Commission* [1995] ECR II-1775, para. 75; Case T-62/98, *Volkswagen AG v. Commission* [2000] ECR II- 2707, para. 199; Case T-368/00 *General Motors Nederland BV and Opel Nederland BV v. Commission* [2003] ECR II-4491, para. 88; Case T-67/00 *JFE Engineering Corp and others v. Commission* [2004] ECRII-2501, para. 341; Case T-168/01 *GlaxoSmithKline Services v. Commission* [2006] ECR II-2969, para. 82. In the context of Art. 101(3) see, Joined Cases 43/82 & 63/82 *VBVB and VBBB v. Commission* [1984] ECR 19, para. 52; Case T 168/01, paras 235, 263, 303 ('a person who relies on Article [101(3) TFEU] must demonstrate that those conditions are satisfied, by means of convincing arguments and evidence'). In the context of Art. 102 TFEU, there are specific indications regarding the standard of proof for efficiencies. See Case T-203/01 *Manufacture française des pneumatiques Michelin v. Commission* [2003] ECR II-4071, paras 108–109 (the dominant company must provide 'specific information' or 'provide economic reasons to explain specifically the discount rates chosen').

[236] See, the examples cited in E. Gippini-Fournier, op. cit, footnotes 24-28.

[237] Case T-25/05, *KME Germany AG, KME France SAS, KME Italy SpA* [2010] ECR II-91, para. 86; Case C-389/10 P, *Re Industrial Tubes Cartel II: KME Germany v. European Commission*, [2012] 4 C.M.L.R. 10, para. 2, referring to the above passage of the General Court's judgment as relating to the "standard of proof".

restrictions of competition"[238]. Most often the Courts referred to the concept of the "requisite legal standard" without any further indication on what this might be[239]. In a more recent case the General Court went as far as requiring the Commission to "show precise and consistent evidence in order to establish the existence of the infringement and to support the *firm conviction* that the alleged infringements constitute appreciable restrictions of competition"[240].

The EU merger regulation being silent as to the evidential threshold the Commission should reach before declaring a merger to cause (or not) a significant impediment to substantive competition the case law of the EU Courts has provided some broad guidelines, in the context of the judicial review of some of the Commission's merger decisions[241]. It is reminded that the Commission enjoys a "margin of discretion" and is subject to a manifest error of appraisal test, under Article 263 TFEU, in contrast to Commission's decisions imposing fines, which are subject to the full jurisdiction of the Court[242]. The CJEU has also recognized that article 2 of the Merger Regulation leaves a certain margin of discretion to the Commission, "especially with respect to assessments of an economic nature", adding that "review by the Community courts of the exercise of that discretion, which is essential for defining the rules on concentrations, must take account of the margin of discretion implicit in the provisions of an economic nature which form part of the rules on concentration"[243]. The judicial review function of the Court, the margin of

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[238] Case T-36/05, *Coats Holdings Ltd v. Commission*, [2007] ECR II-110, para 71.

[239] See, for instance, Joined cases T-44/02, T-54/02 OP, T-56/02 OP, T-60/02 OP & T-61/02 OP, *Dresdner Bank AG and others v. Commission*, [2006] ECR II-3567, para. 59.

[240] Case T-110/07, *Siemens AG v. Commission* [2011, not yet published], para. 46.

[241] In the first cases the General Court annulled the Commission's decisions, the issue was not so much the standard of proof, the Court referring to the concept of "requisite legal standard", but the cogency of the evidence produced by the Commission in this case: see, Case T-342/99 *Airtours v Commission* [2002] ECR II-2585, para. 294; CFI Case T-310/01 *Schneider Electric v Commission* [2002] ECR II-4071, para. 394 (failure of the Commission to produce "sufficiently convincing evidence").

[242] According to Art. 31 Regulation 1/2003 (adopted following Article 261 TFEU), "The Court of Justice shall have unlimited jurisdiction to review decisions whereby the Commission has fixed a fine or periodic penalty payment. It may cancel, reduce or increase the fine or periodic penalty payment imposed". It is interesting to note that in a recent judgment the EFTA Court held that "when imposing fines for infringement of the competition rules, [the EFTA Surveillance Authority] cannot be regarded to have any margin of discretion in the assessment of complex economic matters which goes beyond the leeway that necessarily flows from the limitations inherent in the system of legality review" : Case E-15/10, *Poste Norge AS v. EFTA Surveillance Authority* [April 18, 2012, not yet published], para. 100. The Court referred to Article 6(1) ECHR and the case law of the ECHR requiring that subsequent control of a criminal sanction imposed by an administrative body must be undertaken by a judicial body that has full jurisdiction. One might imply from this case law that the standard of "manifest error of appreciation" might not be compatible with Article 6(1) ECHR, at least with regard to decisions on fines and periodic penalties. This does not however apply *ipso facto* for decisions to prohibit a merger or authorize it, which cannot be considered as imposing criminal charges, according to the ECHR case law, as it is difficult to conceive that a merger decision is a legal rule that has a punitive or deterrent purpose: ECtHR, *Öztürk v. Germany*, Judgment of 21 February 1984, Series A no. 73, p. 21, § 53; ECtHR, *Bendenoun v. France*, judgment of 24 February 1994, Series A no. 284, § 47. In its Opinion in Case C-389/10 P, *KME Germany AG, KME France SAS and KME Italy SpA v. European Commission*, December 8, 2011, not yet officially published, AG Sharpston did not examine the issue of the compatibility of Article 263 TFEU with Article 6(1) ECHR.

[243] Joined Cases C-68/94 and C-30/95 *France and Others v Commission ('Kali & Salz')* [1998] ECR I-1375, paras 223 and 224; Case T-102/96 *Gencor v Commission* [1999] ECR II-753, para. 164 and 165;

discretion of the Commission and the manifest error of appreciation type of judicial scrutiny exercised may lead the EU Courts to be reticent to regulate the evaluation of the evidence by the Commission to a specific evidential standard. The EU Courts have nevertheless recognized the importance of the judicial review of prospective economic evidence "of the kind necessary in merger control" (such as econometrics), thus rejecting the Commission's conception that its margin of discretion is "inherent in any prospective analysis"[244]. The EU Courts examine whether the evidence relied on is "factually <u>accurate</u>, <u>reliable</u> and <u>consistent</u> but also whether that evidence contains all the information which must be taken into account in order to assess a complex situation"[245]. According to the CJEU, the prospective analysis "must be carried out with great care since it does not entail the examination of past events – for which often many items of evidence are available which make it possible to understand the causes – or of current events, but rather a prediction of events which are more or less likely to occur in future if a decision prohibiting the planned concentration or laying down the conditions for it is not adopted"[246].

What is the requisite legal standard for the prospective econometric evidence to be given probative force? According to the CJEU in *Tetra*, a prospective analysis "makes it necessary to envisage various chains of cause and effect with a view to ascertaining which of them are the *most likely*"[247]. Yet, when the CJEU examined the analysis by the Commission of a 'conglomerate-type' concentration as an example of prospective analysis "in which, first, the consideration of a lengthy period of time in the future and, secondly, the leveraging necessary to give rise to a significant impediment to effective competition mean that the chains of cause and effect are dimly discernible, uncertain and difficult to establish", it also held that "the quality of the evidence" produced by the Commission "must support the Commission's conclusion that, if such a decision were not adopted, the economic development envisaged by it would be *plausible*"[248]. The EU Courts' case law has also referred to other standards than "most likely" and "plausible", such as the fact that the Commission should be able to conclude that "a dominant position would, *in all likelihood*, be created or strengthened in the relatively near future and would lead to effective competition on the market being significantly impeded"[249], an Advocate General suggesting a higher standard of proof for prospective evidence, requiring the Commission to prove that the notified concentration would "*very probably*" lead to a significant impediment of competition[250]. It is clear that the standard of proof of the

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and Case T-342/99 *Airtours* v *Commission* [2002] ECR II-2585, para. 64; Case C-12/03 P, *Commission v. Tetra Laval*, [2005] ECR I-987, para. 38

[244] Case C-12/03 P, *Commission v. Tetra Laval*, [2005] ECR I-987, para. 28 (the Commission's view) & 39 (last sentence, the rejection of the Commission's view).

[245] See, Case C-413/06 P, *Bertelsmann AG & Impala v. Commission* [2008] ECR I-4951, para.145 (emphasis added).

[246] Ibid., para. 42.

[247] Ibid., para. 43. See also, Case C-413/06 P, *Bertelsmann AG & Impala v. Commission* [2008] ECR I-4951, para. 47.

[248] Ibid., para. 44.

[249] Case T-5/02, *Tetra Laval BV v. Commission* [2002] ECR II-4381, para. 153.

[250] AG Tizzano, Case C-12/03 P, *Commission v. Tetra Laval*, [2005] ECR I-987, para. 74.

occurrence, or not, of a significant impediment of effective competition should not be overly ambitious, as in this case it will make it virtually impossible to prove any anticompetitive effects of the merger[251]. A similar approach should also be adopted with regard to the standard of proof of efficiency gains in merger control, in view of the symmetrical standard of proof for prohibition and clearance in merger decisions.

In practice, the approach followed by the EU Courts in both EU antitrust law and EU merger control "imports a considerable degree of flexibility, dependent upon the particular circumstances of the case, the allegation made, and the nature of the evidence involved"[252]. For example, the fact that some restrictions of competition are considered as being more serious than others and thus subject to stricter sanctions (high fines and monetary penalties) might lead to higher evidential requirements than other cases. For example, in his Opinion in *Rhône-Poulenc*, Advocate General Vesterdorf remarked:

> "[C]onsiderable importance must be attached to the fact that competition cases of this kind [cartels] are in reality of a penal nature, which naturally suggests that a high standard of proof is required… [T]here must be a sufficient basis for the decision and any reasonable doubt must be for the benefit of the applicants according to the principle *in dubio pro reo*"[253].

The principle *in dubio pro reo* (literally: 'when in doubt, in favor of the accused' – the presumption of innocence), enshrined in Article 6(2) of the European Convention of Human Rights and Article 48(1) of the Charter of Fundamental Rights of the European Union, requires that 'any doubt in the mind of the Court must operate to the advantage of the undertaking to which the decision finding an infringement was addressed', in particular for decisions imposing fines or periodic penalty payments[254]. This is particularly the case in presence of indirect evidence of a concerted practice, such as parallel conduct, the Courts being relatively reluctant to infer the existence of a concerted practice from the simple fact that there is price parallelism, thus requiring a relatively high standard of proof[255], probably because of the high risk of false positives to which the inclusion of situations of oligopolistic interdependence would have led with regard to the scope of Article 101 TFEU[256].

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[251] Since Case C-413/06 P, *Bertelsmann AG & Impala v. Commission* [2008] ECR I-4951, the standard of proof should be symmetrical for the finding that the merger does not produce anticompetitive effects, the same standard applying to clearance decisions and prohibitions.

[252] N. Parr & E. Burrows, Burdens and Standards of Proof in European Community Competition Law, op. cit. , at 177.

[253] Opinion of AG Vesterdorf, Case T-1/89, *Rhône Poulenc v. Commission* [1991] ECR II-876, at II-954.

[254] Case T-44/02 *Dresdner Bank AG and others v. Commission* [2006] II-3567, paras 60–61; Case T-36/05, *Coats Holdings Ltd v. Commission*, [2007] ECR II-110, para. 69.

[255] See, Case C-49/92 P *Commission v. Anic* [1999] ECR I-4125, paras 121, 126; Joined Cases C-204-205/00 P, C-211/00 P, C-213/00 P, C-217/00 P & C-219/00 *P Aalborg Portland and Others v. Commission* [2004] ECR I-123, para. 81; Joined Cases C-403/04 P and C-405/04 P, *Re Seamless Steel Tubes Cartel: Sumitomo Metal Industries Ltd and Others v. Commission* [2007] 4 C.M.L.R. 16, paras 47–48 & 51.

[256] See, Case T-53/03, *BPB plc v. Commission*, [2008] ECR` II-1333, para. 64: "It is apparent from that case law that the Court must reject the applicant's assertion that the Commission must adduce proof "beyond reasonable doubt" of the existence of the infringement in cases where it imposes heavy fines".

The standard of proof also varies according to the stage of the administrative proceedings. The standard of proof for the opening of the proceedings or for sending a statement of objections is not that clear in EU competition law but national competition authorities, such as the OFT in the UK, are required to have 'reasonable grounds' for suspecting the existence of a competition law infringement. In *Claymore*, the CAT distinguished three steps in the investigative proceedings of the OFT: the first stage is the investigation as such, the second stage is prosecution (Rule 14 notice) and the third stage is decision-making: the CAT imposed a sufficient evidence standard for the second and the third stage of the proceedings[257]. The General Court has also determined the amount of evidence required in order for the Commission to grant interim measures prior to the finding of an infringement[258], or the possibility for EU Courts to suspend the effect of a Commission's decision on appeal (interim relief)[259], which are, in both cases, lower than the standard of proof required for the finding of a competition law infringement. One may also assume that the standard of proof a Phase I merger decision might be different from that required from a Phase II merger decision.

The difficulty to collect evidence and more broadly administrability concerns may also influence the courts in setting their evidential requirements. The EU Courts have recognized the inherent difficulties of the task of proving a cartel infringement and apportioned accordingly the evidential requirements, by establishing adequate presumptions enabling the Commission to make inferences. As it has been observed by the Court of Justice,

> "[…] in practice, the Commission is often obliged to prove the existence of an infringement under conditions which are hardly conducive to that task, in that several years may have elapsed since the time of the events constituting the infringement and a number of the undertakings covered by the investigation have not actively co-operated therein. Whilst it is necessarily incumbent upon the Commission to establish that an illegal market-sharing agreement was concluded […], it would be excessive also to require it to produce evidence of the specific mechanism by which that object was attained […]. Indeed, it would be too easy for an undertaking guilty of an infringement to escape any penalty if it was entitled to base its argument on the vagueness of the information produced regarding the operation of an illegal agreement in circumstances in which the existence and anti-competitive purpose of the agreement had nevertheless been sufficiently established […]"[260].

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[257] *Claymore Dairies Ltd v. OFT* [2003] CAT 18 para. 11.
[258] Case T-44/90 *La Cinq v. Commission* [1992] ECR II-1; Case T-184/01R *IMS Health Inc. v. Commission* [2001] ECR II-3193. The finding should be based on reasonable grounds, there should be an urgent need for interim measures and a risk for serious and irreparable damage to competition.
[259] Case T-184/01R *IMS Health Inc. v. Commission*, above, at para. 73.
[260] Joined cases C-403/04 P & C-405/04, *Sumitomo Metal Industries Lts and Others v. Commission*, [2007] ECR I-729, para. 203. See also, Joined cases T-44/02, T-54/02 OP, T-56/02 OP, T-60/02 OP & T-61/02 OP, *Dresdner Bank AG and others v. Commission*, [2006] ECR II-3567, para. 58, noting the existence of "the practical effect principle" to which the Commission's finding of evidence are subject to, the Court not going so far as to require that the documentary evidence upheld in the contested

On the contrary, it was held that the nature/type of the restriction of competition cannot influence the standard of proof applied (at most this might influence the cogency of evidence required). For example, the Court of Justice held that the standard of proof required for the purposes of establishing the existence of an anti-competitive agreement in the framework of a vertical relationship was not higher than that required in the framework of a horizontal relationship. All other relevant factors should be looked at, including the economic and legal context of the case. Whether it could be inferred that an anti-trust agreement had been concluded could not be addressed in abstract terms, according to whether the relationship involved was vertical or horizontal[261].

With regard to private enforcement, there is no definition at the European level of the amount of evidence required for the finding of a competition law infringement, the matter being left to the Member States[262]. There was a discussion in the Green paper on damages to lower the standard of proof for the issue of damages and causation, in comparison to the standard of proof for the finding of an infringement, as a possible means to address the informational asymmetry between the plaintiffs and the defendants[263]. This option was explicitly rejected by the European Commission[264]. The absence of a European framework may lead to important differences between jurisdictions where the concept of standard of proof is known (and which adopt a probabilistic perspective on evidence) and jurisdictions that simply mention that evidence should be convincing; in practice, however, there is little difference between the two standards[265]. The UK courts seem to require a balance of probabilities standard or a higher standard of proof in some cases for

decision constitutes 'irrefutable evidence' of an infringement. The case-law requires only the submission of sufficient evidence

[261] C-260/09, *Activision Blizzard Germany GmbH (formerly CD-Contact Data GmbH) v European Commission* [2011] ECR I-419, para. 71-72.

[262] For an interesting discussion of the degree of procedural autonomy from which benefit the EU Member States, see Opinion of AG Kokott, Case C-8/08, *T-Mobile Netherlands BV and others v. Raad van bestuur van de Nederlandse Mededingingautoriteir*, [2009] ECR I-4259, paras 77-86 & 94 noting that "for the purposes of proving an infringement of article [101 TFEU] in proceedings before national courts, it is for national law to determine the standard of proof required, subject to the proviso that the principles of equivalence and effectiveness and general principles of Community law must be observed. According to the principle of effectiveness, criteria for proof of an infringement of article [101 TFEU] may not be imposed if they are so onerous as to render such proof impossible in practice or excessively difficult. In particular, national courts may not ignore the typical characteristics of evidence adduced in determining infringements of the competition rules and must permit reference to be made to common experience when evaluating typical events".

[263] Option 9 of the Green Paper – Damages actions for breach of the EC antitrust rules, COM(2005) 672 final.

[264] Commission Staff Working Paper, SEC(2008) 404, para. 91. Similarly, the standard of proof for the passing-on defence cannot be lower than the standard to which the claimant has to prove the existence and the amount of the damage: *Ibid.*, para. 214.

[265] Commission Staff Working Paper, SEC(2005) 1732, para. 79, 'In the individual case there may not be any significant difference between these two tests, since the judge may require being convinced that one explanation is more likely than the other'. For an analysis of the different national rules see, Ashurst, *Study on the conditions of claims for damages in case of infringement of EC competition rules*, 2004, at 55–56, <ec.europa.eu/competition/antitrust/actionsdamages/comparative_report_clean_en.pdf>, 5 April 2009.

finding a competition law infringement[266]. A lower standard of proof applies when the courts give summary judgments[267], or grant interim applications[268].

One could finally distinguish between inferences and legal presumptions. Courts and competition authorities make inferences all the time, as they have to deal with fragmentary and sporadic items of evidence. This exercise forms part of their traditional role conceived under the principle of the free evaluation of evidence in both anglo-american and continental legal systems. This role is particularly salient in competition law, as the authorities do not always possess a clear evidential record or documentary evidence of the infringements. Hence, they should be capable to supplement their evidential record with inferences that would "allow the relevant circumstances to be reconstituted"[269]. For example, according to the case law of the

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[266] The question of the standard of proof has been considered in a number of cases (public and private enforcement alike). *Panayiotou v. Sony Music Entertainment (UK) Ltd.* [1994] E.E.C.C. 395, 410*; Bookmakers' Afternoon Greyhound Services Limited*, [2008] EWHC 1978 (Ch), para. 393. In *Napp Pharmaceuticals v. DGFT* [2002] CAT 5 and *JJB Sports plc & All Sports Limited v. OFT* [2004] CAT 17 it was held that the standard of proof is the civil standard of proof on the balance of probabilities, although the seriousness of an infringement of Art. 81 or of the 1998 Competition Act, involving (as it may) the imposition of penalties, is a factor to be taken into account in considering the probabilities of an infringement having occurred. For the requirement of a higher degree of evidential cogency, see also *Chester City Council, Chester City Transport Limited v. Arriva plc* [2007] EWHC 1373 (Ch), para. 10; *Ineos Vinyls Limited and Others v. Huntsman Petrochemicals (UK) Limited* [2006] EWHC 1241, paras 210–211; *Attheraces Limited and another v. The British Horseracing Board* [2005] EWHC 3015, para. 126; *Ultraframe (UK) Ltd v. Gary Fielding* [2005] EWHC 1638 (Ch), para. 9. As Lord Nicholls of Birkenhead explained in *Re H and others* [1996] AC 563, 586: [T]he more serious the allegation the less likely it is that the event occurred and, hence, the stronger should be the evidence before the court concludes that the allegation is established on the balance of probability … [T]his does not mean that where a serious allegation is in issue the standard of proof required is higher. It means only that the inherent probability or improbability of an event is itself a matter to be taken into account when weighing the probabilities and deciding whether, on balance, the event occurred.

[267] Part 24 of the UK Civil Procedure Rules 1998 provides that the Court *may* give summary judgment against a Claimant or a Defendant on the whole of the claim or on a particular issue if (quoting):
(a) it considers that —
(i) the Claimant has no real prospect of succeeding on the claim or issue; or
(ii) the Defendant has no real prospect of successfully defending the claim or issue; and
(b) there is no other compelling reason why the case or issue should be disposed of at a trial.
The test has been further explained in *Swain v. Hillman* [2001] 1 All E.R. 91 ('real prospect' is to be contrasted with 'fanciful'); 'real prospect' is certainly a lower standard than the balance of probabilities: *Adidas-Salomon AG v. Draper and Others* [2006] EWHC 1318, para. 24 ('a prospect can be real, notwithstanding that it is a small prospect or one that does not seem terribly likely to eventuate'). See also *Three Rivers Dist. Council v. Bank of England* [2003] 2 AC 1, para. 95, which limited the possibility of summary judgment in complex cases: 'more complex cases are unlikely to be capable of being resolved in that way (summary judgment) without conducting a mini-trial on the documents without discovery and without oral evidence'. Competition law cases are complex cases: *Intel Corp. v. Via Technologies Inc.*, [2002] EWCA Civ. 1905, para. 32 (Arts 81 and 82 cases raise questions of mixed law and fact that are not suitable for summary determination); See, however, *Wireless Group v. Radio Joint Audience Research Ltd.* [2004] E.W.H.C. 2925, paras 52–53 (remarking that 'The expense of bringing the present case to trial may be enormous' and that 'The pre-trial and trial costs of competition cases, with the need for expert evidence from economists, are notoriously high' before finding that the claim has no reasonable prospect of success, and that judgment should be entered for the defendant under Part 24); *P & S Amusements Limited v. Valley House Leisure Ltd* [2006] EWHC 1510 (Ch), para. 15 ('such claims or defences require careful scrutiny so as to prevent cases lacking in sufficient merit going to long and expensive trials'); *Unipart Group Ltd v. O2* [2004] E.W.H.C. 1034

[268] *Jobserve* [2001] EWCA 2021, ss 15 & 29 (the case should be 'seriously arguable').

[269] Case T-112/07, *Hitachi Ltd v. European Commission* [2011] 5 CMLR 19, para. 61.

EU Courts, "(t)he existence of an anti-competitive practice or agreement may […] be *inferred* from a number of *coincidences* and *indicia* which, taken together, can, in the absence of another plausible explanation, constitute evidence of an infringement of the competition rules"[270]. In the absence of direct documentary evidence of collusion, that is if the Commission bases "solely" its decision on circumstantial evidence, "it is sufficient for those undertakings to prove the existence of circumstances which cast the facts established by the Commission in a different light and thus allow another, *plausible explanation* of those facts to be substituted for the one adopted by the Commission in concluding that the [EU] competition rules have been infringed"[271]. By providing a greater leeway to the Commission to make inferences about anticompetitive effects, the EU Courts may have also eased the effects of the rather strict evidential standards required for the proof of future anticompetitive effects in merger control[272]. The interplay of facts (items of evidence) and inferences determine the factual scenario (or plausible story), which would eventually carry the conviction of the decision-maker (competition authority or judge)[273].

Legal presumptions operate in the opposite direction. They aim to regulate the evidential discretion of the decision-maker (competition authority or judge) by providing some ready-made causal inferences or analytical shortcuts about specific items of evidence. Presumptions may be conclusive or rebuttable[274]. For example, the EU Courts have long established the presumption that if competitors participate to a meeting to discuss prices or output levels and remain active in the market after that meeting, they are presumed to have taken into account in their future action in the market the information exchanged with their competitors when determining their conduct on that market and hence they are presumed to have participated to a concerted practice[275]. In the view of some of the Advocates General of the Court, this presumption of causal link between concertation and market conduct, which the EU

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[270] Ibid. Emphasis added.

[271] Ibid., para. 62. Emphasis added. The possibility for the undertakings to cast the facts established by the Commission in a different light and thus allow another "plausible explanation" of the facts is not applicable where the Commission's findings are based on documentary evidence: Case T-36/05, *Coats Holdings Ltd v. Commission*, [2007] ECR II-110, para 72

[272] See, for instance, with regard to the three conditions for the assessment of the collective dominant position, Case C-413/06 P, *Bertelsmann AG & Impala v. Commission* [2008] ECR I-4951, paras 251-252, "although the three conditions (…) are indeed also necessary, they may, however, in the appropriate circumstances, be *established indirectly on the basis of what may be a very mixed series of indicia and items of evidence* relating to the signs, manifestations and phenomena inherent in the presence of a collective dominant position […] (For example) the close alignment of prices over a long period, especially if they are above a competitive level, together with other factors typical of collective dominant position, might, *in the absence of an alternative reasonable explanation*, suffice to demonstrate the existence of a collective dominant position, even where there is no firm direct evidence of strong market transparency, as such transparency may be presumed in such cases".

[273] On the "story model", see Nancy Pennington & Reid Hastie, 'A Cognitive Theory of Juror Decision Making: The Story Model', (1991) *Cardozo Law Review* 519. The model can be adapted in other decision-making contexts (judges, competition authorities).

[274] See, D. Bailey, Presumptions in EU Competition Law, (2010) 31(9) European Competition Law Review 362.

[275] Case C-49/92 P, *Commission v. Anic Partecipazioni*, [1999] ECR I-4125, para. 121; Case C-199/92 P, *Hüls v. Commission*, [1999] ECR I-4287, paras 162 & 167; Case C-8/08, *T-Mobile Netherlands BV and others v. Raad van bestuur van de Nederlandse*, [2009] ECR I-4259, paras 51-52.

courts recognize in relation to concerted practices under Article 101(1) TFEU, constitutes "nothing other than a legitimate conclusion drawn on the basis of common experience", flowing naturally from a relation of cause and effect between concertation and market conduct[276]. In other words, this presumption is a statement of what normally happens based on common or judicial experience. This acceptance may also be related to the well accepted normative principle in EU competition law that "each economic operator must determine independently the policy which he intends to adopt on the common market"[277]. The reason underlying the presumption is that, having participated in the meeting without publicly distancing itself from what was discussed, "the undertaking has given the other participants to believe that it subscribed to what was decided there and would comply with it"[278]. Hence, the presumption is not only the product of empirical observation but also results from a normative choice.

In other circumstances, presumptions are based on some conception of economic normality[279]. The standard of proof being constant for all types of mergers in EU competition law, "it takes more evidential effort to establish a fact that it held to be intrinsically improbable, such as harmful evidence of a conglomerate merger, than it would be to prove to the same standard a fact that is intrinsically more probable, such as the harmful effect of a horizontal merger"[280]. Indeed, the distinction between standard of proof and evidential cogency may be illustrated by the development of specific presumptions, such as the one adopted by the General Court towards non-horizontal mergers. In *Tetra Laval*, the Court ruled that, "(s)ince the effects of a conglomerate-type merger are generally considered to be neutral, or even beneficial, for competition on the markets concerned […] the proof of anti-competitive conglomerate effects of such a merger calls for a precise examination, supported by convincing evidence, of the circumstances which allegedly produce those effects"[281]. This positive presumption towards conglomerate or vertical mergers heightens the evidential burden bore by the Commission as it "takes more convincing evidence to prove to the requisite legal standard that a conglomerate merger harms competition than to prove that a horizontal or vertical merger has the same effect" (higher evidential cogency)[282]. More precisely, notwithstanding the "perfectly symmetrical nature" of the standard of proof[283], the cogency of evidence required for

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[276] Opinion of Advocate General Kokott, Case C-8/08, op. cit., para. 90.

[277] See, for instance, Joined cases 40-48, 50, 54-56, 111, 113 and 114/73, *Coöperatieve vereniging Suiker Unie v. Commission* [1975] ECR 1663, para. 173.

[278] Joined cases C-403/04 P & C-405?04 P, *Sumitomo Metal Industries Ltd and Others v. Commission* [2007] ECR I-729, para. 48.

[279] See, I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320; A.L. Sibony, Limits of Imports from Economics into Competition Law, in I. Lianos & D. Sokol, *The Global Limits of Competition Law* (Stanford University Press, 2012), pp. 39-53, at pp. 50-53.

[280] Ibid., pp. 51-52.

[281] Case T-5/02, *Tetra Laval BV v. Commission*, [2002] ECR II-4381, para 155.

[282] See, A.L. Sibony, Limits of Imports from Economics into Competition Law, op. cit., p. 52.

[283] Opinion of AG Tizzano, Case C- 12/03 P *Commission v Tetra Laval*, above, para. 73-75.

what is less probable (in this case, non-horizontal mergers harm competition) is of a higher degree than for what is perceived, in mainstream economics, as more probable (horizontal mergers harm competition), assuming the application of the same standard of proof in both cases. If one employs Lord Hoffman's well known metaphor, it is more likely to see an Alsatian walking in the Green Park than a lion[284].

One should however observe that in practice, evidence is not evaluated in isolated pieces but, as Hock Lai observes, "rather in large cognitive structures most familiarly in the form of narratives, stories or global accounts"[285]. With regard to the requirement of precise and consistent evidence in order to establish the existence of the infringement, the EU Courts have indeed recognized that "it is not necessary for every item of evidence produced […] to satisfy those criteria in relation to every aspect of the infringement", but "it is sufficient if the *body of evidence* relied on by the institution, viewed as a whole, meets that requirement"[286]. Certainly, the EU Courts attach to the various pieces of evidence a "probative value", based on the "reliability of that evidence"[287]. Yet, the approach is holistic rather than atomistic: "judgments of plausibility are rendered not on propositions of facts viewed individually and in isolation", but "the truth of any particular proposition of fact will have to be assessed in the context of a larger hypothesis or story or narrative account"[288]. Such conception of the operation of evidence evaluation is compatible with the relative plausibility theory that one of the authors of this study has advanced elsewhere[289].

The relative plausibility theory should be distinguished from general probability theories of evidence evaluation. Plausibility does not reduce to probability. The assessment of the evidence or more generally fact-finding should not focus on abstract probabilities but on the relative plausibility of competing hypothesis presented by the parties[290]. According to this theory, legal proof is a form of inference to the best explanation that examines the comparative plausibility of the parties' stories[291] "ending in the question whether one is justified in believing (or treating) any of them as the true (or most plausible) account"[292]. The process will involve two

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[284] *Secretary of State for the Home department v. Rehman*, [2002] 1 All E.R. 122, para. 55, "…some things are inherently more likely than others. It would need more cogent evidence to satisfy one that the creature seen walking in regent's Park was more likely than not to have been a lioness than to be satisfied to the same standard of probability than it was an Alsatian".

[285] Ho Hock Lai, *A Philosophy of Evidence Law* (OUP, 2008), 161, what he calls the 'narrative model of trial deliberation'.

[286] Case T-44/02 *Dresdner Bank AG and others v. Commission* [2006] II-3567, para. 62 (emphasis added); Case T-110/07, *Siemens AG v. Commission*, op. cit., para. 47 ("it is sufficient if the set of indicia relied on by the institution, viewed as a whole, meets that requirement").

[287] Case T-110/07, *Siemens AG v. Commission*, op. cit., para. 54.

[288] Ho Hock Lai, *A Philosophy of Evidence Law*, op. cit., at 162.

[289] Ioannis Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

[290] See the "relative plausibility theory" of Ronald J. Allen, "The Nature of Juridical proof", (1991) 13 *Cardozo L Rev* 373.

[291] Ronald J. Allen, "Explanationism all the way down", (2008) *Episteme* 320; Michael S. Pardo & Ronald J. Allen, "Juridical Proof and the Best Explanation", (2008) 27 *Law and Philosophy* 223.

[292] Ho Hock Lai, *A Philosophy of Evidence Law*, above, at 156.

steps[293]: first, it is important to generate potential explanations of the evidence; second, it is important to select the best explanation from the list of potential ones (which will be the "actual explanation")[294]. Choosing among competing explanations depends on the *relative* plausibility of each narrative/story, as measured by reference to a number of criteria: the degree of coverage (that is "the greater the portion of the evidence a story is able to account for the higher its plausibility"), the completeness/consilience of the story (it explains more facts and has less gaps)[295], the coherence of the narrative (that is "the added quality of the individual elements integrating well together to yield a smooth and convincing narrative of events" and finally its probative force (that is "the positive support it receives from the evidence)[296]. It becomes therefore clear that plausibility cannot be confined to a simple statement of probability, quantitatively determined as a percentage of already known "objective data" or universal objective frequencies, which would assume that all available explanatory hypotheses would be known by the expert or the court[297]. Rather it refers to the relative "strength of the explanation", as determined by the "inferential interests of the decision-maker"[298], the context of other evidence or other contrary explanations[299].

4.1.2. Econometric evidence and standard of proof

The rules of evidence have been framed with the view that most evidence will be factual. Yet, sources of evidence are diverse and might include contemporaneous documents, such as emails or statements by market participants (competitors, customers and consumers)[300], but also more complex evidence, such as econometrics.

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[293] I follow the pattern of "prospect theory" which identifies a two-steps guiding choice (or behaviour): first, setting a reference point by editing alternatives, then, combining or segregating outcomes after a comparative plausibility analysis: Reid Hastie & Robyn M. Dawes, *Rational Choice in an Uncertain World* (SAGE, 2001), Chapter 13 (however, contrary to prospect theory, we consider that the selection step does not rely on probabilities of occurrences or expectations but on a relative plausibility enquiry).

[294] Michael S. Pardo & Ronald J. Allen, "Juridical Proof and the Best Explanation", above, at 229.

[295] One could employ the expression "explanatory power", that is "the ability of a theory, model, hypothesis to take into account all the observed data and make a persuasive scientific argument": Erican Beecher-Monas, *Evaluating Scientific Evidence* (CUP, 2007) at 140.

[296] Ho Hock Lai, *A Philosophy of Evidence Law*, above, at 164.

[297] Ronald J. Allen, "Explanationism all the way down", above, at 326.

[298] For example, in the US jury system as "the court's assessment of plausibility defines the range of the jury's decision-making discretion", the range of that discretion may vary according to the court's perception of "jury's breadth of experience with the types of issues presented" and the capacity of the jury to deal with technical issues: William H. Page, "The Chicago School and the Evolution of Antitrust: Characterization, Antitrust Injury, and Evidentiary Sufficiency", (1989) 75 *Virginia L Rev* 1221, 1282. These considerations are not present in the European legal system (non-jury system), thus potentially leading to a different definition of plausibility in this context.

[299] Michael S. Pardo & Ronald J. Allen, "Juridical Proof and the Best Explanation", above, at 261.

[300] For example, customer surveys are useful information for assessing the degree of substitutability between particular products: Horizontal Merger Guidelines, para. 29. Customer views are also used by the Commission in order to determine the likelihood of market entry or the degree of competition between the merging parties' products. Case COMP/M.2817 *Barilla/BPL/Kamps* [2002] OJ C 117/05, para 34; Case COMP/M.4961 *Cookson/Foseco* [2008] OJ C 127/3, para 44; Case COMP/M.3149 *Proctor & Gamble/Wella* [2003] OJ C 195/6, para. 46. Yet, as the General Court stressed in *GE*, "while the opinions of customers and other third parties might constitute an important source of information on the foreseeable impact of a concentration on the market, they cannot bind the Commission when it

As we indicated previously, the probative value attached to a piece of evidence depends on the "reliability of that evidence", which is "the sole criterion relevant for evaluating freely adduced evidence"[301]. As the Court noted in *Siemens v. Commission*,

> "(a)ccording to the generally applicable rules on evidence the reliability and therefore the probative value of a document depends on its origins, the circumstances in which it was drawn up, the person to whom it is addressed and the reputed and reliable nature of its content […[In particular great importance must be attached to the fact that a document has been drawn up in close connection with the events or by a direct witness of those events. Furthermore, statements which run counter to the interests of the declarant must in principle be regarded as particularly reliable evidence."[302].

The question that arises is thus if econometric evidence should be treated differently from other types of factual evidence, having in mind that "econometric evidence entails something more complex than crude facts"[303].

The complexity of econometrics has very much to do with the following characteristics (i) they are based on some specific causal inferences ("internal validity") made on the basis of some observations that are generalized, the last operation relating to the connection of these inferences to the real outside world ("external validity"). External validity is important for the reliability of the evidence (this is a shared element with other types of evidence, which should also be reliable); (ii) Both these standards of validity ("internal" and "external") are also based on conventions developed within the context of a specific professional group and/or research community, that of econometricians, with the result that these cannot be assessed easily by someone outside this group using simple common sense; (iii) as a result of the previous characteristics, and the technical complexity of econometrics, courts and competition authorities will have to spend a considerable amount of time and resources if they were to make an in-depth inquiry into the quality and the reliability of the econometric evidence presented by the parties, in particular if they had to re-do the econometric analysis themselves in order to verify its validity. It is much less time consuming and less costly to perform an in depth inquiry of simple factual findings. Does this mean that the EU Courts and/or the European Commission should apply a different standard of proof for econometric evidence than for other forms of factual evidence?

We will attempt to answer this question by examining the following intermediary questions: (i) how do the internal and external standards of validity of econometrics interact with the legal standard of proof, that is, a convention developed within the context of a separate community of practitioners (lawyers, judges) and academic researchers as to the validity of a legal argument. Are there any similarities between them or important differences that might lead to misunderstandings? Our

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makes its own assessment of the impact of a concentration": Case T-210/01 *General Electric v. Commission* [2005] ECR II-5575, para. 278.

[301] Case T-110/07, *Siemens AG v. Commission*, op. cit., para. 54

[302] Ibid.

[303] Yves Botteman, Mergers, Standard of Proof and Expert Economic Evidence, op. cit., p. 77.

focus will not be here on positive law, but on the normative presuppositions about what constitutes valid evidence in econometrics and in law; (ii) what are the different options available to legal decision-makers about fitting econometrics in the different conceptual "boxes" of evidence law?

4.1.2.1. Internal and External standards of validity in econometrics and interaction with the law of evidence

In this section we will examine the following questions: (i) taking into account the existing standards of internal and external validity in econometrics, do econometrics constitute evidence? and (ii) is it possible to make a causal claim in law based on econometric evidence?

4.1.2.1.1. Do econometrics constitute evidence?

In order to answer this question, it is crucial to define what exactly is meant by the concept of evidence. In a legal context, evidence has been defined as

> "any facts considered by the tribunal as data to persuade them to reach a reasoned belief on a probandum. The term is sometimes used to refer to evidential data or autoptic preferences and sometimes to refer to other facts taken as established for purposes of argument"[304].

The law of evidence is agnostic and open as to the *kind* of facts (data or autoptic preferences, that is testimonial assertions, e.g. evidence that will be perceived by the tribunal through one of its senses) presented to the tribunal or, more broadly, the legal decision-maker (e.g. a competition authority) as long as these are provided with the aim to persuade the decision-maker to reach a reasoned belief on a probandum. One could narrow down this functional definition of evidence by including the characteristics of this evidence, but this is generally a different operation that has to do with the question of how credible this evidence is and what is its probative value. Most recent efforts to replace the concept of "evidence" with that of "information in litigation" in order to transcend sharp distinctions between "fact" on the one hand and "value", "law" and "opinion" on the other, illustrate the openness of the legal system on the question of what constitutes evidence.

On the contrary, econometrics and more generally the social sciences have developed a narrower view of what may be considered as "evidence". According to some authors,

> "*scientific* evidence means, [...] the more or less observable outcomes of scientific tests such as experiments, statistical analyses and surveys" [...] means hint, sign, indication of or a reason to believe (the negation of) a scientific hypothesis [...] (something that furnishes) proof of or good or cogent reason to believe (the negation of) a hypothesis"[305].

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[304] T. Anderson, D. Schum & W. Twining, *Analysis of Evidence* (CUP, 2nd ed. 2010), p.382.
[305] J. Reiss, Empirical Evidence: Its Nature and Sources, in the *SAGE Handbook of the Philosophy of Social Sciences* (SAGE, 2011), Ch. 29, pp. 551-576, at p. 552.

Evidence can have a variety of different features, depending on the theory of evidence one takes and the object, methodology and tools employed by the specific scientific discipline. In science, the notion of evidence is thus closely related to that of induction (that is, the question of what kids of inferences someone is justified to make, given the evidence at hand)[306]. Yet, there are different conceptions of induction and consequently confirmation[307]. It follows that different conceptions of confirmation may lead to different views of what constitutes evidence. If one takes Popper's falsificationism and the hypothetico-deductive method of hypothesis testing, evidence may be characterized as "a proposition that is implied by a hypothesis but which is ruled out by others". From a Bayesian confirmation theory perspective and its subjective interpretation of probability as degree of belief, evidence is a proposition that should be capable to "raise the degree of belief in the hypothesis" and that it is "probabilistically relevant to the hypothesis"[308]. Other accounts of confirmation theory require that for being considered as evidence the proposition should make the hypothesis more likely than an alternative hypothesis or that it be more likely than its negation or that it provides reason to believe the hypothesis[309].

It follows that there might be some conflict between the broad view of evidence in the legal context and the narrow view that one might have in the context of social sciences, in our case, econometrics. If one chooses the option to adopt the narrow view, the presence of a variety of conceptions of what constitutes evidence will present an insurmountable problem to the legal decision-maker, as she will have to choose a particular conception of evidence or to engage in the construction of a new widely-acceptable view of evidence in the context of social sciences, before transposing this to the legal context. It is clear that the first option presents important risks and subjects the concept of evidence selected to epistemological attacks by proponents of a different view. The second option is practically unavailable because of the complexity of the task, the limited amount of time the legal decision-maker disposes and the expected failure of completing a task that great thinkers in philosophy, statistics and science have been trying to achieve for centuries without however managing to reach consensus to this date. Hence, because of practical considerations at least, the legal decision-maker should leave open the question of specifying exactly what constitutes evidence and should explore the evidential basis of a claim without having a full definition of evidence at hand.

Yet, this agnostic approach on evidence will not lead the legal decision-maker to accept *any* information as evidence. The decision-maker may decide that she will hear as evidence *only* information that has already been accepted with good reason because it relies on some metaphysical assumptions widely accepted by the wider

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[306] By induction, we mean enumerative induction (inference froma finite number of observations to generalization), projection (inference from a finite number of observations to the next case), explanatory inference (inference from observations to a hypothesis that best explains them).

[307] Historically, confirmation has been closely related to the problem of induction, the question of what to believe regarding the future in the face of knowledge that is restricted to the present and the past.

[308] D. Fennell, *Is structural econometrics evidence-based?*, CPNSS working papers, (LSE 2008), p. 5.

[309] Ibid.

community or because it relies on an appropriate testing *method* which generates inferences. This is particularly true for evidence provided by (expert) witnesses, which have a peculiar position compared to other witnesses, as, first, they are allowed to testify not only on matters of facts they had personally witnessed, but on inferences from facts or classes of facts that others may have reported and, second, they represent "persistent communities of practice outside the legal domain"[310].

It is possible here for the legal decision-maker to make a choice between two different strategies: either to exclude some information based on some criteria, before even the operation of assessing its probative force, or to accept to hear all information provided. We have defined elsewhere the first strategy as manifesting an "exclusionary ethos" linked to the common law's traditional preference for regulating the admissibility of evidence[311]. This is done by looking to the quality and validity of the information provided, according to the standards of validity developed by the "persistent community of practice" to which the expert belongs (in essence an epistemological analysis focusing on methodology), and/or to adopt shortcuts to determine the value of the information (such as the expert's credentials). The second strategy might be linked to what we have called elsewhere "a discursive ethos", which will engage critically with the "evidence" by weighing it and/or developing appropriate standards of proof referring to the quantity/quality of evidence needed in order to persuade the decision maker that an allegation is true, but without excluding any information in litigation *a priori.* We have extensively argued for the second approach elsewhere and we have criticized the development of the *Daubert* standards for the admissibility of evidence in the United States as not being an appropriate model for assessing economic (and econometric) evidence in Europe[312]. Our approach recognizes that legal decision-makers should not proceed in an epistemological analysis of the reasons we should believe what a particular method tells us, by looking to the appropriateness of the method for a given situation and why the method gives us reason to believe its results for that situation, before hearing *all* information provided, within the strictures permitted by the rules of civil or administrative procedure (e.g. by the parties, internal expertise of the authority, other experts appointed by the court/authority or by the parties, *amicus curiae* etc). Indeed, if any epistemological analysis of the information in litigation should be conducted, this should take place when examining the relation between the evidence and the causal claims (hence at the level of establishing causality). This view also takes into account that the practical context of a legal dispute is different from that of a scientific one[313]. From that perspective, econometrics submitted in legal disputes constitutes evidence.

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[310] Déirdre Dwyer, *The Judicial Assessment of Expert Evidence* (Cambridge Univ. Press, 2008), at 6.
[311] I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.
[312] Ibid.
[313] See again our analysis in I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

This acceptance of course does not respond to the question if it is possible to make a causal claim based on econometric evidence.

4.1.2.1.2. Is it possible to make a causal claim in law based on econometric evidence? To answer this question we may proceed as in the previous section. This will first require the definition of the legal conception of causality before examining its possible connection with the econometric conception of causality. Should the concept of causality be similar in law and in econometrics, one would, practically speaking, expect that econometric evidence may prove a causal claim in law simply by fulfilling the conditions for causal claims in econometrics to be considered as valid (internally and externally), assuming equal levels of standard of proof for evidence to carry belief in both law and econometrics. There are reasons of course to believe that the levels set for evidence to carry conviction are not the same in law and econometrics, because of differences in the practical context of the inquiry and its overall purpose. Yet, if there is a similar concept of causality, it would be possible to isolate, for example, the variables relating to the practical context and proceed to the creation of a conceptual framework in law by borrowing directly from the conceptual framework of econometrics.

One can observe that while the general concept of causality is certainly used in sciences (natural and social), in law, the concept employed to refer to a causal inquiry is the narrower one of causation. In a nutshell, causation refers to causal connections between events[314]. It can thus be considered as a species of causality with the practical objective to explain the occurrence of particular *events*, to control events and to attribute moral responsibility to agents whose action has provoked the events, the idea being that among the variety of relationships between events (e.g. agency and harm), only some of them will be considered as causal in law (legal causation). That depends on the functions pursued by causation in law. Causation in law exercises two functions: it is backward looking/explanatory and attributive (e.g. fixing the degree of responsibility of agents for the outcomes that follow their agency intervention in the world)[315]. In contrast, the statistical causality of econometrics has a different purpose, as its main function is forward looking (e.g. to predict future events); it also adopts an empirical view of causation that focuses on regularity or constant conjunction as a necessary condition for causation. This is not the approach generally followed by causation in law[316].

In law, the link that should be established between events for it to be considered as causal is special; all the necessary conditions of an event are not equal.

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[314] In that sense, it can be distinguished from a logical connection (as cause and effect are independent of one another, which is not the case for logical connections) and from statistical causal connections, as for legal causation the determination of the causal relation is unique (connection between events). Part of the following developments draw from J. Hellner, Causality and Causation in Law, (2000) 40 Scandinavian Studies in Law 111

[315] A. Honoré, Causation in the Law, *The Stanford Encyclopedia of Philosophy (Winter 2010 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/win2010/entries/causation-law/>.

[316] J.S. Mill's influence might be a possible explanation for this, in contrast to Hume's influence on probabilistic theories of causation.

Which links are considered as constituting a cause in the sense of legal causation is a question that would be either determined by reference to the general concept of causality, applied in a non-legal context[317] (**option 1**), or according to the logic of condition as applied in law, where the special link that must be established between particular aspects of events depends on the relevant legal category examined (option 2). For example, one would focus on different aspects of events if the legal category examined is negligence, as opposed to fault. Here we have also a choice between two options: either to examine questions of causation in the light of the logic of conditions, in particular *necessary* (a cause is necessary or required to produce the result) and *sufficient* (a cause is sufficient or enough to cause the results) condition (**option 2A**), or to be open to all causal links but at the same time define a specific feature that the cause must possess in relation to the consequence in order for the causal connection to be considered made (adequate, proximate, direct causation). In this case, the determination of the specific feature can be perceived either as a genuine causal matter or as a causally relevant condition – "cause in fact" [e.g. but for condition, a jointly sufficient set of conditions, such as NESS or INUS condition[318]] (**option 2B1**) or be addressed as a question of (legal) policy on the distribution of social risks (e.g. what is the *fairest* or the most *efficient* way to distribute responsibility/share social risks), which is an issue that will not receive the same answer in all areas of law and might also open the door to considerations coming from theories of causality outside the law (e.g. economics) (**option 2B2**)[319].

The analysis of the concept of causation applied in the area of competition law is a matter for further research[320], yet one can already remark that the generalization of the use of counterfactuals in some areas of competition law, as a consequence of the shift towards an "effects-based" economic approach in EU competition law[321],

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[317] H.L.A. Hart & T. Honoré, Causation in the Law (OUP, 2nd ed. 1985), arguing that causation in the law is based on causation outside the law and that the causal principles the courts rely on to determine legal responsibility are based on distinctions exercised in ordinary causal judgments (a distinction of fact between causes and "mere conditions". Based on this approach one could advance an approach relying on probability or on an inference to the best explanation [P. Lipton, Inference to the Best Explanation (Routledge, 2nd ed., 2004)] or any other model developed in philosophy etc.

[318] The but-for condition theory advances that the action must in the circumstances be necessary to the outcome. The NESS condition theory advances that it must form a necessary part of a complex of conditions sufficient for the outcome (necessary element of a sufficient test). The INUS condition refers to an insufficient but not-rebundant part of an unnecessary but sufficient condition. Other theorists prefer a more quantitative or scalar approach, according to which an agent can contribute to be involved to an outcome to a greater or less extent: A. Honoré, Causation in the Law, op. cit.

[319] Economic analysis of law theorists advanced the view that responsibility should be placed to the person best placed to avoid the loss most cheaply (cost avoidance theory): see, G. Calabresi & J. Hirchsoff, Towards a Test in Strict Liability in Torts, (1972) 71 Yale L J 1055; R.A. Posner, Strict Liability: A Comment, (1973) 2 Journal of Legal Studies 205.

[320] See, I. Lianos, Causation in EU Competition Law, CLES Working paper 2/2013 (forth. 2013). On US antitrust law, see M. Carrier, A Tort-Based Causation Framework for Antitrust Analysis, (2011) 77 Antitrust L J 401.

[321] C. Veljanovski, Counterfactual Tests in Competition Law, (2010) 4 Competition Law Journal p. ; D. Geradin & I. Girgenson, The Counterfactual Method in EU Competition Law: The Cornerstone of the Effects-based approach, (December 11, 2011). Available at SSRN: http://ssrn.com/abstract=1970917 or http://dx.doi.org/10.2139/ssrn.1970917; See also in the context of merger control, A. Bavasso & A. Lindsay, Causation in EC Merger Control, (2007) 3(2) Journal of Competition Law & Economics 181.

may indicate that EU competition law borrows from the general theory of causality (option 1) or at least from theories of causality outside the law (option 2B2). If that's the case, then one could expect fewer conflicts with the way causal connections are established in econometrics.

The definition of the appropriate criterion of causality in econometrics is the product of historic evolution and compromise. Econometrics is a rather young discipline, whose formal date of birth as a separate field is set in 1933 with the foundation of the Econometric society, the aim of which was to unify the theoretical-quantitative approach with the empirical-quantitative approach to economics[322]. In the words of Kevin Hoover econometrics is "statistics that is centrally conditioned by economic theory"[323]. It is well known that the main concern of a methodology of statistics is the proper interpretation of probability and how it applies to data. Econometrics differs from statistics in several ways.

First, in econometrics, economic theory provides the blueprint for the specific set ups that will generate probabilities. The role of economic theory will be in this case "to provide the conditions that articulate such a well-defined set-up: a nomological (or law generating) machine" and the "identification needed to render statistics economically interpretable"[324]. Hence, one should have the right theory to identify the model. The application of statistical techniques to economics (econometrics) presents thus very different characteristics than their application to other social sciences, as "economics is a discipline with a theory[325]", a factor that accentuates the *a priorist* dimension of econometrics (the inferential direction runs from theory to data). Contrary to the use of statistics in sociology, econometrics do not aim to connect raw data and causes but to measure the laws of economics, that is to establish a connection between causes and laws, whether the laws be in functional or in probabilistic form. Econometrics does not test theories but is simply "a tool of approximation of known theoretical relationships applied to data"[326]. This implicitly assumes that the fundamental laws of economics are causal laws. The fact that economics, until recently, was not open to experiments, as other social sciences (such as psychology) are, has led to a dominant role for *a priori* theory. Yet, one should not forget that although causal relations may be inferred from the distribution of probabilities resulting from a controlled experiment, it is still not possible to export these causal conclusions from one situation to another[327], so even experimental economics would have been confronted to the same problem.

Second, contrary to statistics, econometrics focuses on establishing causation, while statistics is content with correlation[328]. The role of econometrics in policy

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[322] R. Frisch, Editor's Note (1933) 1(1) Econometrica 1.

[323] K. Hoover, Methodology of Econometrics, Available at SSRN: http://ssrn.com/abstract=728683 or http://dx.doi.org/10.2139/ssrn.728683 (2005), p. 4.

[324] K. Hoover, op. cit., p. 5.

[325] N. Cartwright, *Nature's Capacities and Their Measurement* (Clarendon Press, 1989), p. 14.

[326] K. Hoover, op. cit.,

[327] N. Cartwright, *Hunting Causes and Using Them* (CUP, 2007), p. 186.

[328] K. Hoover, op. cit., p.5, citing J. Heckman, Causal parameters and Policy Analysis in Economics: A Twentieth Century retrospective, 115(1) Quarterly Journal of Economics 45.

evaluation may offer an explanation for this important difference. Furthermore, econometrics does not treat directly with reality but involves the use of models. One could conceive the "theory-data confrontation" as an empirical analysis in which theoretical arguments play an essential role. As it is noted by Stigum,

> "There is a unifying framework within which we can view the different activities in economic theory-data confrontations. All have a core structure consisting of three parts: two disjoint universes, one for theory and one for data, and a bridge between them. The theory universe is populated by theoretical objects that have all the features that the theory ascribes to them. The elements in the data universe are observations from which we create data for the theory-data confrontation. The bridge is built on assertions that describe the way that elements in the two universes are related to one another"[329].

Economic theory drives the selection of observations (through a data generation process that goes from sample population on whose characteristics observations are based to observations, that is data that the researcher has constructed with the help of a theory forming part of the data universe, "in which all the pertinent data variables reside"), as well as the interpretation of the specific theory that will be used (the theory universe) and which will interact with the data universe through the bridge principles[330]. The theory universe comprises theoretical objects that "describe toys in a toy economy": The variables in the data universe also live and function in a socially constructed world of ideas that has little to do with economic reality[331]. The bridge consists of principles that relate variables in the theory universe with variables in the data universe. The bridge principles in a theory-data confrontation reflect the researcher's beliefs as to how her theoretical and data variables are related to one another. This is done for econometrics by referring to economic theorems, which will delineate conditions under which bridge principles are justified. In essence the make-up of the data depends on the theory and the design of the particular empirical analysis. Both the world of theory and the world of data are socially constructed and have little in common with the true social reality to be explained, which raises important questions on the relevance of econometrics to social reality. The "riddle" is how to combine elements from a "toy economy" with elements from a "socially constructed world of ideas" to learn something about social reality[332]. Bridge principles, such as models, "stipulate the mapping between theoretical variables […] and their statistical counterparts"[333]. The worlds of theory and of data, as well as the bridge principles, are thus presented as axiomatized systems, hence they constitute formal systems. Models provide a consistent interpretation of these formal systems,

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[329] B. P. Stigum, Econometrics and the Philosophy of Economics (Princeton University Press, 2003), p. 1.
[330] B. P. Stigum, Stylized facts, the purport of an economic theory, and scientific explanation in economics and econometrics (November 8, 2004), available at http://www.eco.uc3m.es/temp/stigum.pdf , p. 5.
[331] B. P. Stigum, Econometrics and the Philosophy of Economics, p 3.
[332] Ibid., pp. 3-4.
[333] K. Hoover, methodology of Econometrics, p. 17.

hence implying that we may have a multiplicity of models for a given theory: "different models of one and the same theory may describe very different matters"[334].

As economics is based on logical positivism and its axiomatized view of science, the hypothetical-deductive method enables the formulation of explanations and predictions. *Ceteris paribus* clauses enable the generalization of hypotheses made to the real world. An alternative is to adopt "an inductive statistical explanation, in which laws hold only probabilistically and the inferences are not to what happens but to the probability that it happens"[335]. Econometrics takes the second route.

Following the pioneering work of Haavelmo, probability models have been applied to economic data[336]. Haavelmo argued that quantitative economic models must necessarily be probability models in order to incorporate randomness. The models cannot be deterministic, as economic data is not deterministic (because of human agency). Once it is acknowledged that an economic model is a probability model, it follows naturally that the best way to quantify, estimate, and conduct inferences about the economy is through mathematical statistics (multivariate statistical techniques, such as multiple regression). In a regression the causes are correlated with their effects (in the simple configuration of a regression $y_i = \alpha + \beta x_1 + e$, where y_i is the dependent variable, α and β are the regression parameters, e is the error term and the subscript denotes the observation number, y and x are correlated positively or negatively if β differs from zero in the regression [hereinafter, equation]). In the probabilistic approach, models are often characterized in terms of parameters, which are numerical measures describing important characteristics of the model. A regression equation if it is properly specified enables the decision-maker to account for the naturally occurring variations in economically important factors and thus acts as a surrogate to the missing in econometrics explicit experimental controls. The regression coefficient will provide an estimate of the effects of a particular explanatory (independent) variable on a dependent variable (the variable to explain). Yet, as it is noted by Cartwright, in probabilistic accounts of causality, as the one used in econometrics, "deductions are from probabilities to causes, not from statistics – i.e. summaries of data", which can be "a source of uncertainty about the premises of the deductions"; in addition, "there might be probabilistic dependencies that have no causal source and we might even be mistaken in inferring probabilities from the data"[337].

According to Haavelmo, "the class of scientific statements that can be expressed in probability terms is enormous" and in fact contains all the economic "laws" that "have, so far, been formulated"[338]. Indeed, it we want "to apply statistical inference to testing the hypotheses of economic theory, it implies such a formulation of economic theories that they represent statistical hypotheses, i.e., statements-

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[334] B. P. Stigum, Econometrics and the Philosophy of Economics, op. cit., p. 10.
[335] K. Hoover, The Methodology of Econometrics, p. 10.
[336] T. Haavelmo, The Probability Approach in Econometrics, 12 Econometrica (July 1944), pp. iii-115.
[337] N. Cartwright, *Hunting Causes and Using Them* (Cambridge Univ. Press, 2007), p. 30.
[338] T. Haavelmo, The Probability Approach in Econometrics, op. cit., p. iv

perhaps very broad ones-regarding certain probability distributions"[339]. The model "attains economic meaning only after a corresponding system of quantities or objects in real economic life has been chosen or described, in order to be identified with those in the model" (the identification problem)[340]. For example, the identification problem involves the choice of what constitutes endogenous and exogenous variables in an econometric analysis. Economic theory indicates which factors are the appropriate ones in the context of model specification. Model specification involves different operations: (i) the choice of the right sample, that is a selection of data, from the population to obtain estimates of the values of the parameters of the model, (ii) choosing the appropriate variable for analyzing the question in hand (dependent variable), (iii) choosing the explanatory (independent) variable(s) relevant to the question at issue and additional explanatory variables, in case a preliminary analysis shows the unexplained portion of the multiple regression to be particularly high and that there are other previously undetected variables missing, (iv) choosing the functional form of the multiple regression model (linear or non linear forms) and the appropriate multivariate statistical technique for the analysis (multiple regression, logit, etc). Then, it is important to find satisfactory methods of actually *measuring* those economic relations which it could be meaningful to confront with facts (after the question of identification has been sorted). The calculus of probability provides an appropriate tool.

The criteria for the right mapping between theory and data and thus the possibility to make causal inferences have been set by a Commission of experts, the Cowles Commission in the 1940s in the United States[341]. The Cowles Commission followed a a priori/structural perspective to causality as it relies on *a priori* identifying assumptions, which are provided by economic theory. It emphasizes the distinction between endogenous and exogenous variables and proceeds with the identification and estimation of structural parameters for the models, as opposed to a process approach. As it is explained by Fennell, the deductive approach of structural econometrics involves first the use of (economic) theory and auxiliary hypotheses to construct an abstract causal model which gives the dependent variables (the variable to explain) as a function of the independent variables[342]. Error terms represent the net impact of omitted causal factors on some endogenous variables. The method thus begins by assuming that a particular set of functional forms correctly represents the causal structure generating the observed data. The next step involves using the data to parameterise the model. This is an operation that involves the measuring of the strengths of causal impacts of one variable on another, by measuring structural parameters. The aim of the operation is to discover the parameters that turn these functional forms into real functions, where any factor that appears with a non-zero parameter on the right side of the equation (see above) is judged to be a cause of that

[339] Ibid. p. 4.
[340] Ibid.
[341] C.G. Christ, The Cowles Commission's Contributions to Econometrics at Chicago, 1939-1955, (1994) 32 Journal of Economic Literature 30.
[342] D. Fennell, Is structural econometrics evidence-based?, LSE, CPNSS 10/08, p.20.

effect. Once the parameter is measured, it gives the strength of causal influence between the variables. The model is called 'structural' because it is supposed to *represent* the true causal structures among the quantities considered. Contrary to descriptive statistics which tell you about the correlations that happen to hold in the data, causal claims in econometrics tell you what *will* happen to *y* if you change *x*.

Yet, as it is noted by Fennell, these causal claims are conditional on the many assumptions made:

"What evidence is there for the crucial theoretical and background assumptions supporting the choice of model, for the assumption that the functional form chosen actually represents the causal structure generating the data; that the error terms do accurately measure the influence of omitted causal factors, that exogenous factors are not caused by any endogenous factors, and finally that exogenous variables do not have causes that cause an endogenous variable via an unmodelled path. Moreover, what reason is there to accept the concept of causality presupposed in the model and the relationships it presupposes between probabilistic relationships and causal claims?"[343].

The criticisms of Christopher Sims on the inadequacy of structural equations to represent the numerous interdependencies among the variables and his suggestion of vector auto-regression models (VAR) as a technique enabling the data to speak by taking an inferential and process oriented approach, as opposed to the a priorist structural approach of the Cowles Commission[344], as well as the emergence of the LSE methodology and that of the calibration method illustrate the absence of consensus in econometrics on the issue of the causal inferences to be made from the estimates on economic reality. One could identify many different approaches of causality: the structural approach of the Cowles Commission used in econometrics, the more inferential/process oriented Granger causality used for dynamic time-series models in economic theory or the counterfactual approach of causality[345]. From these three, only the counterfactual approach to causality has been transplanted to competition law for the time being, in the form of the various counterfactual tests employed in the application of Articles 101 TFEU, 102 TFEU and merger control.

Consequently, it is not possible to infer causation in competition law between two events (e.g. some anticompetitive conduct and a potential increase in price or reduction of quality) based on a clausal claim presented in the form of some econometric analysis.

Once it is clear that the legal concept of causation and causality in econometrics are not similar concepts, it becomes impossible to infer causation in law from causality in econometrics. A possible way ahead would be to develop a meta-

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[343] Ibid., p. 21-22

[344] C. A. Sims, Macroeconomics and Reality, (1980) 48 Econometrica 1-48; C. A. Sims, Are Forecasting Models Usable for Policy Analysis?, (1986) 10 Minneapolis Federal Reserve Bank 2-16.

[345] N. Cartwright, Counterfactuals in economics: a commentary, in M. O' Rourke et al (eds.) Explanation and Causation: Topics in Contemporary Philosophy, Vol. IV (MIT press, Cambridge, MA, 2007), p. 191.

theory or meta-analysis that would integrate these different expressions/forms of causality in a unitary framework. This approach raises a philosophical question, as it presupposes that there is a concept of causality at the first place, or at least an account of causality that "provides a characterization of a single set of features that distinguishes all causal from noncausal relations"[346]. This view is not shared by adepts of causal pluralism, who emphasize that causation is one word but "many things" and who advance a "multi-faceted", "loose" concept of "causes" or talk about "different kinds of causal system"[347]. Reiss analyzes the claim of causal pluralism as equivalent to pluralism about evidence for causal claims[348]. He distinguishes between different accounts of causation: counterfactual accounts, regularity accounts, mechanistic accounts, probabilistic accounts, interventionist accounts. As previously explained, econometrics adopt a largely probabilistic account of causality, while law can be classified within Reiss' typology as closer to an interventionist account of causality, this concept of cause involving the idea that the manipulation of a cause will result in the manipulation of an effect, an idea implicit in the necessary and sufficient condition approach or the but for approach in legal causation. Yet, one may consider these different accounts as different manifestations of the principle of causality, as providing evidence or test conditions for the existence of a causal relationship. One can therefore advance "different kinds of evidence for theoretical claims" about causation and use different methods to show causality[349]. However, this does not solve the problem of the possibility that alternative accounts of causation provide different explanations. For Reiss, in this context, "we face a case of causation where the different concepts do not coapply"[350].Yet, it is important to consider the "practical purposes" of the causal claims made and to understand the value that these have with regard to the realization of the purposes of the decision-maker (scientist, policy-maker)[351]. Causal claims in an econometric setting will relate primarily to prediction; hence "patterns in the data" will be "deemed causal because they are useful for the prediction of the results of policy intervention"[352] . In essence, "(w)hat kind of causal hypothesis should be investigated (and, in tandem, what kind of evidence should be sought) therefore is to be determined on the basis of purpose pursued in the given context"[353]. Hence, different kinds of evidence for causal relationships tend to support different types of causal claims[354].

Some other authors have attempted to provide a more unified framework for the concept of causation, which could be of interest to our study, should we decide

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[346] J. Reiss, Causation in the Social Sciences – Evidence, Inference, and Purpose, (2009) 39(1) Philosophy of Social Sciences 20.

[347] See, for instance, N. Cartwright, *The Dappled World: a Study of the Boundaries of Science* (Cambridge Univ. Press, 1999); N. Cartwright, *Hunting Causes and Using Them* (Cambridge Univ. Press, 2007), Ch. 2, 3 and 4.

[348] J. Reiss, Causation in the Social Sciences – Evidence, Inference, and Purpose, p. 21.

[349] Ibid., p. 27.

[350] Ibid., p. 34.

[351] Ibid.

[352] Ibid., p. 35.

[353] Ibid.

[354] Ibid., p. 37.

that a meta-theory of causation in both law and econometrics is needed. While accepting that "causal relationships are, in principle, infinite in their diversity", Gerring advances "a *prima facie* case for a unified account of causation", in view of the "little profit" of a plural account[355]. While his thesis of an underlying probabilistic concept of causation shared by all accounts is not helpful for our analysis, his definition of a set of logical criteria applying to all arguments that are causal in nature across fields and methods, presents a particular interest for our study. Gerring distinguishes between "the formal properties of a causal argument and the methods by which such argument might be tested"[356]. Drawing on the commonalities of the heterogeneous approaches in social sciences Gerring suggests sixteen formal properties of causal argument, which relate to the formation of causal propositions. These are listed in the table below:

Table 1: Causal Propositions: Formal Criteria[357]

1. Specification (clarification, operationalization, falsifiability)
    (a) What are the positive and negative outcomes (the factual and the counterfactual, or the range of variation) that the proposition describes, predicts, or explains?
    (b) What is the set of cases (the population, context, domain, contrast-space, frame, or base-line), that the proposition is intended to explain?
    (c) Is the argument internally consistent (does it imply contradictory outcomes)?
    (d) Are the key terms operational?

2. Precision
How precise is the proposition?

3. Breadth (scope, range, domain, generality, population)
What range of instances are covered by the proposition?

4. Boundedness (non-arbitrariness, coherence)
Is the specified population logical, coherent? Does the domain make sense?

5. Completeness (power, richness, thickness, detail)
How many features, or how much variation, is accounted for by the proposition? How strong is the relationship?

6. Parsimony (economy, efficiency, simplicity, reduction, Ockham's razor)

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[355] J. Gerring, Causation - A Unified Framework for the Social Sciences, (2005) 17(2) Journal of theoretical Politics 163, p. 167.
[356] Ibid., pp. 167-168.
[357] Ibid., p.171.

How parsimonious is the proposition?

7. Differentiation (exogeneity) (antonym: endogeneity)
Is the X differentiable from the Y? Is the cause separate, logically and empirically, from the outcome to be explained?

8. Priority
How much temporal or causal priority does X enjoy vis-a-vis Y?

9. Independence (exogeneity, asymmetry, recursiveness) (antonyms: endogeneity, reciprocality, symmetry, feedback)
How independent is X relative to other Xs, and to Y?

10. Contingency (abnormality)
Is the X contingent, relative to other possible Xs? Does the causal explanation conform to our understanding of the normal course of events?

11. Mechanism (causal narrative)
Is there a plausible mechanism connecting X to Y?

12. Analytic utility (logical economy) (antonyms: idiosyncrasy, ad-hocery)
Does the proposition fit with what we know about the world? Does it help to unify that knowledge?

13. Intelligibility (accessibility)
How intelligible is the proposition?

14. Relevance (societal significance)
How relevant is the proposition to a lay audience or to policymakers? Does it matter?

15. Innovation (novelty)
How innovative is the proposition?

16. Comparison
Are there better explanations for a given outcome? Is the purported X superior (along criteria 1–15) to other possible Xs? Have all reasonable counter-hypotheses been explored?

Yet, Gerring also considers the "adjoining problem of induction", that is, "the probative elements of causal argument"[358]. This involves the development of seven

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[358] Ibid., p. 182.

factors that characterize a good from a less good research design and could assist a decision-maker in testing causal propositions. These are also listed in the table below:

Table 2. Causal Propositions: Criteria of Research Design[359]

1. Plenitude (evidence)
How many cases? How large is the sample (N)?

2. Comparability (equivalence, unit homogeneity, cross-case validity) (antonym: uniqueness)
2. (a) Descriptive comparability (conceptual validity): How comparable are the Xs and the Y?
2. (b) Causal comparability: How similar are the cases with respect to factors that might affect Y or the X:Y relationship of interest? Finally, can any remaining dis similarities be taken into account (controlled, modelled)?

3. Independence (antonyms: autocorrelation, Galton's problem, contamination)
How independent are the cases with respect to factors that might affect Y or the X:Y relationship of interest? Can any remaining interdependencies be taken into account (controlled, modelled)?

4. Representativeness (external validity) (antonyms: sample bias, selection bias)
Are the cases representative of the population with respect to all factors that might affect Y or the X:Y relationship of interest? Can any remaining un-representative elements be taken into account (controlled, modeled)?

5. Variation (variance)
Do the cases offer variation (a) on Y, (b) on relevant Xs, (c) without collinearity, and (d) within a particular case(s)?

6. Transparency (process-tracing)
Does the research design offer evidence about the process (i.e. the intermediate factors) by which X affects Y?

7. Replicability (reliability)
Can the research design be replicated? Are the results reliable?

The ability to adjudicate between rival arguments is certainly an important task for the European Commission and the courts. The inability, at least of the courts, to assess econometric arguments in an evidential context that is increasingly characterized by multi-disciplinarity brings to the fore the question of the evaluation

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[359] Ibid., p. 183.

of various kinds of evidence and claims of causality. By providing a unitary "criterial" framework for the evaluation of causation, John Gerring's approach may provide to the courts the necessary tools to evaluate different kinds of evidence without necessarily sacrificing the diversity of causal arguments, by adopting a hegemonic, econometric-centred or legal-centred, view of causality.

A quantitative way to combine research results from a range of studies is meta-analysis. Meta-analysis identifies a common metric of effect size and models it using some form of regression in which the results of the individual studies figure as inputs. Meta-analyses have a variety of advantages over alternatives, such as the increase in statistical power and the ability to control for a variety of sources of error. Obviously, only statistical evidence can be combined (it is not possible to combine econometric evidence with documentary or other qualitative evidence) and it requires that the different individual studies to be integrated with each other deal with the same hypothesis. Yet meta-analysis assumes that we have access to lots of details about the cases, which is not always the case. It is also hard to combine cases from different industries due to the idiosyncrasies of each industry. Nevertheless it's still a useful exercise for narrowly defined topics[360].

4.1.2.2. Fitting econometrics in the evidence law toolbox: options for the regulation of the probative value of econometric evidence

Recognizing the probative value of econometrics as a source of evidence in competition law is one thing. Assessing the credibility and relevance of the specific econometric analysis presented in a case is another. One could imagine that the second question should be left to the experts: the econometricians presenting this evidence in regulatory and other legal proceedings. Yet, the conception of experts as neutral and impartial communicators of a scientific truth, when they act in a legal context, appears out-dated and largely inaccurate. Assuming a realist epistemology (as it is assumed by the authors), one cannot ignore the possible biases that might affect the expert's pronouncements: these biases are related to the expert's personal, financial and intellectual interests[361].

Adopting a Weberian approach[362], Davies's work explores the inward and external vocations of antitrust economists. He notes that antitrust government economists are intensively engaged with academic groups in their discipline and seek publicity and transparency on their work, through academic publications, which is unusual for bureaucrats. There exist also important differences as to the normative presuppositions of each group: bureaucratic economists carry more (neo-classical theory) presuppositions and exclude more questions of worth than academic economists; the empirical mind-set seems also more entrenched with bureaucratic economists. What transpires from Davies' work is that the "overlap between the

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[360] M. Wenberg, The Price Effects of Horizontal Mergers, (2007) 4(2) *Journal of Competition Law & Economics* 433–447.

[361] D. Dwyer, *The Judicial Assessment of Expert Evidence* (Cambridge Univ. Press, 2008), 163.

[362] Max *Weber*, Science as a Vocation, Wissenschaft als Beruf, Gesammlte Aufsaetze zur Wissenschaftslehre (Tubingen,. 1922), pp. 524-55.

scientific and the bureaucratic political vocation" of antitrust bureaucratic economists "leads to an intensification of certain norms and rituals"[363] A similar argument can be made *a propos* of competition economists or econometricians working in the private consultancy sector[364]. Their loyalties are divided between their vocation as scientists, but also their implicit role as advocates of the litigants' perspective, as their analysis forms part of a legal argument.[365]. The market for expertise, and the possible reputation costs of an improper expert submission, cannot also be trusted to mitigate entirely the risks of expert bias, in presence of an important informational asymmetry, as it is expected to be even more the case with the sophisticated econometric evidence presented in competition law cases. The rare instances when forensic experts were appointed by the courts, does not also modify this conclusion. One could start from the hypothesis that every knowledge created to serve policy needs, in this occurrence the "regulatory science" of forensic econometrics, is sociologically distinct from other forms of knowledge and in particular its academic/ "ordinary science" counterpart. Regulatory science is actively developed in response to practical contingencies and produced by social groups engaged in particular activities. Knowledge is thus socially determined. Mannheim refers to these extra-theoretical factors that are not driven by the "inner dialectic" of the thought[366]. We assume that the conditions of the existence of an idea, its historical and social genesis, exercise an inevitable influence on its content and form. Every assertion can thus only be relationally formulated: an assertion by an econometrician in the context of a trial or regulatory decision-making should be assessed differently than her assertion in the context of a purely academic discussion.

Delegating the task of assessing the credibility of econometric evidence exclusively to the community of expert (forensic) econometricians is not thus a (good) option. Increasingly, the legal system has taken stock of the challenges presented by econometric and sophisticated economic evidence and has intervened to regulate the way this evidence is assessed and to explore its probative value, although the principle remains of course the free evaluation of evidence. In Europe, this task has been mainly exercised by the various competition authorities, who developed soft law guidelines discussing "best practices" for the submission and assessment of economic and econometric evidence in administrative[367], as well as in judicial proceedings[368].

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[363] W. Davies, Economic advice as a vocation: symbioses of scientific and political authority, (2011) 62(2) The British Journal of Sociology, pp. 304-323, p. 319.
[364] I. Lianos, The impact of forensic economics on the production and evaluation of economic knowledge, CLES Working paper 05/12 (forth. 2012).
[365] I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320 (challenging the view of forensic experts as neutral and objective bearers of the scientific truth and suggesting that they may considered as advocates).
[366] K. Mannheim, *Ideology and Utopia – Introduction to the Sociology of Knowledge* (Harcourt, Brace & Company, 1949),
[367] UK, Competition Commission, "Suggested best practice for submissions of technical economic analysis from parties to the Competition Commission" (February 2009); Bundeskartellamt (BKA), "Best practices for expert economic opinions" (October 2010);

We will refer to the Best practices recently published by the European Commission for illustration purposes, although a similar analysis may be conducted for all other soft law texts regulating the submission and assessment of economic evidence published by the various competition authorities across Europe. Because of the inherent limitations of the judicial review system in Europe and the quite recent evolution towards a more intensive judicial control of the Commission's decisions, EU courts have been largely absent from the analysis of econometric evidence, and in the few cases that such evidence was examined, the courts did not focus on the intrinsic and extrinsic validity of the evidence, but simply addressed the arguments of the parties and concluded that in view of the margin of discretion from which benefit the Commission in economic matters, if the econometric data submitted by the parties have been addressed in detail in the Commission's decision, the Commission cannot be found to exceed the margins of its discretion[369]. The Court also observed that the econometric analysis of the Commission confirmed and complemented the conclusions derived from the qualitative evidence, hence any claim that the interpretation of the regression results by the Commission is misleading should not affect as such its probative value, taking into account the "accessory" role attributed to this evidence by the Commission in its decision[370]. As Yves Botteman observed in an article published in 2006, after examining the case law of the Court reviewing merger decisions of the Commission,

> "[…] European Courts have not yet deeply delved into considerations that relate to how the econometric models are constructed and which parameters have (and should have) been taken into account. Rather, the Courts so far have reviewed the extent to which an economic study supports the argument that either the Commission or a party is trying to put in the administrative or judicial proceedings"[371].

The EU Courts have not been brought to adjudicate between conflicting econometric studies presented by the parties and the Commission that would *prima facie* be equally plausible. As the *Ryanair* case illustrates, they avoid performing a relative plausibility analysis, which would look to the internal and external validity of the econometric evidence, by finding subterfuge in the discretion the Commission benefits in economic and technical appraisals. The most recent case law of the European courts on the intensity of judicial review for decisions imposing fines seems unlikely to change this timid approach. This view contrasts with the more active involvement of US courts in the assessment of the internal and external validity of econometric evidence, some examples of which we will be examining at the final part of this section.

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[368] Draft Guidance Paper, Quantifying harm in actions for damages based on breaches of Article 101 or 102 of the TFEU (June 2011), available at http://ec.europa.eu/competition/consultations/2011_actions_damages/draft_guidance_paper_en.pdf

[369] Case T-342/07, *Ryanair Holdings plc v. European Commission* [2010] ECR II-3457, paras 164, 169, 176-182.

[370] Ibid., para. 169.

[371] Yves Botteman, Mergers, Standard of proof and Expert Economic Evidence, (2006) 2(1) Journal of Competition Law and Economics 71-100, at 86.

Before exploring in detail the content of these best practices, it is important to note that, contrary to the more procedure-oriented best practices for the conduct of proceedings in the context of Articles 101 and 102 TFEU that the Commission adopted during the same period of time, which were published at the Official Journal of the EU and are thus legally binding (for the Commission)[372], the best practices on the submission of economic evidence have not to this date been published to the Official Journal and have been explicitly referred to as a DG Competition discussion paper, not a Commission notice, hence they do not have any legal effect[373] and in no case can they create new rights or obligations or alter the rights and obligations arising from the Treaty, secondary legislation and the case law of the Courts[374]. The Commission also notes that the recommendations included in the document may not always apply, as the specificity of some individual cases may require an adaptation or deviation from them, and that they should be interpreted "in light of procedural and resource constraints"[375]. Their purpose is not normative but they aim instead to provide incentives to undertakings to submit economic and econometric evidence in the most effective way, so that this evidence has the greatest evidentiary impact. Yet, the document can provide very useful insights on the probative value of such evidence.

According to the Commission, the role of economic (and econometric) analysis is to provide a framework for explanation of how each particular market operates and how competitive interactions take place, as well as to be a tool of prediction of the "possible consequences of the practices" and of the "direction and magnitude" of these effects[376]. Explanation (in the form of diagnosis) and prediction constitute the two flips of the same coin, according to the positivist view of science (the deductive-nomological model of Hempel), which the Commission seems to adopt[377]. Yet, as it is noted in the *Best Practices*, economic analysis needs to be "framed" in a way that enables the decision-maker to use "in an effective way reliable and relevant evidence" within the statutory time limit in which a decision has to be adopted[378]. This implies that, taking into account this practical constraint, to determine "the relevance and significance of an economic analysis for a particular case", one should "assess its intrinsic quality from a technical perspective, i.e. whether it has been generated and presented in a way that meets adequate technical requirements *prevalent in the profession*"[379].

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[372] Commission notice on best practices for the conduct of proceedings concerning Articles 101 and 102 TFEU, [2011] OJ C 308/6.

[373] DG Competition, Staff Discussion Paper, Best practices for the submission of economic evidence and data collection in cases concerning the application of Articles 191 and 102 TFEU and in merger cases (2011) (hereinafter, *BP on economic evidence*), available at http://ec.europa.eu/competition/antitrust/legislation/best_practices_submission_en.pdf

[374] See, ibid, para. 7.

[375] Ibid., para. 8.

[376] Ibid., para. 1.

[377] C. Hempel, Aspects of Scientific Explanation and other Essays in the Philosophy of Science (Free Press, New York, 1965).

[378] *BP on economic evidence*, para. 2.

[379] Ibid., para. 3 (emphasis added).

The highlighted part of the quote did not appear in the first draft of the *Best Practices*, but was added in a later version. One could note that, contrary to the legal profession, which is organized in a closed manner, with accreditation procedures, self-regulated by bar councils/associations and subject to strict ethical standards and codes of conduct, econometricians and economists are not formally organized as a "profession": there is no accreditation procedure, no ethical standards or codes of conduct, no formal competition forensic economists associations equivalent to the bar councils and associations. Yet, the absence of a framework does not make econometricians less of a profession than lawyers. As it has been noted elsewhere [380], the conceptual framework developed by MS Larson might be helpful in understanding the process by which, forensic economists, as producers of special services, seek to constitute and control a market for their expertise[381]. Larson highlights how the constitution of professional markets, a process that began in the nineteenth century, was an attempt to translate special knowledge and skills to social and economic monopolistic rewards. She notes that the first phase of professionalization came through the constitution of professional associations and the subsequent closure of the domain through accreditation and professional examinations. Yet, this is a strategy that characterizes the rise of the traditional professions in the 19th century (law, medicine) but does not reflect the more sophisticated strategies adopted at the later stages of the development of the "professional project" by other professions. Larson refers to the importance of developing a "cognitive basis" as a mechanism to control the providers of professional services in order to standardize and thus identify the commodity they provide[382]. However, as she also remarks, "a cognitive basis of any kind had to be at least approximately defined before the rising modern professions could negotiate cognitive exclusiveness – that is, before they could convincingly establish a teaching monopoly on their specific tools and techniques, while claiming absolute superiority for them"[383]. The monopoly is thus constituted by the linkage of rewards with merit by means of formally universalistic criteria of recruitment and promotion and by the parallel construction of a "monopoly of credibility" with the larger public[384]. From this perspective, "cognitive standardization allows a measure of uniformity and homogeneity in the production of producers". Furthermore, "the more formalized the cognitive basis, the more the profession's language and knowledge appear to be connotation-free and objective"[385]. It is argued that the development of econometrics, following the so-called "mathematical-quantitative revolution in economics" has brought the theoretical core of the subject of economics much closer to the ideal of a "restricted" discipline"[386]. Probably, the Commission's reference to the profession, as a source of knowledge for good economic (or econometric) practice

[380] I. Lianos, The emergence of forensic economics: a sociological analysis, CLES WP 5/2012.

[381] MS Larson, *The Rise of Professionalism – A Sociological Analysis* (University of California Press, 1977).

[382] Ibid, p. 15.

[383] Ibid.

[384] Ibid, p. 17.

[385] Ibid. p. 41.

[386] A.W.B. Coats, *The Sociology and Professionalization of Economics* (Routledge, 1993), p. 27

contributes to this *professional* project of economics. It is ironic that the Commission cautions the development of a "restricted discipline" of economics (and econometrics) and the monopolistic rents that will certainly ensue, while at the same time targeting the "professional project" of more traditional professions, such as lawyers, with intense liberalisation efforts aiming to break their "restricted" nature and to open them to competition.

The *Best practices* provide a wealth of information on the criteria that would enable the submission of econometric evidence to have the greatest effect. These do not only relate to its internal or external validity, but also to the reporting, interpretation and presentation of its results. We will comment on some of the most important aspects with regard to the aim of our study.

First, assumptions matter:

"Any economic model which explicitly or implicitly supports a theoretical claim must rely on assumptions that are consistent with the facts of the industry under consideration. These assumptions should be carefully laid out and the sensitivity of its predictions to changes to the assumptions should be made explicit. While it is not necessary for economic submissions to actually formalize verbal arguments in a model, this will sometimes be helpful to clearly spell out the assumptions underlying an argument, to check its logic consistency, to assess effects of a high degree of complexity, or to use the model as the theoretical basis for an empirical estimation"[387].

Structural econometrics can thus be acceptable sources of evidence. As the Commission noted in its *Draft Guidance paper on quantifying harm in actions for damages based on breaches of Articles 101 and 102 TFEU*,

"(t)he different forms of regression analysis […] are sometimes referred to as 'reduced form' approaches, as they directly estimate parameters of an equation that are themselves derived from other economic relationships (e.g. the interaction of supply and demand), without modelling these explicitly. Alternatively, econometric models can be built to estimate these underlying economic relationships. Although such econometric models, which are usually referred to as 'structural', often rely on particularly strong assumptions, they may bring a deeper understanding of the market concerned and form an integral part of simulation exercises to estimate damages"[388].

The Commission accepts that models and economic arguments are based on simplifications of reality, yet it also explains that

"it is […] normally not sufficient to disprove a particular argument or model, to point out that it is 'based on seemingly unrealistic assumptions'. It is also necessary to explicitly identify which aspects of reality should be better

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[387] *BP on economic evidence*, para. 10.
[388] Draft Guidance Paper, Quantifying harm in actions for damages based on breaches of Article 101 or 102 of the TFEU (June 2011), op. cit., para. 79.

reflected in the model or argumentation, and to indicate why this would alter the conclusions"[389].

Milton Friedman's epistemology with its emphasis on the ability of an abstract model to make good predictions of reality as the ultimate standard of validity of deductive-nomological economic thinking[390], makes finally its triumphal entry into the Commission's evaluation of economic evidence's validity, ironically, at the same time that it begins to be expelled from the discipline of economics[391].

The Commission reminds us of good practices in formulating research questions that are relevant to the case at hand, by requiring that the null hypothesis but also other alternative hypotheses being explicitly formulated[392]. The "intrinsic quality" of empirical evidence, such as econometrics, depends on the reliance and reliability of the underlying data, while that of its theoretical counterparts, the economic theory which the empirical technique attempts to link to the data, depends on the extent to which "the underlying assumptions match the corresponding economic facts"[393]. Some degree of data mining is inevitable in structural econometrics, the Commission taking care to note the existence of statistical techniques developed to deal with measurement errors, missing observations and sample selection problems in order to deal with some of the data's "imperfections"[394]. The choice of the empirical methodology should also be "properly motivated" and should address potential identification problems. According to the Commission,

> "identification can be understood as clarifying the basis upon which one theory can be preferred to another. Similarly, the term can be used to refer to any situation where an econometric model will invariably have more than one set of parameters which generate the same distribution of observations"[395].

Having recourse to non-parametric estimation will not solve the problem. The identification problem for non-parametric estimation is exactly the same as in a parametric estimation. In any case, one needs either a good instrument or a good control group to make any inferences. The main advantage of non-parametric estimation is that one can impose fewer assumptions on the estimated equation. However, by imposing less structure, we are able to test fewer things. For example we can examine whether the market is competitive or not, but we cannot measure/quantify market power.

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[389] Ibid., para. 12

[390] M. Friedman, The Methodology of Positive Economics, in M. Friedman (ed.), *The Methodology of Positive Economics* (University of Chicago Press, 1953), pp. 3-43.

[391] See, for instance, the analysis of R.E. Backhouse, *The Puzzle of Modern Economics-Science or Ideology?* (Cambridge Univ. Press, 2010), pp. 178-186 ; J. Kay, The Map is not the Territory: An Essay on the State of Economics, INET, available at http://ineteconomics.org/blog/inet/john-kay-map-not-territory-essay-state-economics (October 4, 2011).

[392] It is noteworthy that the following paragraph was omitted from the final version of the *Best practices*: "one should explicitly discuss the link between the hypothesis being tested and any economic theory regarding the competitive effects under assessment to which it relates".

[393] *BP on economic evidence*, para. 20.

[394] Ibid., para, 23.

[395] Ibid., para. 25

With regard to the interpretation of the data, the Commission's document includes important information on statistical significance. The significance level measures the probability that the null hypothesis (that is, a particular dependent variable does not have a correlation with an independent variable) will be rejected incorrectly, assuming that the null hypothesis is true. The lower is the level of statistical significance the more difficult it is to reject the null hypothesis. In the draft version of the *Best Practices* the Commission had strict requirements on statistical significance, requiring the standard significance level of 5% or inversely 95% confidence level (the null hypothesis is rejected (in favour of an alternative hypothesis) when the p-value is below or equal to 5%), accepting a statistical significance level of 10% only in specific circumstances. The final version of the *Best Practices* quotes both 5 and 10%, thus adopting a more liberal approach, with regard to the rejection of the null hypothesis. Yet, the Commission also adds that "just because some hypothesis cannot be rejected in a statistical sense does not necessarily mean that the empirical analysis has no evidentiary value"[396]. Indeed, "depending on the question of interest, an approximate economic or econometric result can be informative if, for example, it is the direction of effects rather than its magnitude that are most relevant"[397]. Not being statistically significant does not mean that a finding cannot be economically significant. When only limited data are available, it may not be possible to show that some effects are statistically significant, although they may be highly significant from the economic point of view. Robustness checks should also be performed prior to the presentation of the results in order to ensure that the regression results are sensitive to slight modifications in the data, the choice of empirical methods and the precise modelling assumptions. Robustness checks the external validity of the analysis and if the results can be generalised outside the sample. According to the Commission, "the econometric analysis needs to be generally consistent and reasonably predict observed past outcomes and behaviour"[398].

The *Best Practices* also include information on the reporting of econometric evidence, requiring the disclosure of assumptions and the sensitivity of the predictions of the analysis to changes, its limitations with regards to accuracy or explanatory power of the underlying data, the timely provision of data to the Commission in order to enable the replication of the analysis performed, the discussion of alternative methodologies and, if possible, the completion of multiple empirical analyses relying on different methodologies in order to check the robustness of the tests or models

With regard to the probative value of such evidence, the Commission follows the case law of the General Court in *Ryanair* noting that "economic models or econometric analysis, as it is the case with other types of evidence will rarely, if ever, prove conclusive by themselves" and that it "can always take into account different

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[396] Ibid, para. 36.
[397] Ibid., para. 37.
[398] Ibid., para. 40.

items of evidence", prioritize some and discount others[399]. It is clear that this is not a matter of probabilities, as a probability perspective on evidence would have advanced. On the contrary, the Commission takes a holistic view of the different items of evidence, which are examined according to the narrative/story evidential model that emphasizes congruence and consistency. According to the Commission, "one must assess the congruence and consistency of the economic analysis with other pieces of quantitative and qualitative evidence (such as customer responses, or documentary evidence)"[400]. The best way to rebut econometric evidence remains to show its inconsistency with regard to the rest of the arguments of the case[401]. Yet, econometric evidence is useful even if it provides only partial verification of an accompanying economic model or theory of competitive effects, although it should be properly qualified[402]. In multiple instances the Commission refers to the *"weight"* of different items of econometric evidence, thus indicating that this may vary, depending on its internal and external validity:

> "Failure to observe and validate all key assumptions or deficiencies in the data should not prevent an economic analysis to be given weight, though caution must be exercised before relying on its conclusions"[403].

and

> "Reports which do not allow for replication and in particular econometric analysis not including the code and data in electronic form will receive less consideration and are consequently unlikely to be given much weight"[404].

Yet, the consensus of the "profession" over "generally accepted methods[405]" might also enable some discrimination among the different sorts of evidence produced:

> "congruent and convergent results based on methods supported by academic and practitioners' (sic) are likely to be given greater significance than widely divergent results"[406].

The timid approach of the EU Courts and the choice of EU competition law for a soft law (non-binding) approach with regard to the selection and application of criteria for evaluating the probative force of individual items of econometric evidence or the weight of a 'mass' of evidence in a given case offers a wider margin of discretion to the Commission than the more actively interventionist approach followed by the US courts, which subject econometric analyses to a strict scrutiny of their internal and external validity. This is not only limited to the admissibility step in application of the *Daubert* criteria of the US Supreme Court[407], but also extends

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[399] Ibid., footnote 2.
[400] Ibid., para. 4.
[401] Ibid., para. 9.
[402] Ibid., para. 19
[403] Ibid., para. 23.
[404] Ibid., para. 33.
[405] Ibid., para. 29.
[406] Ibid., para. 42.
[407] *Daubert v. Merrell Dow Pharms, Inc.*, 509 U.S. 579 (1993). For an extensive and critical analysis, see I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

beyond the admissibility step, when the courts assess the weight of econometric evidence, as the *Daubert* factors "may weaken technical evidence even after submission"[408]. Hence, the courts look to the qualifications of the experts, the reliability of the method used (has it been or can it be tested?; has it been subject to peer review?; has the specific method a known or measurable error rate?; has the scientific community accepted that method?; has the method failed to include variables?) and its relevance to assist the trier of facts[409]. With regard to the relevance, the US courts delve into the internal and external validity of the evidence presented by looking to the statistical power of the conclusions reached, and suggested that failure to include all measurable variables or outliers may affect the probative value of the econometric evidence, although it may not lead to its exclusion from consideration[410]. The same applies for failure in the selection of underlying data[411].

Of course, in practice the intensity of the review by the courts of first instance or the appellate review, which for evidentiary rulings in the US is only for abuse of discretion, depends on the familiarity of the judge with quantitative research methodologies and hence, by definition, varies. As an illustration of a hands-on judicial scrutiny of econometric analysis, we can cite Judge Richard Posner's opinion in *Ata Airlines, Inc v. Federal Express Corporation*, a breach of agreement case which involved the award of damages to one of the parties. The award was based on a regression analysis presented by an accountant. The district court had accepted the admissibility of such econometric evidence, despite the objections of the defendant (in this case Fedex) relying on the fact that "simple regression analysis is an accepted method", although it was clear that the district judge was not able to assess how this simple regression methodology was applied in this case. Judge Posner noted that

> "(t)his cursory, and none too clear, response to FedEx's objections to (the expert's) regression analysis did not discharge the duty of a district judge to evaluate in advance of trial a challenge to the admissibility of an expert's proposed testimony. The evaluation of such a challenge may not be easy; the principles and methods used by expert witnesses will often be difficult for a judge to understand. But difficult is not impossible. The judge can require the lawyer who wants to offer the expert's testimony to explain to the judge in lain English what the basis and logic of the proposed testimony are, and the judge can likewise require the opposing counsel to explain his objections in plain English.

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[408] ABA, Section of Antitrust Law, *Econometrics – Legal, Practical and Technical Issues* (ABA, 2005), p.60.

[409] Ibid., pp. 32-52.

[410] *Conwood v. United States Tobacco Co.,* 290 F3d 768, 794 (6th Cir. 2002), cert. denied, 537 U.S. 1148 (2003); Blomkest Fertilizer, Inc v. potash Corp. of Saskatchewan, 203 F.3d 1028, 1037-1038 (8th Cir. 2000)

[411] ABA, Section of Antitrust Law, *Econometrics – Legal, Practical and Technical Issues* (ABA, 2005), pp. 46-48.

> This might not have worked in the present case; neither party's lawyers,[…] understand regression analysis; or if they do understand it they are unable to communicate their understanding in plain English (sic)."[412].

Judge Posner then proceeded to an introductory class of regression analysis for the benefit of the district court judge and the parties' lawyers, before addressing the regression analysis presented by one of the parties' expert. The latter presented many flaws: the dependent and independent variables were not appropriately selected and hence the regression was not built on "a rational foundation" and the model was improperly implemented, among other deficiencies. Judge Posner concluded that the "regression had as many bloody wounds as Julius Caesar when he was stabbed 23 times by the Roman Senators led by Brutus…" and reaffirmed the "responsibility" of district judges to "screen expert testimony, however technical", in particular in a jury trial, "since jurors on average have an even lower comfort level with technical evidence than judges"[413].

The development of an equivalent capacity of EU Courts to proceed to an intensive judicial scrutiny of the econometric evidence presented and examine its internal and external validity will be one of the major challenges for the implementation of the "effects-based" approach in EU competition law. We have expressed elsewhere our preference for the establishment of specialized tribunals that would have the required technical competence and we have emphasized the possibility for courts to appoint neutral experts or assessors, as it is provided for in various civil procedure systems in Europe[414].

However, greater judicial scrutiny of the validity of the econometric evidence is a different question than the rules of weight or evaluation (cf marking rules) that may apply to econometric evidence. It is clear from the analysis of the case law of the EU courts and that of the best practices adopted by the European Commission and other competition authorities in Europe that the regulation of the weight of specific items of evidence is minimal (the standard of proof referring to the *body of evidence* rather than to each specific item of evidence[415]) and that decision-makers benefit from a margin of discretion, which is compatible with the principle of the free evaluation of evidence. Yet, an empirical analysis of the Commission's decisions may indicate some regularity on the probative value provided to certain types of econometric evidence. Of course, our analysis should be put in the complex factual context of each case, taking into account the existence of various items of evidence of different types, some econometric, some documentary, a consumer survey etc. As we explained previously, assessing evidence is a holistic process, but empirical analysis of different types of econometric evidence might prove useful in a more practical context, but also

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[412] *Ata Airlines, Inc v. Federal Express Corporation,* 665 F.3d 882, 889 (2011).

[413] Ibid., p. 896.

[414] I. Lianos, "Judging Economists": Economic expertise in competition litigation: a European view, in Ioannis Lianos & Ioannis Kokkoris (ed.), Towards an Optimal Competition law System , Kluwer International, The Hague , 2009, pp. 185-320.

[415] See, Case T-110/07, *Siemens AG v. Commission*, op. cit., para. 47.

in order to illustrate the overall credibility and probative force of econometric evidence.

5.   Codifying and Analyzing Econometric Techniques in EU antitrust decisions

Based on the previous categorization of quantitative techniques, we collected and codified information on all the publically available decisions on merger, antitrust and cartel cases of the European Commission from 2004 until 2011. Our aim is to analyze both their frequency of use over time, but also to try to quantify the opinion of the European Commission for the particular techniques used.

5.1.   Data Description

All publicly available versions of European Commission decisions on merger, antitrust and cartel cases, concluded by the Commission from 01/01/2004 to 11/10/2011 (based on the last decision date for each case), for which an English version of the decision was available, was collected. The main source of these documents was the online database of the European Commission's Directorate-General for Competition[416].

        The analysis of the Merger cases was confined to cases judged under Council Regulation 139/2004 (cases under Council Regulation 4064/89 were ignored). For this analysis, we collected information on a total of 2405 cases (merger cases with last decision dated from 01/01/2004 to 11/10/2011 and published on the Commission's online database until 11/10/2011), 2221 of which were Phase I cases, 47 were Phase II cases and 58 were withdrawn or aborted cases (the remaining 79 cases fell in none of these categories. Those were cases for which Phase II proceedings were initiated, but no Phase II decision has yet been concluded, cases referred to national competition authorities under Article 4(4) etc.). The analysis was confined to 822 cases (out of a total of 2405 cases), for which an English version of the decision was available on the Commission's online database, and the decision included some useful information on the Commission's rationale (for 146 cases no English version of the decision was available and for 1437 cases the decision was either a typical statement of exemption or no decision was published on the database). In 55 of those cases some form of quantitative techniques was employed. Table 1 provides a summary of this information.

[Table 1]

        For the analysis of the antitrust and cartel cases we collected information on a total of 120 cases (antitrust and cartel cases with last decision dated from 01/01/2004 to 11/10/2011 and published on the Commission's online database until 11/10/2011). The analysis was confined to 83 of those cases, for which an English version of the Commission's decision was available on the Commission's online database (for 16

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[416] Web address: http://ec.europa.eu/competition/elojade/isef/index.cfm

cases no English version of the decision was available, and for 21 cases no decision was included in the database). In 9 of those cases some form of quantitative techniques was employed (plus one more case in which the use of a quantitative technique is mentioned in the text, but no details are provided).[417] Table 2 provides a summary of this information.

[Table 2]

5.2. Methodology

For each case we first searched the decision texts using keywords related to the previously analysed quantitative techniques (such as "regression", "demand analysis", "correlation" etc.). The complete list of keywords used can be found in the Appendix . We then read in detail the passage where such keywords were used to establish whether a quantitative technique was employed.

It should be noted that very often the Commission's decisions only present general descriptions of the techniques used and all the technical details are being omitted, when these were deemed to contain sensitive and confidential information. We spend a considerable amount to time trying to categorize the techniques used correctly based on the available information.

Finally, each time a reference to a quantitative technique was identified, we assigned an "opinion" score, that represents how heavily the technique weighted in the Commission's decision. The scale of the "opinion" score varies from one (implying that the Commission discarded entirely the argumentation posed by the technique) to five (implying the Commission found the quantitative technique very convincing and used it as a basis to reach a conclusion), as shown on Table 5.

[Table 5]

5.3. Analysis of Econometric Techniques

Classifying all the quantitative techniques into three broad categories (statistical tests, demand analysis and other techniques), we believe that is interesting to see their evolution over time. Figure 1 presents the percentage use of the different quantitative categories over time. Statistical test were very pervasive in 2004 (used in 83% of all the cases utilizing some kind of quantitative technique), but their "dominance" has diminished over time and they have been overtaken by demand analysis. Other techniques usage has fluctuated over time, but in general they are the ones least used overall.

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[417] Please note that there may be cases with a final decision date before 11/10/2011, that were published on the commission's online database after 11/10/2011 (e.g. because of delays caused by reviews of the decisions by the parties involved to protect confidential information). Such cases were not included in the analysis.

[Figure 1]

Figure 2 depicts in percentage terms the purpose for which these quantitative techniques are utilized. As we can see from the graph the most common purposes of use are market definition (52%) and pricing behavior (22%), followed by market structure (17%), non-pricing behavior (8%) and assessment of efficiencies (1%). Given that market definition is one of the first questions usually answered in any merger or antitrust case and that most cases are usually centered around issues on how firms used their pricing decisions as a strategic variable our findings are not that surprising.

[Figure 2]

More interesting is to see the cross-tabulation of the different techniques used for each purpose as presented in Table 3. Statistical tests are primarily used for market definition and market structure purposes, whereas demand analysis is the preferred method when analyzing pricing behaviour. Other techniques are mainly used when analyzing efficiencies or non-price behaviour.

[Table 3]

Figure 3 presents the percentage use of the various quantitative techniques. Price correlation (28%) is the most commonly used technique, followed closely by price determinant regressions (21%) and the SSNIP test (15%). Industry specific model simulation (12%) and demand estimation for differentiated products (9%) are the next most popular. Is should be noted here however, that in most cases where data is available and some quantitative techniques are used, firms often employ multiple techniques to prove an argument. So the use of the different techniques should be seen more as complements (a firm would use both an easy to calculate price correlation and a more complicated demand estimation to demonstrate a close relationship between two products for example), rather than as substitutes.

[Figure 3]

Finally, we turn to the opinions expressed by the EC for each technique as indicated in the decisions' text and codified by us on a scale from 1 (the worst) to 5 (the best). Looking at the broad categories, statistical tests have an average 3.1 opinion score, whereas demand analysis has a 3.4 and other techniques 3.6 average score. However, none of the mean scores are statistically different from each other based on a formal test of means.

We explore this relationship further, through the following econometric framework:

$$opinion_i = \alpha_0 + Demand\ Analysis + Other\ Technique +$$

$$\alpha_y + \alpha_p + \alpha_c + \alpha_t + u_i$$

where $opinion_i$ is the score that we assigned based on the EE decision text commenting on the statistical technique used i, *Demand Analysis* is a binary indicator that equals one if the technique i belongs to this category, similarly *Other Technique* is a binary indicator that equals one if the technique i belongs to this category, $\alpha_y, \alpha_p, \alpha_c, \alpha_t$ are binary indicators for year, purpose of the techniques used, case for which it was used (merger, antitrust or cartel) and particular type of technique used respectively, and u_i is the econometric error term. The coefficient on *Demand Analysis* and *Other Technique* indicate whether the opinion expressed by the EC in a decision would be higher or lower compare to the opinion expressed for the omitted category, which is the *Statistical Tests* in this case.

Table 4 presents the results. Column 1 simply regresses the two dummies for the two broad categories (*Demand Analysis* and *Other Technique*) on the opinion's score, without any further controls. Results indicate that using either a *Demand Analysis* or *Other Technique* would both increase the opinion expressed by the EC compare to using only a *Statistical Test* technique. However, only the coefficient on *Other Technique* is significant at the 10%, indicating a weak conditional correlation. In column 2 we add controls for the different years in order to capture any common factors that might have changed over time (such as the advent of new quantitative techniques or changes in the EC's opinion) and that could affect the opinions' expressed. Both coefficients remain positive, but none of them is statistically significant now. In column 3 we add further controls for the purpose of the technique used, whereas in column 4 we also control for the case in which the techniques were used, i.e. whether it was a merger, antitrust or cartel case. Results seem largely unchanged with the coefficients fluctuating, but not being significantly different from zero. In column 5 we present our most complete specification where we additionally control for the particular technique used. As you can see from the last row of the table the model's fit is quite good (50%). Both coefficients are positive, but the only one significant now is the coefficient on the *Demand Analysis*, indicating that, everything else held constant, the use of demand analysis techniques compare to statistical tests would increase the EC's opinion by 1.2 points, or some 38% on average.

[Table 4]

6. Conclusion

Looking at the evidence overall, such as the evolution of the use of these techniques over time, as well as the econometric analysis just described, one would be tempted to say that quantitative techniques used for antitrust analysis are shifting away from simple statistical tests and towards more sophisticated, more detailed analytical frameworks. Both economic theory and econometric techniques have progressed at a fast pace over the last two decades and graduate economic students (typically employed to perform quantitative analyses as the ones described above)

have now both a wider toolbox available and better computers on which they can perform more sophisticated analysis.

However, one has to be careful at drawing definitive conclusions so early. As we discussed above, these techniques are more complements than substitutes. We think the common view is that by presenting an argument using different techniques (both descriptive and more complicated) the EC would be more convinced about the underlying robustness of the phenomenon. Moreover, the econometric evidence presented above treats the quantitative technique chosen as exogenous to the opinion expressed. However, one can think of many reasons why statistical tests might score low compare to the other techniques, but the underlying reason is not the "weakness" of the technique itself, but some other underlying factor, such as lack of data or lack of knowledge on how to use the available data more effectively. This is the first attempt to describe and codify the evolution and impact that quantitative techniques have on competition cases in general and certainly there are a lot of aspects still open for research. We like to believe though that this is a very interesting topic for future research, as quantitative techniques have become an integral part of almost any competition case nowadays.

Appendix

The complete list of keywords used in all cases is as follows: econometric, regression, quantitative, technique, empiric, simulat, Bertrand, Cournot, logit, SSNIP, correlation, stationarity, cross-section, hedonic, co-integration, causality, residual, diversion, statistic, AIDS, elasticity, non-transitory, co-movement, scedastic, envelopment, robust, bidding, algorithm, dynamic price, price analys, price stud, price survey, price test, price concentration, demand analys, demand stud, demand survey, demand test, demand model, demand estimate, demand system, economic stud, economic analys, economic model, bidding stud, bidding analys, import penetration, critical loss, time series, panel data, speed of adjustment, discrete choice, stock market.

TABLE 1 - DESCRIPTIVE TABLE OF MERGER DECISIONS

Year	2004	2005	2006	2007	2008	2009	2010	2011	Total
Number of cases (decisions)									
PHASE I									
Art. 6(1)(a)	0	0	0	0	0	0	0	0	**0**
Art. 6(1)(b)	220	276	323	368	307	225	253	231	**2203**
Art. 6(1)(b) with conditions and obligations	12	15	13	18	19	13	14	4	**108**
Total Phase I Decisions	232	291	336	386	326	238	267	235	**2311**
PHASE II									
Art. 8(1) (Allowed mergeres)	2	2	4	5	9	0	1	2	**25**
Art. 8(2) with conditions and obligations (Allowed mergers)	4	3	6	4	5	3	2	0	**27**
Art. 8(3) (Blocked mergers)	1	0	0	1	0	0	0	1	**3**
Art. 8(4) (Blocked mergers)	0	0	0	0	0	0	0	0	**0**
Total Phase II Decisions	**7**	**5**	10	10	14	3	3	3	55
Total Phase II ALLOWED mergers [Sum of Art. 8(1) and Art. 8(2)]	6	5	10	9	14	3	3	2	52
Total Phase II BLOCKED mergers [Sum of Art. 8(3) and Art. 8(4)]	1	0	0	1	0	0	0	1	3
WITHDRAWN									
Withdrawn (Phase I)	3	6	7	5	10	6	4	7	**48**
Aborted / withdrawn (Phase II)	2	3	2	2	3	2	0	1	**15**
Total Withdrawn and Aborted	5	9	9	7	13	8	4	8	**63**

Source: Authors' calculations based on all publicly available versions of European Commission decisions on merger cases, concluded by the Commission from 01/01/2004 to 11/10/2011.

TABLE 2 - DESCRIPTIVE TABLE OF ANTITRUST AND CARTEL DECISIONS

Year	2004	2005	2006	2007	2008	2009	2010	2011	Total
CARTEL CASES									
Total number of cases concluded by the Commission	7	6	7	8	7	6	6	1	**48**
Cases for which decisions in English are available	6	6	5	7	6	4	1	1	**36**
Cases in which quantitative techniques were employed	1	0	0	0	1	0	1	0	**3**
OTHER ANTITRUST CASES									
Total number of cases concluded by the Commission	15	8	7	14	7	8	9	4	**72**
Cases for which decisions in English are available	9	7	5	5	6	7	7	1	**47**
Cases in which quantitative techniques were employed	1	1	0	3	0	1	1	0	**7**
ALL CASES (Cartel and other Antitrust aggregates)									
Total number of cases concluded by the Commission	22	14	14	22	14	14	15	5	**120**
Cases for which decisions in English are available	15	13	10	12	12	11	8	2	**83**
Cases in which quantitative techniques were employed	2	1	0	3	1	1	2	0	**10**

Source: Authors' calculations based on all publicly available versions of European Commission decisions on antitrust and cartel cases, concluded by the Commission from 01/01/2004 to 11/10/2011.

TABLE 3 - CROSS-TABULATION OF QUANTITATIVE TECHNIQUE AND PURPOSE OF USE

	statistical tests	demand analysis	other techniques
efficiencies' assessment	0	0	1
market definition	32	23	0
market structure	16	0	2
non-price behaviour	1	0	7
pricing behaviour	8	12	3

Source: Authors' calculations based on all publicly available versions of European Commission decisions on merger, antitrust and cartel cases, concluded by the Commission from 01/01/2004 to 11/10/2011. For each case we first searched the decision texts using keywords related to the previously analysed quantitative techniques. We then read in detail the passage where such keywords were used to establish whether a quantitative technique was employed and for what purpose.

TABLE 4 - ECONOMETRIC ANALYSIS OF EU CC OPINION ON DIFFERENT QUANTITATIVE TECHNIQUES

	(1)	(2)	(3)	(4)	(5)
Estimation method	OLS	OLS	OLS	OLS	OLS
Dependent variable	opinion score	opinion score	opinion score	opinion score	opinion score
Demand Analysis	0.249	0.166	0.303	-0.168	1.232*
	(0.243)	(0.265)	(0.240)	(0.251)	(0.710)
Other Techniques	0.493*	0.442	0.906*	0.487	0.578
	(0.293)	(0.294)	(0.487)	(0.552)	(0.739)
Year Dummies	no	yes	yes	yes	yes
Purpose Dummies	no	no	yes	yes	yes
Case Dummies	no	no	no	yes	yes
Technique Dummies	no	no	no	no	yes
Observations	105	105	105	105	105
R-squared	0.022	0.165	0.300	0.410	0.502

Source: Authors' calculations based on all publicly available versions of European Commission decisions on merger, antitrust and cartel cases, concluded by the Commission from 01/01/2004 to 11/10/2011.
Notes: Robust standard errors are reported in parenthesis below coefficients: *significant at 10%; **significant at 5%; ***significant at 1%.

TABLE 5 - OPINION SCORE SCALE

Opinion Score	Interpretation
1	The technique was discarded
2	Strong objections were raised on aspects of the technique and the technique had no significant impact on conclusions
3	The technique was taken into consideration as evidence, albeit with reservations
4	The technique was taken seriously into consideration as evidence, however it was not solely relied upon to reach a conclusion
5	The technique was very convincing and constituted a solid basis for a conclusion

Source: Authors' definitions.

Figure 1: Evolution of Use of Quantitative Techniques (2004-2011)
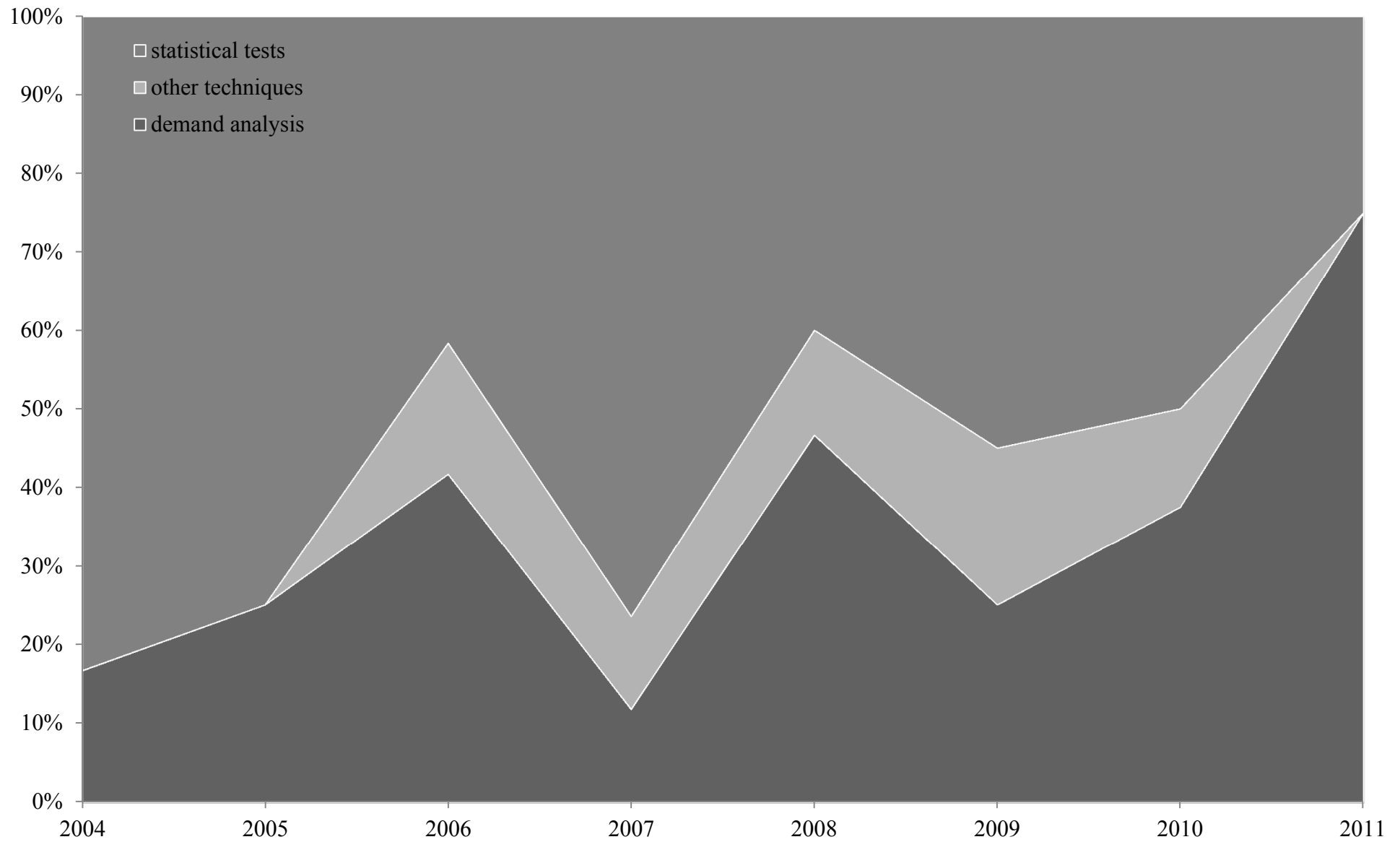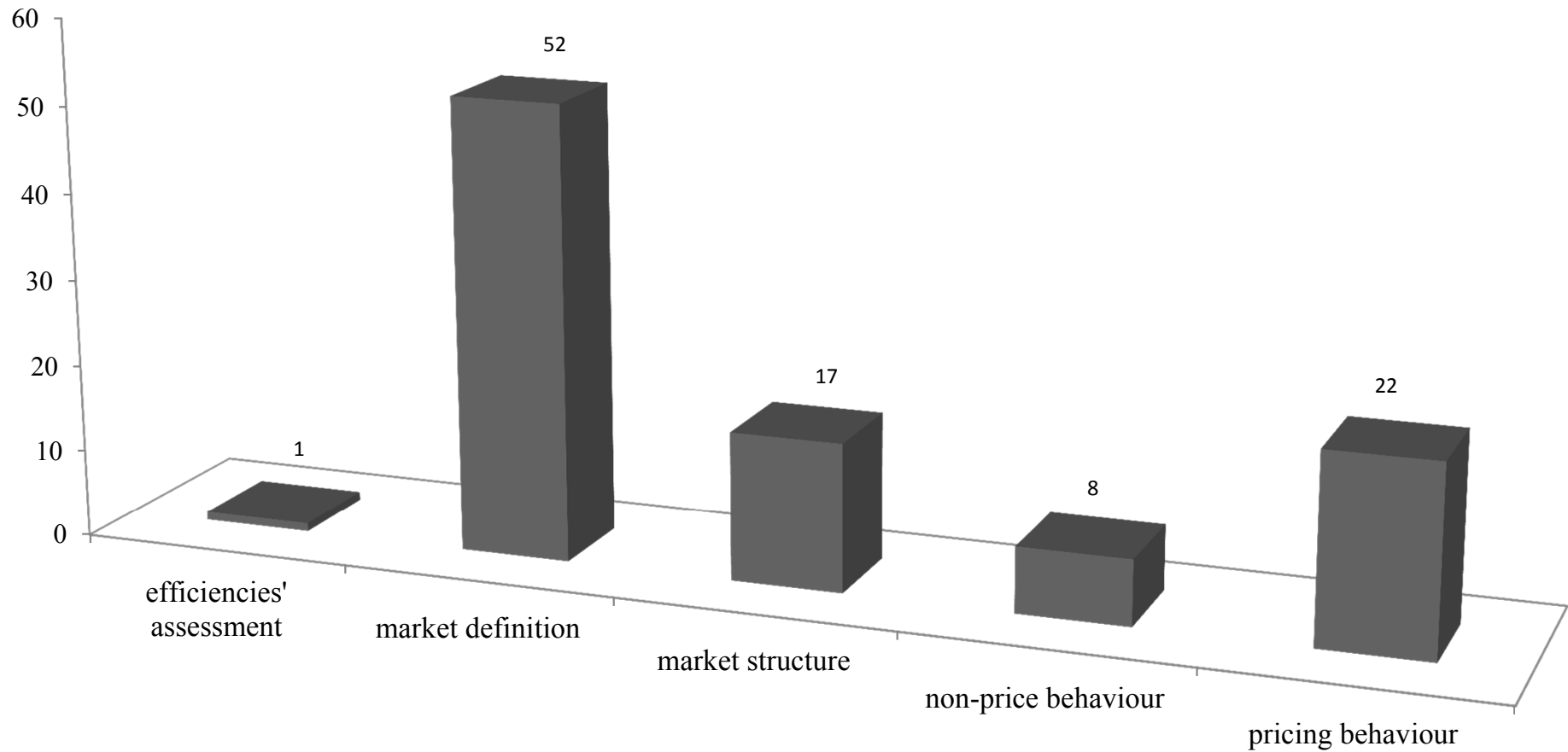
Figure 2: Percentage Purpose of Use of Quantitative Techniques

Figure 3: Percentage Use of Quantitative Techniques (by type)