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## Statistical Analysis of European Merger Control

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To date, more than 2,877 mergers were notified to the European Commission, 204 were cleared with conditions, 147 led to a detailed review and 45 were prohibited or abandoned after that phase. Those figures – particularly the first three – are significant enough to be used in statistical analyses. Several recent economic studies have used these data. To illustrate the main methods used and the results obtained, five studies will be discussed here (see Table 1).

Before examining the econometric analysis, a description of the data sets on mergers already reveals valuable information. For example, the study by Lindsay et al. (2003) indicates that the average notified merger concerns around 1.5 product markets and almost 3 geographical markets, that it creates an entity whose market share is less than 25%, and that it rarely generates an acute concentration problem (see Table 2). Similarly, Plagnet's data set (2005) shows that the average percentage of remedies per market rises from 17% to 75% when the new entity's market share increases from below 30% to above 75% (see Table 3).

## Share price trends and the European Commission

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Some of the research papers reviewed here use the event study method. Event studies compare the Commission's assessment of the effects of a merger with that of the financial markets. The main aim of applying this method to mergers is normative: does the Commission commit systematic errors?

The method works as follows. When a merger is announced, financial operators integrate the event into their valuations of the companies concerned. The stock price of the bidder, the target and competitors vary more than normal. These abnormal variations are measured over a period of a few days by the Average Cumulative Abnormal Return (ACAR). Duso et al. (2003) observed these variations for five days before and five days after the initial merger announcement (see Table 3). If the merger is favorable to the company in question, the ACAR is positive. Conversely, if the merger has a negative impact on the share price, the ACAR is negative.

Where there are no anticompetitive effects, the economist expects the combined value of the bidder and the target to increase, and the value of competitors to decrease because the merger is assumed to make the new entity stronger at the expense of its rivals. The study by Duso et al. (2003) confirms this assumption since the ACAR is positive for the merging companies and negative for competitors.

Table 1: Characteristics of the data sets

Source	No. of merger cases reviewed	Period under review	Bans	Phase I	Phase II
Bergman et al. (2005)	96	1990-2002	16	49	47
Duso et al. (2003)	164	1990-2002	14	91	73
Lindsay et al. (2003)	245	2000-2002	1	236	9
Aktas et al. (2004)	290	1990-2000	NA	260	30
Plagnet (2005)	195	1990-2004	0	156	59

But what happens when there are anticompetitive effects? As previously, the combined value of the new entity must increase. But the economist also expects the value of competitors to rise rather than fall. This is easy to understand in the case of a collective dominant position, since collusion benefits everyone. The explanation is less intuitive in other cases. Economic theory has nevertheless established a link between the loss of consumer surplus due to the merger and the increase in competitor profit in many configurations, particularly a Cournot oligopoly (homogeneous products) and a Bertrand oligopoly (differentiated products).

Following this reasoning, the economist can compare the procompetitive or anticompetitive impact of a merger as assessed by the market and by the competition authority. The market signals that a merger is anticompetitive when the competitors' abnormal returns are positive. The competition authority indicates that a merger is anticompetitive when it bans a merger or clears it with conditions. The economist, who puts more faith in the market than in state intervention, thus has a way of showing up when the competition authority takes the wrong decision. If the competition authority bans a merger when the market's valuation of the competitors decreases on the announcement of the merger, it commits a so-called Type I error. Conversely, if the competition authority clears a merger without remedies when the market's valuation of the competitors increases, it commits a Type II error.

Let us take a look at the results. Duso et al. (2003) show that 28% of the European Commission's merger bans are procompetitive mergers according to the market and that 23% of clearances without remedies are anticompetitive mergers. The percentages of Type I and Type II errors are therefore similar and the probability of the Commission being mistaken in either direction is around 25%. The authors also show that the decision the Commission takes in Phase I is determinant for Type II errors.

Using a predictive model, Duso et al. show that the probability of allowing an anticompetitive merger to go through is, all other things being equal, 72% higher in Phase I<sup>3</sup>. It comes as no surprise that the Commission makes mistakes more often when it lacks the time to examine the facts thoroughly.

However, that error rate shows that the cost of having a fast-track procedure in European merger control is not negligible.

Table 2: Descriptive statistics of the data set used by Lindsay et al. (2003)

Explanatory variable	Average	Standard deviation
No. of product markets	1.44	3.27
No. of geographical markets	2.79	16.15
Market share (%) of the merged company	23.90	17.06
Difference in market share (%) between companies	2.3	5.41
% of cases with an HHI > 1,800 and D HHI > 50	0.06	0.30
% of cases with a US bidder	0.20	0.40
% of cases with a Nordic bidder	0.16	0.37

This data set, which contains 245 cases, is a representative sample of decisions taken by the Commission in first few years of this century. The average notified transaction thus concerns around 1.5 product markets and close to 3 geographical markets, creates an entity with market share of less than 25%, achieves only a small market share gain as a result of the merger (2.3%), rarely raises an acute concentration problem (only 6% of mergers have an HHI above 1,800 and a change in HHI above 50), and involves a US or Nordic bidder in no more than 20% of cases. This data set consists almost entirely of cases that do not cause competition problems (91% of the cases were cleared in Phase I without remedies). The average table of notified mergers based on this data set therefore represents, with few exceptions, the average table of cleared mergers.

Table 3: Percentage of markets with remedies by aggregate market share and difference in market share between the two merging companies (Source: Plagnet, 2005)

Market share	<30%	30%-50%	50%-75%	>75%
Difference in market share				
<5%	16%	32%	55%	74%
5% - 15%	18%	33%	90%	95%
>15%	17%	74%	79%	89%
Total	17%	37%	71%	85%

The data set contains 1,268 markets for 195 cases, which is an average of 6 markets affected per merger. For 45% of these markets, the parties proposed a remedy. The table shows that this rate is lower when the market share of the new entity and the difference in market share between the two companies are small.

Let us not lose sight of the fact, however, that a statistical result is based on various theoretical assumptions and is only valid for a particular set of data and measures. Let us take another look at the link between loss of consumer surplus and competitor gain. It is not always true. In the case, for example, of a vertical or conglomerate merger that leads to foreclosure, the transaction generates a loss for both consumers and competitors<sup>4</sup>. Furthermore, the result depends on the method of measurement used – in particular for evaluating normal return – and the data set – particularly the size of mergers. For example, the percentage of Type I errors decreases by half if non horizontal mergers are excluded from Duso et al.’s data set (2003), namely the *Tetra Laval/Sidel and GE/Honeywell* mergers. That leaves only two bans associated with a negative ACAR for competitors versus four previously. Since the number of bans is very small (see Table 1), the percentages, like any average, should be interpreted with caution.

## Influence of structure indicators

Does the Commission take a structural approach to competition? Before showing how statistical analysis can answer that question, let us recall a few basic econometric principles. The general idea is to evaluate effects “all other things being equal”. To that end, a causal link must be established between a variable that we seek to explain and variables whose impact we attempt to evaluate. In the studies reviewed here, the variable to explain is the merger decision, and the explanatory variables include structural indicators (e.g., market share, HHI).

**Table 4: Effects of the initial merger announcement on the aggregate share price of the merging companies and their competitors (Source: Duso et al., 2003)**

Day in relation to the merger announcement date	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Merging companies ACAR % (probability)	-0.04 (0.54)	0.04 (0.83)	0.00 (0.95)	0.01 (0.25)	0.058 (0.00)	1.09 (0.00)	1.05 (0.00)	1.10 (0.00)	1.08 (0.00)	0.91 (0.00)	0.88 (0.00)
Competitors ACAR % (probability)	0.00 (0.79)	-0.01 (0.69)	-0.15 (0.08)	-0.18 (0.07)	-0.09 (0.23)	-0.10 (0.23)	-0.12 (0.17)	-0.15 (0.15)	-0.29 (0.02)	-0.35 (0.01)	-0.31 (0.07)

The changes in share price were observed over an 11-day period that began 5 days before the announcement and ended 5 days after it. Using such a long period makes it possible to take into account any leaks of information. The changes are measured by the ACAR. The ACAR is an indicator based on changes in the share price observed at other periods and in other sectors. The table shows that the merger announcement has a positive trend effect on the aggregate share price of the merging companies. It becomes statistically significant (probability below 10%) on the day before the merger announcement. Conversely, a loss of value for competitors is observed.

Let us take, for example, the Y variable, which is the number of remedies included in the decision, and let us test a series of X<sub>i</sub> variables that might explain it. The link to be established is assumed to be linear. It is written  $Y = \sum b_i X_i$  where  $b_i$  are the coefficients that the calculation estimates. The first step of the process concerns the variables' statistical significance. A coefficient that is significant at 1% indicates that the variable is 99% likely to be determinant. By convention, a coefficient that is only significant at above 10%, or even at above 5%, is not considered satisfactory. The corresponding variable cannot be used; no conclusions can be drawn about its effect or lack thereof. The second step of the process concerns the sign (plus or minus) of the  $b_i$  coefficients. It indicates if Y and X change in the same direction or in opposite directions. In the example of the number of remedies, Table 5, drawn from Plagnet's study (2005), shows that the coefficients for the "difference in market share" and "entry barrier" variables are positive. The number of remedies increases with difference in market share between predator and target and is higher when there are entry barriers. Conversely, the "market share of the new entity" variable was not statistically significant.

Table 5: Analysis of the number of remedies (Source: Plagnet, 2005).

Explanatory variable	Coefficient (standard deviation)
Decision before or after Mario Monti	0.396 (0.207)*
Decision in Phase I or II	0.778 (0.271)***
Network industry	1.012 (0.334)***
Crossborder merger	0.392 (0.210)*
Difference in market share	0.247 (0.091)***
No. of competition problems	-2.329 (0.652)***
Horizontal effect	1.931(0.598)***
Collective dominance	2.580 (0.717)***
Vertical effect	2.135 (0.598)***
Conglomerate effect	2.360 (0.903)***
Entry barrier	0.738 (0.320)**
R2 regression coefficient	0.1711

Only variables significant at 10% (\*), 5% (\*\*), and 1% (\*\*\*) were used in this model. The analysis here concerns only mergers with remedies. More specifically, it concerns markets that, according to the Commission, carry anticompetitive risks. There are 511 such cases in the data set. Owing to the

low  $R^2$  coefficient, the model is not predictive here (the explanatory variables explain only a fraction of the variable that we seek to explain, namely the number of remedies). The model is nevertheless useful for analyzing the direction in which the variables move. Unsurprisingly, the number of remedies increases when the decision is taken in Phase II and that the difference in market share increases before and after the merger. Also unsurprisingly, the number of remedies increases when the markets concern network businesses since this often involves solving problems of access, which are particularly complex. The change in the opposite direction of the number of remedies and the number of competitive problems is counter intuitive. Why is the number of remedies lower when the market has both a horizontal and a vertical competition problem than when there is only a horizontal problem? One hypothesis is that when there are several competition problems, the remedy decided is more radical (e.g., asset disposal rather than behavioral remedy). One such remedy is enough. Lastly, it is worth noting that the number of remedies increases if the decision was taken when Mario Monti was Commissioner.

The study by Lindsay et al. (2003) offers even more conclusive results on structural indicators. Unlike the previous paper, the authors look at clearance decisions rather than at the number of remedies. They focus on clearances without conditions. In their model,  $Y$  is a binary variable that has a value of 0 if the decision is cleared as is, and a value of 1 in other cases (i.e., ban or clearance with remedies). The estimated model identifies four statistically significant explanatory variables: the market share of the new entity, the difference in market share, medium or high entry barriers, and the number of geographical markets. These variables make it possible to predict whether the Commission will clear the merger as is or with conditions with 96% accuracy. Market share is therefore indisputably a decisive factor in the Commission's clearance decisions. More specifically, the model can also be used to calculate market share effects, all other things being equal. For example, a merger with an average geographical coverage (2.8 markets affected), an average difference in market share (+2.3%), and medium or high entry barriers, has a 50% chance of not being cleared as is if the new entity's market share is 53%. The probability leaps to 80% if market share is 88%. Bergman et al. (2005) looked at the factors determining a Phase II review. They found that the probability of a Phase II is 16 times higher when the total market share of the companies is between 31% and 50% than when it is below 30%. It is 73 times higher when market share is above 50%. An easier result to remember is that a 1% increase in the total market share of the merging companies raises the probability of a Phase II by 10%.

## The impact of political variables

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European merger control is suspected of being strongly influenced by non economic factors. Here again, an econometric analysis can be used to confirm or disprove intuitions and beliefs. For example,

the influence of the Commissioner for Competition was tested for the first time by Bergman et al. (2005). The authors introduced the “Monti” variable by the decision date into account. The estimated models have coefficients associated with that variable that are sometimes positive, sometimes negative; but they are never statistically significant. By contrast, Plagnet’s econometric analysis (2005) shows that the “Monti” variable is always positive and significantly determinant. The difference in result is probably due to the fact that the latter data set is more recent and therefore more complete. The authors establish that the presence of the Commissioner from Italy (i) reduces the probability of clearance without remedies (ii), increases the probability of a binding decision for the companies assessed by the total number of remedies included in the decision (iii) and increases the probability of a decision including asset disposals.

Furthermore, it has often been suggested that the European Commission is influenced by the geographical origin of the merging companies. The Commission’s decisions are allegedly more severe when the companies are US-based. Moreover, the large countries in the European Union, such as France and Germany, are reputed to carry more weight in obtaining decisions favorable to their companies. Conversely, small countries, like Denmark and Sweden, are presumed to be disadvantaged. On the whole, the research does not confirm these suspicions. The variables “US bidder” (Bergman et al., 2005; Lindsay et al., 2003), “company from a large EU country” (Duso et al., 2003) and “Nordic bidder” (Lindsay et al., 2003) were tested without success. They do not appear statistically significant.

As its title indicates, the paper by Atkas et al. (2003) “European M&A Regulation is Protectionist” is grist to the mill of the Commission’s detractors. The authors attempted to test the assumption of a behavioral bias at the Commission in favor of European companies by using the event method described above. The Y variable they seek to explain is how binding the decision is for the merging companies. It has a value of 0 when the merger is cleared as is and a value of 1 when it is cleared with remedies or is taken after a detailed review. The ACAR was calculated for all the European competitors. Table 6 shows the main results of their model. The competitors’ return is positive: the Commission therefore tends to take decisions that are binding on companies when the market considers the merger to be anticompetitive. That observation is clearly in the Commission’s favor. By contrast, the ACAR is negative when the bidder is not European. In other words, the probability of a binding decision increases when the bidder is not European. However, that result is not statistically significant. At this stage, the hypothesis of a bias against foreign companies is therefore neither confirmed nor disproved.

The authors’ assumption in fact relies on a combination of the “origin of bidder” and “ACAR of European competitors” variables. It indeed appears that the probability of a binding decision is greater

when the bidder is foreign and when the merger has a negative share price impact on competitors. As the authors recognize, this result might be due to a problem with the method. The model used requires the variables to be exogenous. However, it is hard to imagine that financial operators do not anticipate the Commission’s decision when they react to a merger announcement, or, conversely, that the Commission is not influenced by the market’s reactions.

**Table 6: Sensitivity of the Commission to whether the bidder is not European (Source: Aktas et al., 2003).**

Explanatory variable	Estimated coefficient	Probability (significance)
Competitors’ ACAR	3.24	0.02
Non European bidder	-0.15	0.24
Non European bidder and competitors’ ACAR	-4.45	0.07

In this model, the variable to explain is how binding the decision is for companies or not. It has a value of 0 if the merger is cleared as is in Phase I and a value of 1 if the merger is subject to remedies or to a Phase II. The explanatory variables concern the ACAR of the European competitors (i.e., change in competitors’ share price at the merger announcement) and the bidder’s non European origin. Other variables such as the size of the target and the value of the transaction are included in the model but are not shown here. The pseudo R 2 is 0.19, which makes the model very unproductive.

However, it is worth observing the signs of the coefficient of the explanatory variables. The probability of a binding decision increases when the ACAR increases. The Commission therefore tends to take binding decisions where appropriate. With respect to the other two explanatory variables, the coefficients have a minus sign. However, the “non-European bidder” variable is not statistically significant since the probability is above 0.1. It therefore cannot be used to prove that the probability of a binding decision decreases when the bidder is not European. By contrast, it can be suggested that the probability of a binding decision increases when the bidder is from the EU and the ACAR of its European competitors is negative. This is what prompts the authors of the model to state that the European Commission’s merger control is protectionist.

The problem of endogeneity is not specific to the preceding method. We have seen that the Commission’s decisions can be largely attributed to structural indicators. This result supports the idea that the Commission is independent of political pressure. But it might also be due to a methodological bias, i.e., attempting to explain the Commission’s decisions by the Commission’s decisions. For instance, the market shares taken into account by the models are those that appear in the text of the decision. They are therefore determined by the Commission’s definition of the market. By defining the size of the relevant markets, the Commission can obscure behavior prompted by other considerations.

To conclude, analyzing the Commission's merger decisions on the basis of information provided by the Commission or on the market's reactions is not flawless. Furthermore, the interpretation of statistical results is difficult. They depend on the theoretical assumptions made, the variables chosen and the quality of the data set used. An econometric analysis nevertheless has two advantages: it can be used to establish whether there are systematic biases in merger control and to verify commonly held beliefs about its implementation. Econometric analysis also provides valuable information that complements the study of individual cases.

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## Abstract

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For the lawyer, every merger is unique: its procompetitive and anticompetitive effects must be evaluated on the basis of the specific characteristics of the industry and the merging companies. The economist shares this viewpoint, but also knows the value of statistics for assessing phenomena and testing assumptions. For example, has the appointment of Mario Monti been reflected in more binding decisions for companies on average? Are clearances with remedies more frequent when there are entry barriers? This paper surveys various economic analyses conducted recently using data sets of European mergers and describes their main outcomes.

## Notes

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1 B. Dumont (2004) also examines the reactions of stock markets when merger bans are announced.

2 In event studies, the financial markets are considered to be efficient (i.e., the price of a stock integrates all available information). Public decisions are limited by asymmetry of information; the competition authorities therefore have a discretionary power enabling them to pursue a purpose other than consumer protection.

3 For other variables tested, such as the size of the relevant national market or the industrial sector concerned, the results are less conclusive because they are not statistically significant.

4 In the case of a horizontal merger in an industry of differentiated products with Cournot Competition, the consumer surplus can increase or decrease independently of producer profit.

5 Since the link between variable to explain and explanatory variables is no longer linear, the authors use a Probit model.

6 This figure plainly shows the model's relevance. It should, however, be compared to the minimum threshold of performance obtained by a random model, which is 50% and not, of course, 0%.