The Political Economy of European Merger Control:
Evidence using Stock Market Data[*]

by

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Abstract

The objective of this paper is to investigate the determinants of EU merger control decisions. We consider a sample of 167 EU mergers between 1990 and 2002 and evaluate their competitive consequences by the reaction of the stock market price of competitors to the merging firms. We then account for the discrepancies between the actual and the optimal decision as indicated by the stock market in terms of the political economy surrounding the cases. Our results suggest that the commission's decisions cannot be solely accounted for by protecting consumer surplus. The institutional and political environment does matter. As far as influence is concerned, however, our data suggests that the commission's decisions are not sensitive to firms' interests. Instead, the evidence suggests that other factors – such as market definition and procedural aspects, as well as country and industry effect– do play a significant role.

Keywords: Merger Control, Event Studies, Lobbying, EU

JEL codes: L4, K21, C12, C1

1. Introduction

The objective of this paper is to investigate the determinants of EU merger control decisions. An evaluation of EU competition policy seems particularly timely. Not only has the EU Merger Regulation been in place long enough for a consistent assessment to be possible,[1] but there has also been controversy over the standard of proof - in particular with regard to economic assessments - as well as the margin of discretion that the European Commission operates under, when assessing the competitive effects of mergers.

In 2001 the Court of First Instance of the European Community had overturned three prohibition decisions (*Airtours/First Choice*, *Tetra Laval/Sidel* and *Schneider/Legrand* cases). In those cases, the Court pointed to weaknesses in the Commission's economic analysis. The Court found that the Commission's claims regarding potential anti-competitive effects were not clearly articulated and that the evidence presented by the Commission was insufficient. Similar comments have been made with respect to another prominent prohibition decision, the *General Electric/Honeywell* case.

These developments raise the question whether systematic errors may have been made by the Commission, in particular with respect to pro-competitive mergers. Some commentators highlight certain features of the Commission's procedure, which may contribute to these errors (see Kühn, 2002). It is claimed that the Commission is relatively open to be captured, in particular in terms of influence by competitors of the merging firms. This view has also been endorsed by US antitrust authorities in the context of the *General Electric/Honeywell* merger (see James, 2001 and Evans and Salinger, 2002).

These possible shortcomings of EU merger control procedures, which have been alleged in the context of prohibition decisions, may have broader implications. In particular, anti-competitive mergers, which are not prohibited (or properly amended), are often not subject to Court scrutiny. Yet, if these weaknesses prove significant, they should equally matter for the potential clearance of anti-competitive mergers.

In this paper we investigate these claims and ask whether there is systematic evidence to suggest that the EU merger procedures are prone to errors. If so, we further ask whether the

political economy of EU merger control can explain these discrepancies. Specifically, we investigate a sample of 167 recent EU merger control decisions and assess the competitive consequences of these mergers from the abnormal stock market returns of competitors to the merging firms. We develop an approach to identify instances where the EU has prohibited a merger that the stock market regarded as pro-competitive (type I errors) as well as instances where the EU has failed to prevent mergers that were regarded as anti-competitive (type II errors). In a second step, we investigate the sources of these errors and focus on the potential influences that can be brought to bear on the decision making process. Our empirical specification is derived from the framework of Neven and Röller (2005), in which the decisions of an antitrust agency are modeled in terms of the characteristics of the institutional environment and the influences that firms can exercise.

European merger institutions differ from their American counterparts. The European Communities Merger Regulation (ECMR) came into force in September 21st 1990 and was amended in 2004 by Council Regulation (EC) No. 139/2004. Merging parties are obliged to notify their intentions to merge to the Commission when the deal has a community dimension.[2] The Commission can decide outright that a merger should referred to the member states for review, if it considers that a distinct market exists, where competition is significantly affected by the concentration. After receiving notification of the concentration, the commission has 25 working days to asses whether it is compatible with the common market (the so called phase I). After this short period of time, the Commission can either clear the proposed concentration unconditionally (Art 6.1.b), it can decide to let it go through after verifying that the commitments and obligations proposed by the undertakings can effectively restore competition (Art. 6.2.), or it can decide that the proposed concentrations raise serious doubts (Art. 6.1c) and, therefore, a more in depth analysis is needed. In this case, the so-called phase II is opened, which consists of 90 working days. During this period of time, an in depth investigation is carried out, after which the Commission has to come to its final decision: either to block the merger (Art. 8.3) or to let it through unconditionally or with commitments and obligations (Art. 8.2.).

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[1] Our sample ends in 2002, so that the new Merger Regulation which came into effect on May 1st, 2004, has no empirical relevance for the findings of this study.
[2] A merger has community dimension if it takes place between firms with a combined worldwide turnover of at least 5 billion Euros and a turnover within the European Economic Area of more than 250 million Euros for each of at least two of the undertakings unless each undertaking achieves more than 2/3 of its aggregate Community turnover within one and the same member state

Our approach to the evaluation of merger control decisions differs from other studies of this kind. The existing literature typically accounts for merger decisions in terms of the competitive characteristics of deals and in terms of variables, which control for the political economy environment. Coate and Mc Chesney (1992) evaluate whether the decision to refer merger cases by the FTC can be predicted by the factors listed in the merger guidelines (in particular the concentration indices).[3] Bergman et al. (2005) perform a similar study for a sample of 96 EU merger cases, accounting for the decision to open a phase II investigation and the decision to prohibit in terms of factors listed in the decisions.[4] This approach, while yielding important insights, provides a test of whether the antitrust authorities give appropriate weights to the factors that they regard as important *ex ante* (for instance as mentioned in guidelines) like market shares, concentration, and barriers to entry. However, to the extent that many variables - like the importance of entry barriers and the prospect for co-ordinated effects - remain judgmental, this approach provides limited insights with respect to the overall quality of the decisions. For instance, one would expect in most phase II and prohibition decisions that the Commission would assert that barriers to entry are indeed high. Hence, trying to account for decisions in terms of the factors put forward by the agency themselves provides a good test of the consistency of antitrust authorities, yet a more independent measurement is needed to evaluate the overall quality of the competitive assessment.

Coate (2002) has analyzed the FTC procedure, where separate investigations are undertaken by the bureau of economics and the bureau of competition, while decisions are made by a college of five commissioners (whose appointment has a political dimension).[5] Coate (2002) exploits this feature of the US procedure in his analysis of FTC's referral decisions in order to evaluate the importance of political control over the FTC. In a model that accounts for interaction between congress and the president, Coate finds that political control affects the mergers

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[3] See Khemani and Shapiro (1993) for a similar study on Canadian enforcement.

[4] Beelders and Ozden (2002) also analyse a sample of mergers reviewed by the EU, trying to account for the decision to open a phase II investigation. They focus on the external effects of merger control decisions across jurisdictions. Using the insights of Barros and Cabral (1994), who analyse merger control decisions in international markets, they focus on the nationality of firms and the geographical distribution of their output as determinants of these decisions. In order to control for the anti-competitive consequences of the mergers in the EU, these authors use the presence of merging firms in the EU (relative to other jurisdictions) as a proxy for market shares. Whether this approach provides an adequate control for the anti-competitive consequences of the mergers under review is debatable.

[5] In the EU, cases are investigated by DG COMP, while decisions are formally taken by the College of Commissioners. However, in the area of competition policy considerable independence has been delegated to the Commissioner for Competition. Furthermore, interests of member states are represented through advisory committees, who are consultative bodies. In addition, there have been several internal checks and balances introduced more recently (an outside our sample) such as the fresh pairs of eyes and the Office of the Chief Economist.

decisions and the weight that is given to the competitive evaluation undertaken by the bureaucracy.

Our approach differs from the above in that we construct an alternative evaluation of the competitive consequences of the mergers reviewed by the EU. We do this by using evidence from the stock market. As we will discuss below, the evaluation that can be inferred from the stock market data reactions to merger announcements suffers itself from significant shortcomings. However, the stock market approach has the advantage that it relies on an independent assessment of the competitive consequences of the mergers against which the EU Commission's decision can be evaluated. It therefore does not rely on the information provided by the Commission decisions, which is possibly incomplete and likely endogenous.

Similarly to our approach, two recent papers by Aktas et al. (2004, 2006) also undertake event studies for merging partners and consider a large sample of cases analyzed by the EU Commission, which partly overlaps with ours. They examine whether the market considers the prospect for regulatory intervention in its initial assessment of the proposed mergers and test whether the EU is biased against mergers involving non EU firms. [6]

Our main findings are as follows. In terms of descriptive results our data suggest that the Commission made a type I error in 3 of the 14 prohibitions (some 21%). Interestingly, our method has identified as type I errors two cases that have later been overturned on appeal (namely *Airtours/First Choice* and *Tetra Laval/Sidel*) and one case (*General Electric/Honeywell*) that has been highly controversial but upheld by the Court. Regarding type II errors, we find that the Commission made an error in about 23 % of the cases that it has allowed without conditions.

We further provide econometric evidence regarding the determinants of type I and II errors. Our results suggest that the commission's decisions in the period 1990-2002 cannot be explained solely in terms of protecting consumer surplus. In other words, the institutional and political environment does matter. As far as influence is concerned, however, our data suggests that the Commission's decisions are not sensitive to firms' interests. In particular, there is no

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[6] Brady and Feinberg (2000) have used event studies to evaluate the impact of the introduction of the EU merger regulation and to evaluate the effects of particular news with respect to the development of EU procedures in specific cases (like the decision to open a phase II investigation). They focus on merging firms and do not consider the effect on competitors.

support in our data for the claim that "the Commission listens too much to competitors, at the expense of consumer interests." Instead, the evidence suggests that other factors – such as market definition and procedural aspects, as well as country and industry effects – do play a significant role.

The paper is organized as follows. Section 2 presents our framework. We outline a prototype model of merger control, in which the change in competitors' profit is an indicator of the merger's competitive consequences and suggest using event studies to measure such effects. Section 3 derives our econometric specification and formulates our hypothesis. Section 4 describes our data set and provides some summary statistics, while Section 5 presents the econometric results. Section 6 concludes.

2. The Evaluation of Merger Control through Reactions in Stock Prices

The most difficult and crucial task in assessing the determinants of the performance of merger control is to obtain a measure of whether a merger is pro- or anti-competitive (i.e. it increases or reduces consumer surplus). The approach we follow in this paper is based on two important elements: an identifying assumption that is satisfied by many – but not all – competitive environments, as well as the use of stock market data.

Specifically, we assume that the impact of a merger on consumer surplus is directly linked to the impact on the competitors to the merging parties. In particular, we classify a merger as pro-competitive whenever the impact of the merger on competitors is negative. Conversely, a merger is presumed to be anti-competitive whenever competitors benefit. This is the key identifying assumption of this paper and we discuss it in detail in this section. Moreover, we measure the effects of a merger on (merging firms and) competitors through stock market reactions at the mergers' announcement date. The use of stock market data raises a number of other issues, which are also discussed in this section.

2.1. Consumer Surplus and Competitors' Profits

To motivate the correspondence between the impact of a merger on consumer surplus and competitors' profits, consider the well-known homogeneous Cournot model (see for example

Vives 2000). The consequences of a merger for merging parties, competitors and consumers are sketched in Figure 1.

Figure 1. Efficiency, Profits and Welfare
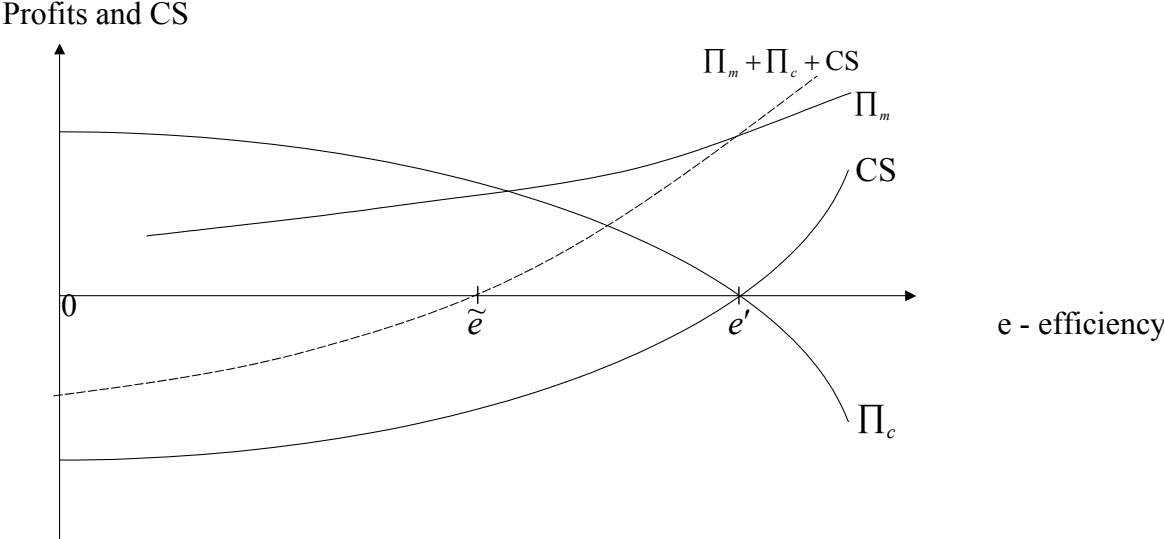
Assume that before the merger N firms compete with identical marginal costs. The merger involves M firms, where the merged entity has a lower marginal cost. The marginal cost saving achieved by the merger (relative to the common pre-merger level) is represented on the horizontal axis and dubbed e (for efficiency). The four curves in Figure 1 present respectively; the *change* in the profit of the merging parties (that is, the level of profit of the merged entity less the sum of the individual profits of the merging parties before the merger, denoted Π_m); the *change* in the profit of competitors (all firms not involved in the merger, denoted Π_c); the *change* in the consumer surplus (denoted *CS*); and the *change* in welfare (defined as the sum of profits and consumer surplus denoted $\Pi_m + \Pi_c + CS$).

There are five striking features from this figure. First, it is immediately apparent that mergers are not attractive (both privately and in terms of welfare) if they do not achieve at least some level of efficiency. Second, the change in consumer surplus increases as the level of efficiency achieved by the merger increases. This accords with intuition, as part of the efficiency achieved by the merged entity will be passed on to consumers. Third, when the efficiency is large

enough, the reduction in the number of competitors entailed by the merger, which normally leads to higher prices, is more than compensated by the effect of higher efficiency, which leads to lower prices, other things being equal. As indicated by Figure 1, there is a critical level of efficiency (e'), which ensures that the merger does not affect consumers. At this critical level, prices are unchanged. Fourth, the change in welfare is also increasing with the level of efficiency. Higher efficiency leads to higher aggregate profits (this is not shown) and higher consumer surplus, thereby increasing welfare. Figure 1 also indicates the level of efficiency, ẽ, which is required in order to ensure that welfare increases as a consequence of the merger. This level is naturally less than the level, which is required to ensure that consumers are not hurt. Fifth, and most importantly for our purpose, we observe that the change in profits accruing to competitors mirrors the changes in consumer surplus: profits to competitors fall as the level of efficiency achieved by the merger increases and the level of efficiency which ensures that competitors do not gain is exactly the level which ensures that consumers are not hurt. In other words, if a merger hurts competitors, it will benefit consumers and vice versa[7].

How general is this result? It turns out that the correspondence between the change in competitor's profits and the change in consumer surplus holds for a wide class of oligopoly models. As is shown by Farrell and Shapiro 1990 (see also Vives 2000, pp 101-102), homogenous Cournot games that satisfy some regularity conditions (such as uniqueness and stability) exhibit the property that $CS > 0$ if and only if $\Pi_c < 0$. In other words, using the impact on competitors to assess the impact on consumers is valid in such games (as in Figure 1). Moreover, the same property holds for games with product differentiation. As is shown in Appendix 1, markets that can be characterized by Bertrand competition with product differentiation also display the correspondence between the signs of the change in CS and competitors' profits, provided some regularity conditions are met again.[8] Hence, it would appear that under some fairly standard assumptions, a correspondence between the impact of a merger on consumers and the impact on competitors' profits holds for both homogenous Cournot markets as well as in markets with product differentiation and Bertrand price setting.

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[7] We assume that competitors are not hurt to such an extent that would prefer to exit the industry.
[8] Interestingly, the correspondence between the sign in CS and competitors' profits is lost in quantity games with product differentiation. Intuitively, the proof in Appendix 1 breaks down under quantity competition, as the property of strategic substitutes implies that the merging firms output and the competitors' output move in opposite directions. This implies that some prices may go up, while other prices may go down. Depending on the precise consumer preferences, consumer surplus may go up or down, independently of the sign on competitors' profits.

An interesting aspect of the above analysis is that the correspondence is only valid insofar as the sign of the change in consumer surplus and competitors' profits are concerned. Clearly, if one is interested in a measure of consumer surplus, the above argument is of little use. However, for the purposes of defining whether a merger is pro- or anticompetitive, the sign of the change in consumer surplus is in fact all that is needed.

Nevertheless, there are situations where the identification of consumer surplus through competitors' profits may break down. The above framework focuses on unilateral effects in horizontal mergers.[9] As will be discussed in the next section, in a dynamic context, such as when a merger signals possible efficiency gains, the correspondence between consumer surplus's reduction and increase of competitors' profits might break down. In addition, non-horizontal mergers may lead to outcomes where the correspondence is lost. In particular, if a merger between firms active in different markets leads to the marginalisation or foreclosure of competitors, thereby reducing their profit, consumers may be hurt. For instance, consider a merger amongst firms selling complementary goods as a bundle. In this case, competitors will typically loose, even though consumers may gain or loose depending on particular features of demand. Similarly tied sales of substitute or independent goods will typically hurt consumers but may increase or decrease competitors' profits, depending again on particular features of demand.

In sum, we find that the correspondence between the change in consumer surplus and competitors' profits holds for a large class of number of market games and merger effects, including those which are most widely used in the empirical literature on merger analysis, such as Bertrand Nash price setting. However, there are exceptions, most notably when conglomerate effects are at work. Given that conglomerate effects have played a role in several of the mergers evaluated by the European Commission in our sample, our empirical analysis needs to control for these cases (see below).

The use of stock market data raises additional issues, which we now turn to.

2.2. The Use of Event Studies

The idea that mergers, which hurt competitors, will tend to be pro-competitive has long been recognized and analyzed first by Eckbo (1983) and Stillman (1983). They propose to use stock

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[9] The correspondence would also hold with coordinated effects - which should increase the profits of competitors at the expense of consumers.

market reaction to the announcement of a merger (a so called "event study") to evaluate the impact of the merger on competitors' profits. The change in the value of competitors' equity can then be taken as a measure of the (discounted) additional profits that is expected to accrue to them as a consequence of the merger. A positive reaction indicates that the merger enhances competitors' profits which might be due to an increase in market power. This effect has been called the "collusion hypothesis". [10]

There are several advantages to using stock market data. Most importantly, the stock market is an independent assessment of the merger's effects. It is not an evaluation made by insiders hence can be viewed as exogenous to the decision. Second, stock market reactions are easily observable. In particular, as we will see below, by using the stock market reactions on the day of the announcement, we identify the impact of a merger on competitors' stocks even when the merger is blocked. Stock market data thus avoid a potential censoring problem (i.e. the impact of a merger is only observed if the merger is cleared). Another advantage of stock market data is that they are relatively easy to obtain, considering the alternative of getting measures of consumer surplus through the estimation of structural demand parameters. Clearly structural estimation of demand in the context of a large number of cases is not feasible. Finally, in comparison to accounting data, stock market data are prospective and hence better suited to capture dynamic effects of mergers on firm performance. Using annual accounting profitability would require an explicit dynamic specification, the structure of which may not be easily tested.

One possible problem in the identification of anticompetitive mergers by means of stock market data has been pointed out by Eckbo and Wier (1985). They build on Eckbo (1983) and postulate that positive abnormal returns for rivals around the merger announcement might not only signal enhanced market power, but also the possibility for competitors to become more efficient. If so, an increase in the competitors' stock prices might be consistent with a pro-competitive merger, which would violate our identifying assumption.[11] While this line of argument is plausible, no microeconomic foundation is provided. Eckbo and Wier (1985) set out to test this hypothesis empirically by attempting to identify whether rivals' positive

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[10] As we showed in the previous section and in Appendix 1, this hypothesis can be formally derived from the most common models of oligopolistic competition. In a model of Bertrand competition with product differentiation Fudenberg and Tirole (1994) prove that, under some standard assumptions, the comparative statics with respect to the efficiency parameter are such that with increasing efficiencies for the merging firms all prices and competitors' profits decrease, while consumers benefit.
[11] Note that this is a variant of an "in play" effect; see below.

abnormal returns around the merger's announcement day are indicative of the "collusion" hypothesis or future efficiencies. In order to identify these effects, they need to assume that antitrust action is always effective: as a result when an antitrust challenge is announced, this should reduce rivals' rents accruing from increased market power but not those rents due to future efficiency gains. Using a sample of 259 US mergers, they conclude that the observed patterns of positive abnormal returns for competitors result from efficiencies and do not indicate that the merger is anti-competitive.

Even though the idea about mergers signaling future efficiencies is appealing, the Eckbo and Weir approach does not discriminate future efficiencies from *ineffective* antitrust challenges. While the identification approach proposed in this paper does not allow for a merger signaling any future efficiencies, we nevertheless are able to identify pro- vs. anticompetitive mergers. Moreover, we do provide a micro foundation to our approach and show that our identification holds for a large class of models.

The Eckbo-Stillman methodology was also challenged for other reasons. McAfee and Williams (1988) for instance argue that the failure to detect market power may be due to rivals being large conglomerates that received only a small portion of their profits from the relevant market. They also argue that the existence of effective merger control may have had a deterrent effect on certain types of attempted mergers. Schumann (1993) finds similar patterns as Eckbo and Wier (1985), but concludes that the competitive implications are ambiguous. His analysis indicates that the abnormal returns earned by rivals as a group depends on the size distribution of rivals and the implications of antitrust policy, in particular that an antitrust complaint may signal that large rivals will not be allowed to merge in the future, but do not provide the same signal to smaller rivals.[12]

Another potential drawback of using stock market data arises when the announcement of a particular merger affects the likelihood of alternative future configurations.[13] A change in the

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[12] Mullin et al. (1995), using the same approach, find evidence for the market power hypothesis. They investigate the U.S. Steel consolidation and incorporate an examination of downstream firms in addition to merging and rival firms. Their found pattern of reactions implies that the dissolution of U.S. Steel would have lowered steel prices and raised output.

[13] More generally, it should also be recognized that the market takes into account the antitrust procedure at the time of announcement (see Aktas et al., 2006 for evidence on this). Hence, the change in the value of the stock at the time of the announcement is equal to the probability that the deal will be cleared times the value that will accrue if it is realised. In order to identify whether deals are perceived as anti-competitive or not, we only use the sign of the expected change in the stock price. The expected change is of the same sign as the conditional change (i.e. given that the merger takes place), the former being a proportion of the latter. Hence, the fact that the market may

stock price of competitors may reflect the change in the likelihood of alternative mergers rather than the consequences of the announced merger for its profit. On the one hand, the stock market reaction may indicate an "out of play" effect if, prior to the annoucement, the market anticipated an increase in the value of the "competitor" in alternative merger configurations which become irrelevant when the merger is announced (see Fridolfsson and Stennek, 2005). In such instance, a fall in its stock price may not be a reliable indicator that the merger is pro-competitive (but an increase in its stock price will remain a good indicator that the merger is anti-competitive). On the other hand, the announcement of a merger may also induce an "in play" effect, such that it increases the likelihood that "competitors" will themselves be involved in subsequent mergers. In this instance, an increase in the value of stock price of competitors may not be reliable indicator that the merger is anti-competitive. Whether the "in play" effect is important empirically is not clear. Salinger and Schumann (1988) test for the presence of such effects and conclude that it may matter in some cases, but it does not matter on average across a sample of cases. More recently, Simpson (2001) uses an event study to analyze a merger among US department stores. He finds positive abnormal returns to merging firms and their rivals, consistent with an increased concentration due to this merger. Moreover he shows that this pattern of abnormal returns seems to be better explained by the market power hypothesis rather than the increased acquisition probability hypothesis.

Overall, it is thus difficult to predict the direction of various potential "in and out of play" effects and it is unclear whether they matter. Whether and how much these dynamic (and/or signaling) effects are present is a matter of empirical analysis. As far as we read the literature, there is considerable dispute as to their empirical relevance. Moreover, not all these effects are based in solid micro-foundations, like the one we provide in this paper. Given the difficulty to identify those mergers where "in play" or "out of play" effects might be of relevance, as well as their empirical significance, we do not address these issues in this paper.

The final potential drawback is the quality of the information provided by event studies may be low. Even though this methodology is widely used,[14] it has also been subject to criticism (see,

anticipate the outcome of the antitrust procedure does not introduce a bias in our procedure. However, the anticipated profits cannot be seen as exogenous. This is further discussed below.

[14] See for instance Pautler (2001) for a survey. If event studies are no longer used by US antitrust authorities in order to evaluate the anti-competitive consequences of particular mergers under review (as they were at one point in time), they have remained quite popular as a source of information to be used in cross-section studies (see for instance, Banerjee and Eckart, 1998). Given the variance that surrounds the estimates of the merger effects in event studies, it would indeed seem appropriate to avoid attaching too much significance to particular observations but rather use them as observations subject to measurement errors in the context of cross section studies.

for instance, Ravenscraft and Scherer, 1987).[15] As confirmed by Schwert (1996), there is much evidence in support of the semi-strong hypothesis of market efficiency with respect to mergers. That is, the change in stock prices is likely to provide an unbiased estimate of the change in profit, even though that estimate may not be very precise. Whether the precision is high can also be assessed in terms of predictive power. A number of studies have tried to compare *ex ante* previsions through event studies with *ex post* realizations. One should be cautious in interpreting the results of *ex post* studies (which face their own methodological problems), but the results are nonetheless instructive. Using different samples of mergers, Ravenscraft and Pascoe (1989), Healy et al. (1992), as well as Kaplan and Weisbach (1992) showed that the *ex ante* stock market returns are positively and significantly correlated with *ex post* performance. Moreover, Sirower and O' Byrne (1998) find that *ex post* outcomes (in terms of economic value added – i.e. profit less a normal charge for capital) match the *ex ante* stock market prediction in 66% of the cases and explain 46% of the variation in the market. Duso et al. (2006) is the first study to look at this relationship also for the rivals. They find that the *ex ante* prediction significantly explains the *ex post* performance both for merging firms and competitors. Overall, these studies show that the market predicts actual outcomes with some accuracy.

2.3 Estimating Abnormal Returns

Several methods can be used to compute abnormal returns.[16] We estimate the so-called market model, which regresses the stock return on a constant and the market return (or an industry index) over a sample which immediately precedes a window of some days around the merger's announcement date. Under the assumptions of efficient markets and rational expectations, the market model predicts that firm j's stock price at time t ($R_{j,t}$) is proportional to a market index ($R_{m,t}$):

$$R_{j,t} = \alpha + \beta R_{m,t} + \varepsilon_{j,t},$$

where $\varepsilon_{j,t}$ is an i.i.d. normally distributed random variable with zero mean and variance equal to $\sigma_{\varepsilon_{jt}}$.

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[15] Event studies are typically less reliable when the merger affects a small part of the firm being quoted.
[16] In a previous version of this paper we estimated abnormal returns using a simpler methodology. We just looked at the firms' stock market reaction at the announcement date and compared it to the reaction of the relevant market index. Even though the new measures of abnormal returns obtained by estimating the market model differ in terms of size and significance, the results are very much comparable for what matters the sign of the estimated effects.

To study the stock price reaction to mergers' announcements, we estimate the market model over 240 trading days, starting from 40 days prior to the announcement day using the Scholes–Williams (1977) method. We obtain estimated values for the model's parameters α and β that we can use to predict what the firm j's stock price would have been, had the merger not be announced. Firm j's abnormal return before the announcement day t ($AR_{j,t}$) is then computed as the difference between actual returns and the predicted returns obtained from the estimated equation:

$$AR_{j,t} = R_{j,t} - \hat{R}_{j,t} = R_{j,\tau} - \hat{\alpha} - \hat{\beta} \, R_{m,t}$$

Under the null hypothesis of efficient markets, abnormal returns have zero mean and a variance equal to:

$$Var(AR_{j,t}) = \sigma^2{}_{\varepsilon_{j,t}} + \frac{1}{L}\left[1 + \frac{R_{mt} - \overline{R}_m}{\sigma^2{}_m}\right],$$

where L is the estimation period length and $\overline{R}_m$ and $\sigma^2{}_m$ are respectively the mean and variance of the market portfolio.

Daily abnormal returns are then cumulated over the span of the window of $2x+1$ days around the event day to obtain a cumulative average abnormal return:

$$CAR_{j,\tau+2x} = \sum_{\tau=\tau-x}^{\tau=\tau+x} AR_{j,\tau}$$

For each merger, we compute these measures for merging firms and all rivals. To obtain one measure of the merger's aggregate effects on merging firms and competitors ($WACAR_i$, $i = M, C$), we take the weighted average of the cumulative abnormal returns of all firms in each of the two groups ($i=M,C$), the weight being the firms j's market value (MV_i , $i = M, C$):

$$WACAR_i = \frac{\sum_{j=1}^{N_i} CAR_j MV_j}{\sum_{j=1}^{N_i} MV_j} \quad j = 1,...,N_i, \ i = M, C. \quad [1]$$

Alternatively, we measure the *value* of the change in profit due to the merger by the sum over merging firms and competitors of the CAR times the market value:

$$GAINS_i = \sum_{j=1}^{N_i} WACAR_j MV_j \quad j = 1,...,N_i, \ i = M, C. \quad [2]$$

Both these variables should provide a measure of merging firms and competitors' willingness to pay for a given policy decision (for instance by providing contingent perks) and hence a proxy for the merger effect Π_i ($i = M,C$) introduced in the previous section.

Finally, the question also arises whether abnormal returns are significant. We will come back to this point when discussing the preliminary results.

3.   A Simple Empirical Framework

As discussed above, we proceed by using the change in competitors' profit as an indicator of the competitive consequences of the merger. For the time being, let us assume that the antitrust agency is meant to clear or prohibit mergers depending on its consequences on competition and hence consumer surplus (we will return to this assumption later). As a result, we are able to identify the mergers for which the actual decision of the agency is different from what it should have been according to the anticipation of the stock market. Furthermore, we can investigate the circumstances that will make such mistakes more or less likely.

3.1 Empirical Specification

According to the above set-up, a benevolent agency blocks a merger if and only if consumer surplus is reduced. Define a decision dummy for the benevolent agency, D, we have the following decision rule,

$$D = \begin{cases} 1 & (clear) & if & CS > 0 \\ 0 & (block) & otherwise \end{cases}$$

Let P be the actual decision taken by the agency, which is equal to 1 when the merger is cleared, and zero otherwise.[17] To characterize these decisions, it is useful to refer to type I and type II errors: a type I error occurs when the agency blocks a merger that should have been cleared, while a type II error occurs when the agency clears a merger that should have been blocked. Assuming that P and D are observable to the econometrician (we will return to this later), type I and II errors are given by,

$$E1 = 1 \quad iff \quad P = 0 \quad and \quad D = 1 \text{ (Type I error)}$$

$$E2 = 1 \quad iff \quad P = 1 \quad and \quad D = 0 \text{ (Type II error)}$$

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[17] Remedies (or undertakings) will be discussed below.

What are the potential factors that influence the occurrences of type I and II errors? Following the theoretical analysis in Neven and Röller (2005), we suppose that an antitrust agency maximizes its own utility and that third parties (including firms as well as other agents like member states' governments) can affect its utility (for instance by providing contingent perks). In this context, to the extent that the agency is not perfectly monitored by its principal, it may pursue its own objective at the expense of those that it has been assigned. Clearly, the monitoring environment (which includes accountability to the ultimate principals but also media attention) play an important role in the relative "costs" of making either errors of type I or II.

Let us first consider the influence that firms can bring to bear on the agency. There are two cases of interest. First, assume that a merger is anti-competitive, that is $D=0$. In this case, competitors' profits rise with a merger ($\Pi_c > 0$), competitors and the merging firms' incentives are aligned, and all firms are in favor of getting the merger approved. In particular, when a benevolent agency wants to block the merger, *all* firms have an incentive to influence the agency to have the merger cleared. If they are successful, a type II error occurs. The second possibility arises when a merger is pro-competitive, that is $D=1$. Note that in this case the incentives of the firms are not aligned, since competitors' profits fall with the merger ($\Pi_c < 0$). In this situation the relative influence of the two sides is important. If the competitors have enough influence with the agency then the merger is blocked, and a type I error occurs. Alternatively, if the merging firms have more influence, then pro-competitive mergers are always cleared and no error occurs.

Besides firms, there are also a number of institutional and political economy variables that may influence the anti-trust agency. For instance, it has been suggested (see Neven et al., 1994) that the size of the country in which the merging firms originate does play a role in the final outcome of a merger investigation presumably because of the political pressure that can be exercised by large countries.[18]

Another important issue is market definition. It is often asserted (see for instance, Neven et al. 1994) that the EU merger guidelines are biased towards excessively narrow market definitions, both in terms of the wording of the guidelines and in actual practice. As a result, narrow market definition may thus be associated with a higher frequency of errors.

There are also procedural issues that potentially have an impact on errors. Most importantly, the time available to undertake the analysis may be relevant so that errors may be affected by whether the case has been decided in phase I or has been subject to a more substantial investigation (phase II). Finally, the pattern of errors may vary across the sectors in which the mergers are taking place, as some industrial sectors have more political cloud than others, mostly as the level of member states.

The previous discussion suggests the following political economy specification of type I and type II errors in merger control,

$$E1 = \alpha_0 - \alpha_c \Pi_c - \alpha_m \Pi_m + \alpha_x X + \varepsilon_1 \qquad \text{for } D=1 \qquad [4]$$

$$E2 = \beta_0 + \beta_c \Pi_c + \beta_m \Pi_m + \beta_x X + \varepsilon_2 \qquad \text{for } D=0 \qquad [5]$$

where *E1* and *E2* are defined in [1], Π_c and Π_m are changes in profits due to the merger to the merging firms and the competitors, respectively.[19] Note that [4] specifies type I errors conditional on a merger being pro-competitive (*D=1*) as *E1* can only occur when *D=1*. Similarly, [5] specifies type II errors conditional on a merger being anti-competitive (*D=0*), since *E2* can only occur when *D=0.*

Note that we expect $\alpha_c > 0$, since the impact of the competitors profits on type I errors is negative, i.e. the more negative Π^c the more competitors are against the merger and the higher the likelihood of a type I error. Also, we would expect that $\alpha_m > 0$, since merging firms have an incentive to lobby against type I errors. Finally, we expect that $\beta_m > 0$ and $\beta_c > 0$, as all firms would like to induce a type II errors.

In light with the above discussion, specification [4] and [5] includes several other important institutional and political economy variables (X) that may influence the anti-trust agency such

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[18] See also, for instance, Horn and Stennek, 2001, with regard to Nordic countries.
[19] Note the change in the profit of merging firms, as estimated from stock market data, is often negative. In the context of the estimation of (4)-(5), this however only involves a scaling issue. We used two different measure of change in profits, as reported in section 2.3:
There are up to 14 competitors identified in our sample (see Section 4). We have aggregated the returns of the competitors into a single measure. As expected the individual firms' returns are often – but not always – of the same sign. In particular, the sign of individual firms' returns are the same as the aggregate return in about two-thirds of all the cases.

as country and industry effects, market definition, as well as procedural issues. We will return to these variables in more details below.

3.2 Hypotheses

Assuming that we can measure the variables and estimate [4] and [5] consistently (see the next section), we then test the following hypotheses about the decision process. We begin by specifying a test for benevolence (up to white noise).

H1 (Benevolence): $\alpha's = \beta's = 0$, no systematic errors of type I or II.

That is the decision process produces errors that can be characterized by white noise through the error terms of $(\varepsilon_1, \varepsilon_2)$. As can be seen from the definition of *E1* and *E2* this is likely to be the case whenever *P* and *D* are similar.

The next hypothesis tests for systematic influence on the agency, which is consistent with the theoretical model discussed above.

H2 (Influence)

$$\alpha_c > 0, \alpha_m > 0, \alpha_x \neq 0 \qquad \textbf{type I}$$
$$\beta_c > 0, \beta_m > 0, \beta_x \neq 0 \qquad \textbf{type II}$$

The following hypothesis tests whether the agency is more susceptible to influence activities by merging firms or by competitors.

H3 ("listen to competitors more ")

$$\alpha_c > \alpha_m \Rightarrow \text{competitors matter more in type I scenarios}$$
$$\beta_c > \beta_m \Rightarrow \text{competitors matter more in type II scenarios}$$

H3 tests the claim that has been alleged by various parties (see for instance James, 2001) that the EU Commission does listen more to competitors than to other firms.

The final hypothesis centers around possible systematic biases away from what a benevolent agency might do.

H4 ("systematic biases") $\alpha_0 \neq 0, \beta_0 \neq 0$

Recall that benevolence is defined as following a consumer surplus standard. This assumption is worth discussing, with particular reference to the European context. The European Commissions' Merger Regulation (ECMR) is concerned with the creation or reinforcement of a dominant position as a result of which effective competition would be significantly impeded (Art 2.3). The regulation also indicates that efficiencies can be taken into account in the analysis as long as consumers are not hurt (Art 2.1b). Altogether, the objective set by the ECMR would thus appear to involve the protection of consumer welfare. Two difficulties arise, however, with this interpretation. The first difficulty arises from the concept of dominance, which is not closely associated with the prospect for price increases, which hurt consumers. If anything, it would appear that significant price increases can take place, even if dominance is not created or strengthened. There has been increasing recognition of this in the context of the debate surrounding the Green paper on the reform of the ECMR (see Vickers, 2002 for a succinct view on this). This arises because firms with moderate market share may still be able to achieve significant price increases if they sell close substitutes. Accordingly, the excessively narrow scope of the concept of dominance may induce systematic type II errors (but no systematic type I error).

The second difficulty arises from the consideration of efficiencies. As emphasized by Farrell and Shapiro (2001), any antitrust authority which (like the EU) only considers efficiency (if at all) in the presence of significant anti-competitive concerns[20] must assume a benchmark level of efficiency across all cases (and clear cases where minor anti-competitive concerns arise on the assumption that they will be compensated by efficiencies). Still, the absence of a systematic evaluation of efficiencies in each case could involve a bias in the Commission's decisions; if the benchmark level of efficiency, which is assumed by the Commission, exceeds average efficiency gains, mergers which hurt consumers could be allowed by the Commission.

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[20] This interpretation is consistent with the wording of the regulation and the apparent practice of the Commission. It is also consistent with some of the rare references to efficiency that one finds in actual decisions. For instance, in *Aérospatiale-Alénia/De Havilland* (a prohibition), the Commission acknowledged that it had considered efficiencies but that efficiencies were not sufficient to overturn the presumption that the merger was anti-competitive. Some observers however doubt that the Commission pays more than lip service to efficiency claims put forward by the parties (see Röller *et al*., 2001). The fact that the Commission may have turned efficiency into an offence in some cases should also induce some reluctance on the part of merging parties in claiming efficiencies. This may further contribute to an effective neglect of efficiency considerations.

The opposite, however, is not true because the Commission's approach is asymmetric,[21] if the Commission finds that there is a competitive concern and that the benchmark level of efficiency is insufficient to ensure that prices will not increase, it will investigate actual efficiencies. Assuming that its evaluation is not biased, it will on average find the actual level of efficiency and hence will not prevent mergers which exhibit sufficient efficiency to ensure that prices do not increase. Hence, the Commission's approach to efficiency could lead to systematic type II errors but not to systematic type I errors.

Overall, it appears that both the dominance criteria and the treatment of efficiencies could lead to systematic type II errors. In the context of our empirical investigation a finding that $\alpha_0 > 0$, could thus be associated with these factors.

3.3 Further Measurement Issues

In order to estimate specification [4] and [5] we need to measure *E1* and *E2*. Since the actual decision *P* is observable, measurement of *E1* and *E2* is equivalent to measuring *D*. Since *D* requires an estimate of the impact on consumer surplus, we define *D=1 (CS>0)* iff $\Pi_c < 0$.

As discussed above, there are circumstances (conglomerate effects) where a merger could have a negative impact on both *CS* and Π_c. In other words, while a positive Π_c would always imply an anti-competitive merger, a negative Π_c could be either pro- or anti-competitive. As a result, there may be cases where *D* is set to zero, even though it should be one. Given the definition of *E1* and *E2*, this implies that there are cases wrongly classified as a type I error, as well as cases which are wrongly classified as no type II error. We will return to this point below.

A second measurement issue relates to the observability of the change in profit associated with the merger, that is (Π_c, Π_m). Recall that we need (Π_c, Π_m) to define *D*, as well as for estimation of [4] and [5]. However, we only observe (Π_c, Π_m) when *P=1*, i.e. when the merger actually takes place. Moreover, we also need to know what (Π_c, Π_m) would have been, when a merger is blocked. This is a censoring problem[22].

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[21] If one assumes (see previous footnote) that the Commission hardly ever consider efficiencies, then both types of discrepancies could arise. Mergers that benefit consumers could be prohibited.

[22] One solution may be to estimate a simultaneous switching regression model, where P and the firm profitability are estimated. Given the available data this is not a feasible estimation strategy.

As discussed above, we solve this problem by using stock market reaction data. In particular, consider the change in the stock price around the date of announcement (see the data section for details). Let V_m be the abnormal change in the value of the merging firms on the day of the announcement of the merger. Similarly, let V_c be the abnormal change in the value of the competitors' stock on the day of the announcement of the merger. Moreover, let p be the probability that the market assigns to the event that the merger is cleared by the antitrust agency. From this it follows that $V_m = p\Pi_m$ and $V_c = p\Pi_c$. Note that V_c and Π_c have the same sign (since p must be non-negative), which allows us to define $D=1$ iff $\Pi_c < 0$. Moreover, a measure of the change in firm profitability are given by $\Pi_c = V_c / p$ and $\Pi_m = V_m / p$. Since V_m and V_c are observable in the stock market, we are left with the need to obtain a consistent estimate of p, which is the probability that the market expects that the merger is cleared by the antitrust agency, to obtain an unbiased measure of Π_m and Π_c. We therefore estimate p by a reduced form probit on the full sample using all the instruments in Table 3. Having estimated p, we are able to get measures for $\hat{\Pi}_c = V_c / \hat{p}$ and $\hat{\Pi}_m = V_m / \hat{p}$.

4. Data and Descriptive Results

Our sample includes all phase II mergers scrutinized by the EC until the end of 2001, together with a randomly matched sample of phase I merger cases, which run through June 2002. In Appendix 2 we describe in details how the sample was built and a list of all cases and the decision dates are provided in Appendix 3. For each case, the identity of the merging firms and their competitors has been obtained from the published decisions. The date of the announcement of the merger has been identified through the financial press. For each firm (merging firm or competitor), we compute the abnormal return as described in Section 2.2. In a first step, we aggregated abnormal returns over merging parties using each firm's market value as a weight. However, in the regressions, we use the abnormal returns in terms of values rather than in percentage. When several competitors are identified in the decision (as is often the case, in particular when several relevant markets are considered), we similarly aggregate each firms cumulative abnormal return using its market value as a weight or take the *value* as expressed by the CAR times the market value. Because of difficulties in identifying competitors or their stock, we end up with 78 phase II cases and 89 phase I cases for which we have complete information

Table 1 reports on the estimated weighted average aggregated abnormal returns from equation [1] for the merging firms and competitors, as well as the aggregated value of the cumulative abnormal returns from equation [2]. We calculate four measures for the weighted average abnormal returns ($WACAR_i$, $i=M,C$): the one day abnormal return at the announcement date, and the 3, 5, and 11 days cumulative abnormal returns around this date. According to the weighted average abnormal returns, the mergers in our sample were on average profitable since the weighted average CARs for the merging firms are positive and statistically significant at the 1% level for both the 1-day and 3-days measures. The size of the profitability effect is however quite modest (1.1%). Yet, this result seems to be in line with the literature.[23] The cumulative abnormal returns for the rivals are, instead, not statistically significant different from zero. On average, these mergers seem to be "welfare-neutral", in the sense that neither they increase nor decrease competitors' profits. The second and third rows of Table 1 report the value of the merger induced profit effects as expressed by the sum over the involved firms ($GAINS_i$, $i=M,C$) of the CARs times the market value. Not surprisingly, the results differ in terms of size and significance respect to those obtained with the other measure, since the variability is higher due to the variability in market values. According to this second measure we do not observe any significant effect of the merger on merging firms and competitors on average.

In line with our methodology discussed above, we can use the competitors' estimated abnormal returns to classify mergers into pro- and anti-competitive. Table 2 reports on the frequencies of each category. Using this approach, we find that 47 % of all cases are classified as pro-competitive.[24] This is consistent with a median efficiency gain in our sample which is roughly equal to the level of efficiency that would ensure that consumers are benefiting (i.e. e' in Figure 1). This observation should be contrasted with the usual finding of event studies such that a majority of mergers fail to generate value for the shareholders of acquirers (even though the variance is large and some mergers generate very high returns), such that target shareholders obtain handsome premia and acquirers and target shareholders combined earn small but

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[23] See for instance Andrade et al. (2002). In fact, this is the weighted sum of the abnormal returns of the acquiring and the target firms. Depending on the event window, we estimate an average abnormal returns for acquirers in the range between -0.54% and 0.12% (not statistically significant different from zero) and for the targets in the range between 3.4% and 6.2% (statistically significantly greater than zero at the 1% level). These results are in line with those reported by Atkas et al. (2004) using a comparable sample of mergers analyzed by the EU Commission.

[24] This figure relates to the 3-days cumulative abnormal returns. The results obtained by using other windows are slightly different. Using the daily abnormal return we have 45,8% pro-competitive cases that increases to 50% with the 5-days CARs and to 52.3% with 11-days CARs. Also when we use the GAINS variables to define pro-competitive mergers results are very similar: the percentage of pro-competitive cases varies between 46 to 52%. Only slight differences in the mergers' taxonomy can be found depending on the adopted profitability measures.

positive returns on average (see Pautler, 2002, for a survey). Leaving aside the issue of the allocation of the value being generated across merging firms (acquirer and target) and the puzzle that many mergers are not expected to generate value ex ante for acquirers, these observations suggest that the average level of efficiency is fairly low. Hence, it would appear that the average[25] level of efficiency, as inferred from the stock market reaction of competitors is significantly larger than the average level of efficiency, which can be inferred from the stock market reaction of merging firms.[26] This observation is a bit of a puzzle. One possible interpretation is that mergers do generate significant efficiencies, which affect competitors, but that the shareholders of the merging firms do not manage to obtain the rents associated with these efficiencies (possibly in part because of ineffective corporate control).[27] If this interpretation is correct, it would suggest that the common presumption that efficiencies associated with mergers tend to be small, which relies on evidence of gains to merging firms, could be misplaced. Gains may have been underestimated.

Table 2 furthermore distinguishes between different types of decisions. Unconditional clearance are associated with Article 6.1.b decisions in phase I, and with Article 8.1 decisions in phase II. Similarly, prohibitions are associated with Article 8.3 decisions (only in phase II). The issue then arises of how to consider decisions which involve remedies, either in phase I (Article 6.1b decisions with conditions) or in phase II (Article 8.2 decisions). Whether a decision with undertaking can be seen as giving rise to an error, namely a type I error in a pro-competitive case and a type II error in a anti-competitive case, depends on whether the stock market anticipate remedies, and whether the remedies work to the benefit of the consumer. In our empirical analysis below, we assume that the stock market cannot anticipate the remedies.[28] We will also assume that the remedies meet the competitive concerns, in cases that are otherwise anti-competitive. These assumptions first imply that cases which are considered as anti-competitive by the stock market and include remedies will not involve type II errors. From

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[25] Assuming that the average is close to the median.

[26] The usual finding with respect to the creation of value for merging firms is broadly confirmed in our sample. We find 98 cases (out of 167) in which the merger creates value for the merging firms.

[27] This interpretation would also be consistent with the observation from ex post studies that most mergers do not generate additional profits relative a control group, as long as the rents appropriated by management are recorded as additional costs and hence reduce reported profits. See Gugler et al. (2003).

[28] Given that remedies are the outcome of a negotiation between the Commission and the parties, it appears difficult to form a prior. Note, however, that if the market does anticipate remedies, the definition of our dependent variables in [4] and [5] are affected. In this case, any instance where the market anticipates that the merger would be anti-competitive would be associated with a type II error. But of course, any instance where the market anticipates that the merger would be pro-competitive and is cleared with remedies would not be associated with a type I error. See Duso et al. (2006a) and (2006b) for an empirical analysis of remedies based on a similar methodology and the same sample.

this perspective, our assumptions are thus conservative as they lead to less type II errors. We therefore define type II errors solely as cases considered as anti-competitive by the stock market which are cleared without conditions (bottom row of Table 2). Second, under our assumptions, remedies are not necessary in those mergers that the stock market anticipates as pro-competitive (top of Table 2). Hence, Article 8.2 decisions and Article 6.1.b decisions with remedies then involve unwarranted restrictions on pro-competitive deals. We classify those cases as "weak type I" errors. Overall, strong type I errors involve prohibitions of mergers that the market deems to be pro-competitive. Weak type I errors involve strong type I errors as well as cases considered to be pro-competitive which involve remedies. Our econometric analysis will be performed with respect to weak type I errors. [29]

Table 2 indicates the frequency of type I and II errors. *Given* that a merger is anti-competitive, it shows that 49 cases (out of 87) are unconditionally cleared. This implies that some 56.3% of all anti-competitive mergers are type II errors (29.3% of all cases). On the other hand, *given* that a merger is pro-competitive, only 3.75% (3 out of 80) of the cases are blocked and involve strong type I errors. However, weak type I error are observed in 34 out of 80 cases, or some 42.5% (20.8% of all cases).

Interestingly, our data identify as strong type I errors two cases that have later been overturned on appeal (namely *Airtours/First Choice* and *Tetra Laval/Sidel*) and one case (*General Electric/Honeywell*) that has been highly controversial and is being appealed. As we mentioned above, however, our approach does not take conglomerate effects into account. Assuming that no type I error was made in those cases where conglomerate effects play an important role, then both *Tetra Laval/Sidel* and *General Electric/Honeywell* are no mistakes, reducing the number of type I errors to 1 out of 80 pro-competitive cases.

Conditioning our frequencies on the decision, our data find that the number of strong type I errors as a proportion of the total number of prohibition is 3 of the 13 (some 23%).[30] Looking at type II errors, as a percentage of all mergers that were cleared, our data suggest that the Commission made an error in about 35.7 % of the cases. This implies that both type I and II

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[29] Note that there are only 3 strong type I errors using the 3-day CARs measure (ranging between 3 and 6 depending on the adopted window). An econometric analysis using this alternative definition would be rather uninformative.
[30] Excluding those cases where conglomerate effects were crucial, we get 1 out of 11 (some 9%).

errors occur with similar probabilities: roughly one in four mergers that are cleared (or blocked).

Table 3 reports on the average values for the aggregated cumulative abnormal returns for merging and rival firms depending on the decision and on the merger's competitiveness effect. The last column shows that the average CAR for rivals in anticompetitive merger is 2.36% and significantly positive, while merging firms have an average positive and significant CAR of 1.8%. Interestingly, one does not observe significant differences for rivals' abnormal returns across decisions, as if the market would not build a prior about the Commission's final assessment at the announcement day. This result qualifies our approach with respect to the fact that the stock price reaction at the merger's announcement can be seen as a good proxy of the deal's value. Similar results can be observed in case of pro-competitive mergers. Here merging firms have significant and positive CAR of 1.36%, while rivals loose on average 1.72%. Again the differences across the various Commissions' decisions are not significant.

5. Econometric Results

Having provided some summary statistics of the frequencies and significance of the type I and type II errors, we now turn to the econometric analysis of their determinants. Accordingly, we estimate equations [4] and [5] by splitting the sample into anti- and pro-competitive sub-samples, as defined by the dummy variable D. In particular, we estimate [4] as a probit model on the sample of pro-competitive deals. Moreover, we use the weak definition of type I errors, that is we set $E1=1$ when a pro-competitive merger is blocked or conditionally approved with remedies. Similarly, equation [5] is estimated on the sub-sample of anti-competitive deals.[31]

The explanatory variables that are available for each merger case are described in Table 4 with summary statistics provided in Table 5. The variable $GAINS_m$ denotes the expected change in the profit of the merging firms as measured by equation [2] (sum of the abnormal return times the market value) around the day of the announcements, while $GAINS_c$ is the expected change in the profits of competitors.

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[31] Alternatively, one can estimate equation [4] and [5] jointly – possibly allowing for correlation across equations-as a bivariate probit with sample selection, due to the definition of D.

There are also a number of other important variables that may explain EU decisions (see Table 4 and 5 again). To characterize market definition we include a dummy called NATIONAL, which is equal to 1 if the relevant geographic market is national, as well as a dummy EU, which is equal to 1 when the relevant geographic market is the EU.[32] We also include country and industry effects. BIG_EU is a dummy that takes the value 1 if at least one of the merging companies has its headquarter and main operation in one of the large EU countries (France, Germany, Italy, Spain or the UK), while SMALL_EU is a dummy that takes the value 1 if at least one of the merging companies has its headquarter and main operation in one of the small EU countries (Austria, Belgium, Netherlands, Luxembourg, Ireland, Norway, Sweden, Denmark, Finland).[33] Furthermore, we use a dummy called US indicating whether one of the merging companies comes from the United States. In terms of industries, we include dummies for NACE codes corresponding to "manufacturing", "energy and water supply", "transport, storage, and communication", as well as "financial intermediation".[34] We also control for the merger's type, i.e. whether the proposed concentration was a full merger, a joint venture, or a partial merger. Finally, we introduce some variables that relate to procedure: a dummy variable (PHASE1) is 1 when a decision is made in phase I, as well as a non linear time trend (T and T2).

The results of the probit estimation are presented in Table 6 and in Table 7 we report the marginal effects. Considering weak type I estimation results first, it can be seen in Table 6, that the Chi-squared statistic is 77.54[35], which indicates that $\alpha's \neq 0$ with over 99% probability. In other words, the decisions by the Commission are not consistent with what a benevolent agency (making random errors) would have done. Similar findings can be observed for type II errors where the Chi-squared statistic is 46.25 and we can reject the null hypothesis $\beta's = 0$ at the 1% significance level. We therefore strongly reject hypothesis **H1** (benevolence).

Regarding the specific determinants, Tables 6 shows that there is no evidence for the influence hypothesis **H2** in our data, for both weak type 1 and type 2 errors. That is, we cannot reject the hypothesis that firms' have no influence over the agency. This is true for both competitors and

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[32] For the sake of identification we drop the dummy=1 if the geographic market was defined to be worldwide.
[33] See Horn and Stennek (2002) for a rationale.
[34] We experimented with dummies for all NACE codes present in our sample. Other industry dummies that those reported here never proved significant (and their inclusion does not change the results). We use the NACE codes reported in the decisions.
[35] The Chi-squared statistic for testing H_0: β=0 (not including the constant) and the significance level equals the probability that the χ^2 exceeds the test value calculated as $\chi^2=2(\ln L-\ln L_0)$, where L is the log-likelihood of the estimated model and L_0 is the log-likelihood of the model estimate with the constant only.

merging firms. It appears therefore that influence is not associated with firms' rents.[36] Moreover, we can also reject the hypothesis **H3** ("listen to the competitor more"), since the coefficient of the lobbying variables for merging firms and rivals are not statistically different from each other.

The estimates in Table 6 further indicate that there is no systematic bias (hypothesis **H4)** as the constant in [4] is not significant for both type I and type II errors, suggesting that dominance and the treatment of efficiency may not induce a systematic deviation away from the protection of consumers.

Turning to the determinants, one of the most interesting results in terms of weak type I errors concerns the geographic market. A narrow market definition significantly decreases the probability of type I errors but not in a linear way. Compared to the situation where the market is defined worldwide, the probability of type I error is on average 65% lower than when the market is EU, whereas the probability is only 38% lower than when the market is national. These findings suggest that the Commission is less likely to make a type I error when the proposed concentration involves the entire common market area, as compared to a single member state or the entire world. This result is consistent with the Commission's goal of the common market, i.e. they are in favor of more pan-European Mergers. Interestingly, there is no evidence in our data that the geographic market definition has any role in determining type II errors.

As expected, procedural factors are also important. The impact of the PHASE I variable indicates that the probability of a weak type I error is 98% more likely in phase II. This is of course not surprising at all, as all prohibitions and many remedy decisions are taken in phase II. As a result, it is rather unlikely that this type of mistakes occurs in the preliminary investigation phase. More interestingly, the estimates in Table 4 confirm that significantly more type II errors are made in phase I. Table 7 indicates that the probability of waving an anti-competitive merger through is some 75% larger in phase I. This is indeed a very high price to pay for a faster decision. Given that DG COMP operates under a significant resource constrain, it is thus hardly surprising that the number of type II errors is high. However, one may wonder whether

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[36] In one specification, where we use the percentage CARs from equation [1] instead of the GAIN variables from equation [2], we find a negative significant coefficient for the merging firms' lobbying variable. This implies that in pro-competitive mergers, higher profits for merging firms reduces the likelihood by the Commission to mistakenly prohibit a merger. This is indeed a form of "welfare improving" lobbying, as firms help clearing pro-competitive mergers to the benefit of consumers.

an increase by some 75% is not a reason to believe that too few phase II investigations are carried out. It should be noted that our methodology does not include a measure of cost associated with a phase II investigation, both for DG COMP and the merging parties. Nevertheless, given our empirical results, it appears that more resources devoted to in depth merger investigations is an issue that is worth considering[37].

In terms of country effects we find some support for a small-country bias, as type I errors are 67% more likely if at least one firm comes from a small European countries. On the other hand, we do not find any small country bias for type II errors. In terms of industry effects, we do not observe any significant bias for type I errors, while we observe a 45% lower likelihood of getting an anti-competitive deal unconditionally approved for the "transport, storage, and communication" industry (p-value of 0.051).

Finally, the likelihood of a type I error is some 28% higher if the proposed concentration is a full merger, suggesting that the Commission has been overly concerned about the competition effects of a merger involving a complete overlap of two companies as compared to a partial merger or a joint venture.

5.1 Robustness Checks

In order to check the robustness of our findings, we have performed a number of alternative specifications and tests that we now briefly mention. We do not report all the results in detail here. However, they are available from the authors upon request.

Vertical Foreclosure and Conglomerate Effects

As discussed above, the correspondence between consumer surplus and competitors does not necessarily hold for vertical foreclosure or conglomerate mergers. Going through the published decisions, we have identified those cases where the Commission has mentioned conglomerate effects or foreclosure as one of their leading arguments in support of the final decision (such as for instance *Tetra Laval/Sidel* and *General Electric/Honeywell*). This leads to 18 merger decisions. We then drop those 18 mergers from the sub-sample of pro-competitive mergers, and re-estimate [2] on the reduced sample. Overall, it can be said that the results as well as

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[37] The observation that type II errors are more likely in phase I is also explained by the positive sign of the time trend T (although not statistically insignificant), which picks up an increased workload, resulting in a higher proportion of cases necessarily being decided in phase I.

most of the parameter estimates do not change. In particular, our findings regarding hypothesis **H1-H4** are the same. In addition, our findings relating to market definition and procedural variables continue to hold, even though the marginal effects are slightly affected.

Interestingly, if instead of removing these cases from the sample we classify them as not an error, we find that the impacts of BIGEU and US variables change. For example, the probability of weak type I errors is now 7% smaller if at least one US firm is involved in the concentration.

Alternative measures of firms' influences

An alternative proxy of firms' influence activities is the weighted average cumulative abnormal returns ($WACAR_i$) as expressed in equation [1]. Using this measure, we find that lobbying does have a significant effect. In particular, merging firms' abnormal returns reduce the probability of a type I error (p-value 0.091, marginal effect -0.80). This is "beneficial lobbying", as merging firms prevent a mistake by the authority which would hurt consumers. This is however the only specification where we find evidence of some form of effective firms' influence on the Commission decisions. All other results concerning the determinants of type I as well as type II errors are essentially unchanged.

Using only statistically significant cases

There are cases in our sample where the gains for both merging and rival firms are very small and not statistically different form zero. To test robustness, we build a sub-sample where we eliminate the central part of the distributions, i.e. we eliminate all those cases where the merging firms' or competitors' CARs are around zero in an interval twice the standard error of the respective measures. This eliminates 50 mergers from our sample. We then re-estimate our model and find that our results are unchanged. In particular, the results for type II errors remain the same. With regard to type I errors, we lose some significance, which is not surprising. Nevertheless, the results relating to PHASE1 and EU keep being significant.

Alternative measures of abnormal returns

Recall that we use a 3 day window for the abnormal return. We have re-estimated our model (including the other robustness checks) using the $GAINS_i$ variables based on 1, 5, and 11-day CARs. Clearly, these are a large number of regression results and we can not report all of them here. However, some general conclusions regarding robustness can be drawn as follow. As before, most of our results remain essentially unchanged. Concerning type I errors, the

coefficients' size and sign are the same as in the main regression reported in the tables. It is worth emphasizing that PHASE1 and EU (geographical market) are statistically significant in all specifications, independently of the adopted measure. Some other measures are also significant in the different specifications, but not consistently across all of them. As for type II errors, the impact of PHASE1 stays positive and very significant. In some specification a non-linear time trend can be observed and some other industry dummies are also significant, although not consistently across all specifications. Also, for some specifications the constant is significant. We therefore cannot always reject the "systematic bias" hypothesis both for type I and type II errors.

6. Conclusion

The objective of this paper is to investigate the determinants of EU merger control decisions. We consider a sample of some 167 mergers that have been reviewed by the EU and collect evidence on whether the stock market anticipated that these mergers were anti-competitive. From this, we identify instances where the EU has prohibited mergers that the stock market regarded as pro-competitive (strong type I errors), has imposed remedies on seemingly pro-competitive deals (weak type I errors), as well as instances where the EU has failed to prevent mergers that were regarded as anti-competitive (type II errors). We further investigate the source of these errors and in particular focus on the potential influences that can be brought to bear on the decision making process.

In terms of descriptive results our data suggest that the Commission made a strong type I error in 4 of the 14 prohibitions (some 28%). Interestingly, our method has identified as type I errors two cases that have later been overturned on appeal (namely *Airtours/First Choice* and *Tetra Laval/Sidel*) and one case (*General Electric/Honeywell*) that has been highly controversial.[38] Regarding type II errors, we find that the Commission made an error in about 23 % of the cases that is has cleared without remedies (assuming that the market did not anticipate remedies – our preferred hypothesis).

We further provide econometric evidence regarding the determinants of weak type I and type II errors. Our results suggest that the Commission's decisions are not purely explained by the motive of protecting consumer surplus. In other words, the institutional and political

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[38] As discussed above, the evidence regarding *Airtours/First Choice* is more telling as the other two cases involved conglomerate effects.

environment does matter. As far as firms' influence is concerned, however, our data suggests that the Commission's decisions are not sensitive to firms' interests. In particular, there is no support in our data for the claim that "the Commission listens too much to competitors, at the expense of consumer interests". Instead, the evidence suggests that other factor – such as market definition, the length of the investigation as expressed by whether a case is decided in phase I, as well as country and industry effects– do play a role.

Our analysis also finds that procedural aspects are important. One possible explanation consistent with our data is that the workload has increased over time, which results in more cases being decided in phase I. The probability of waving an anti-competitive merger through is some 75% higher, which is a high price to pay. This suggests that allocating more time and resources to phase I, as well as opening phase II more frequently, may reduce type II errors considerably.

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Table 1
Estimated Abnormal Returns

Variable	1 day	3 days	5 days	11 days
$WACAR_m$	**0.0114**** (0.0049)	**0.0157***** (0.0059)	**0.0207***** (0.0065)	**0.0191***** (0.0072)
$WACAR_c$	0.0038 (0.0041)	**0.0029*** (0.0023)	0.0005 (0.0031)	0.0056 (0.0075)
$GAINS_m$	-392.7203 (365.7429)	-657.9332 (530.4149)	-558.3477 (490.2213)	-962.7087 553.5819
$GAINS_c$	-839.9243 (1101.572)	-546.3242 (905.8616)	**1566.726*** (1174.824)	-12478.8 (12157.68)

We report the mean and standard deviation (in parentheses) of the different measures of the merger effects as defined in equation [1] and [2]. The $GAINS_i$ variables are expressed in million US Dollar. We use a one tailed t-test to test whether the abnormal returns are significantly positive or negative, and report significance: 1%, 5%, and 10% significance level are represented by ***, **, * respectively.

Table 2
Pro- and Anti-competitive Mergers: Sample Frequencies

	PHASE I		PHASE II			
	6.1.b	6.1.b with remedies	8.1.	8.2. with remedies	8.3.	
Anti-competitive (Rivals' profits increase)	39	8	10	20	10	87
Pro-competitive (Rivals' profits decrease)	39	3	7	28	3	80
Total	78	11	17	48	13	167

Table 3
Average Cumulative Abnormal Returns

		PHASE I		PHASE II			Tot
		6.1.b	**6.2.** (remedies)	**8.1.**	**8.2.** (remedies)	**8.3.**	
Anti-competitive	$WACAR_m$	**0.0163*** (0.0694)	0.0026 (0.0445)	**0.0267**** (0.0331)	**0.0350***** (0.0396)	-0.0032 (0.0489)	0.0180 ** (0.0565)
Rivals' profits increase	$WACAR_c$	**0.0255***** (0.0296)	**0.0223**** (0.0123)	**0.0130**** (0.0215)	**0.0240***** (0.0228)	**0.0215***** (0.0077)	**0.0236***** (0.0252)
Pro-competitive	$WACAR_m$	0.0108 (0.0926)	0.0139 (0.0330)	0.0610 (0.1643)	0.0076 (0.0392)	-0.0112 (0.1325)	**0.0136*** (0.0879)
Rivals' profits decrease	$WACAR_c$	**-0.0137***** (0.0131)	-0.0188 (0.0224)	**-0.0158**** (0.0134)	**-0.0207***** (0.0236)	-0.0333 (0.0315)	**-0.0172***** (0.0186)

Results are based on the 3-days cumulative abnormal returns. We report the mean and standard deviation (in parentheses) of the gains variable (aggregated CARs). We use a one tailed t-test to test whether the abnormal returns are significantly positive or negative, and report significance: 1%, 5%, and 10% significance level that are represented by ***, **, * respectively.

Table 4 - Definition of Variables

Variable	Definition
Decisions	
BLOCK	Dummy = 1 if the merger was blocked (Art. 8.3)
CLEAR	Dummy = 1 if the merger was cleared without remedies (Art. 6.1b or Art. 8.2.)
REMEDIES	Dummy = 1 if the merger was cleared with remedies (Art. 6.1b with remedies or Art. 8.2 with remedies)
PHASE1	Dummy = 1 if the merger was in phase I
PHASE2	Dummy = 1 if the merger was in phase II
Gains from merger	
$GAINS_c$	Gains from mergers for the competitors[a]: sum over competitors of the 3-days cumulative abnormal returns times the market values. The value is expressed in million 1995 constant US Dollar.
$GAINS_m$	Gains from mergers for the merging firms: sum over merging firms of the 3-days cumulative abnormal returns times the market values. The value is expressed in million 1995 constant US Dollar.
Concentration's type	
FULL	Dummy = 1 if the concentration was a full merger
JV	Dummy = 1 if the concentrations was a jont venture
PARTIAL	Dummy = 1 if the concentrations was a partial merger
Competitiveness Assessment	
PROCOMP	Dummy = 1 if the merger was pro-competitive (CGAINS < 0)
ANTICOMP	Dummy = 1 if the merger was anti-competitive (CGAINS > 0)
Commission's errors	
STYPE1	Dummy = 1 if the commission made a type I error, i.e. a pro-competitive merger was blocked. We assume that also remedies should be considered an error, since these are pro-competitive mergers, which should be unconditionally allowed.
WTYPE1	Dummy = 1 if the commission blocks or impose remedies on a pro-competitive merger
TYPE2	Dummy = 1 if the commission made a type II error, i.e. a anti-competitive merger was cleared with remedies. The assumption is that the remedies restore competition but the market did not anticipate the use of remedies
Geographic dummies	
BIG_EU	Dummy = 1 if one of the merging part comes from one big EU country (France, Germany, Italy, Spain, UK)
SMALL_EU	Dummy = 1 if one of the merging part comes from one small EU country (Austria, Belgium, Netherlands, Luxembourg, Ireland, Norway, Sweden, Denmark, Finland)
Geographic and product market [b]	
NATIONAL	Dummy = 1 if the relevant geographic market is national
EU	Dummy = 1 if the relevant geographic market is the EU
WORLD	Dummy = 1 if the relevant geographic market is the world
D	Dummy = 1 if the relevant product market is "manufacturing"
E	Dummy = 1 if the relevant product market is "energy and water supply "
I	Dummy = 1 if the relevant product market is "transport, storage and communication"
J	Dummy = 1 if the relevant product market is "financial intermediation"

[a] The competitors are those recognized as such in the Commission's report. [b] The product markets are defined according to the NACE codes.

Table 5
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
BLOCK	167	0.0778	0.2687	0	1
CLEAR	167	0.5689	0.4967	0	1
REMEDIES	167	0.3533	0.4794	0	1
PHASE1	167	0.5329	0.5004	0	1
ANTICOMP	167	0.5210	0.5011	0	1
WTYPE 1	167	0.2036	0.4039	0	1
STYPE 1	167	0.0180	0.1332	0	1
TYPE 2	167	0.2934	0.4567	0	1
GAINSc	167	-654.1699	6582.444	-75825.33	12525.29
GAINSm	167	-541.6289	11741.470	-147819.80	18406.88
FULL	167	0.5689	0.4967	0	1
JV	167	0.2395	0.4281	0	1
BIGEU	167	0.6347	0.4830	0	1
SMALLEU	167	0.3114	0.4644	0	1
NATIONAL	167	0.3573	0.4775	0	1
EU	167	0.4232	0.4939	0	1
WORLD	167	0.2195	0.4082	0	1
D	167	0.6467	0.4794	0	1
E	167	0.0479	0.2142	0	1
I	167	0.1257	03326	0	1
J	167	0.0539	0.2265	0	1

Table 6 - Probit Estimation of Equation [2] and [3]

Dependent variable	WTYPE 1 Errors		TYPE 2 Errors	
	Coeff.	St. Err.	Coeff.	St. Err.
CONSTANT	0.0919	2.4866	-0.1486	1.1281
$GAINS_m$	7.97e-06	0.0001	-0.0001	0.0001
$GAINS_c$	-0.0003	0.0003	-0.0001	0.0001
NATIONAL	-3.8226**	1.8886	-0.3228	0.5701
EU	-3.8898**	1.7769	-0.1884	0.6630
SMALL_EU	2.7124*	1.4230	-0.4022	0.5344
BIG_EU	1.3368	1.1704	-0.4892	0.5317
US	-0.0295	0.7348	-0.0644	0.5954
PHASE1	-6.5848***	2.6459	2.3265***	0.5796
TIME	0.0567	0.0431	0.0111	0.0262
TIME2	-0.0003	0.0003	-0.0001	0.0001
D (manufacturing)	-0.4849	2.0880	-0.2966	0.6766
E (energy/water)	0.4286	9.3844	-0.3119	0.9652
I (transport/communication)			-1.2449*	0.7037
J (financial intermediation)	3.3777	2.5521		
FULL	1.9835**	0.9952	-0.3636	0.7248
JV	0.1933	1.0768	0.8579	0.8522
Observations	80		87	
Log Likelihood	-11.7063		-25.2820	
Chi-squared	77.54		46.25	
Significance level	0.0000		0.0000	
Pseudo R-squared	0.7681		0.4777	

The estimation of Type I errors is on the sub-sample of pro-competitive mergers, while the estimation of Type II errors is on the sub-sample of anti-competitive mergers. The dependent variables are wtype1 and type2. For the sake of identification we dropped the dummy=1 if the geographical product market was "world" and the dummy=1 if the merger was defined as "partial". The Gains Variables are corrected for the predicted probability of the case being cleared obtained by estimating a reduced form probit on the full sample, where the dependent variable is a dummy equal to 1 if the merger was not blocked and the exogenous variables are a constant, ANTICOMP, $GAINS_m$, $GAINS_c$, NATIONAL, EU, BIG_EU, D, E, I, J, TIME, TIME2, FULL, JV. Significance at the 1%,5%, and 10% level is represented by *,**,*** respectively.

Table 7 - Marginal Effects

	WTYPE 1 Errors		TYPE 2 Errors	
	Coeff.	**St. Err.**	**Coeff.**	**St. Err.**
$GAINS_m$	1.15e-06	5.93e-06	-0.00002	0.00002
$GAINS_c$	-0.00004	0.00005	-0.00001	0.00002
NATIONAL	-0.3798**	0.2979	-0.1279	0.2248
EU	-0.6507**	0.3371	-0.0748	0.2631
SMALL_EU	0.6971**	0.3363	-0.1592	0.2093
BIG_EU	0.1569	0.1906	-0.1903	0.1996
US	-0.0042	0.1049	-0.0256	0.2365
PHASE1	-0.9814***	0.0451	0.7547***	0.1173
TIME	0.0082	0.0098	0.0044	0.0104
TIME2	-0.00004	0.00005	-0.00002	0.0001
D	-0.0835	0.4272	-0.1169	0.2636
E	0.0806	2.2302	-0.1239	0.3790
I			-0.4546*	0.2124
J	0.9077	0.2299		
FULL	0.2840**	0.2736	-0.1426	0.2801
JV	0.0298	0.1829	0.3112	0.2632

Partial derivatives of E[y] = F[*] with respect to the vector of characteristics. They are computed at the means of the Xs. All sample observations used for computing the means (84 for type I errors and 80 for Type II errors). dF/dx is for discrete change of dummy variable from 0 to 1. Significance at the 1%,5%, and 10% level is represented by *,**,*** respectively.

Appendix 1 - The correspondence between consumer surplus and competitors' profits

For our definition of *type I* and *II* errors, we use the property that the sign of the *CS* is opposite of the sign of the competitors' profits Π_c. In other words, we need to show that the impact of the merger on CS and Π_c is such that $CS > 0$ if and only if $\Pi_c < 0$. As is shown by Farell and Shapiro 1990 (see also Vives 2000, page 101-102), Cournot games that satisfy some regularity conditions (such as uniqueness and stability) satisfy that $CS > 0$ if and only if $\Pi_c < 0$.

Consider now Bertrand competition with product differentiation. Let the sum of the competitors' profits be denoted by $\Pi_c(p_c, p_m)$, where p_c is a price vector of competitors' prices and p_m is a price vector of the merging firms. Further let the products be substitutes such that $\Pi_c(p_c, p_m)$ is increasing in p_m. Assume that there are well-defined best-response functions, and that there is a unique and (locally) stable Nash equilibrium that depends smoothly on the efficiency e. Let the pre-merger equilibrium be denoted by (p_c^*, p_m^*). Note that the merger will have two effects: a change in efficiency (*e*) and a collusive price setting amongst the merging firms (*m*).

Consider first a sole increase in efficiency and denote the resulting equilibrium prices by (p_c^e, p_m^e). As has been shown by Fudenberg and Tirole (1994) (see also Vives 2000, page 213-217), the comparative statics with respect to *e* under the above assumptions are such that all prices decrease, competitors profits decrease, and consumers benefit. In particular, we have $p_c^e < p_c^*$ and $p_m^e < p_m^*$, that is all prices fall[39]. Consider now the effect of collusion, that is the *m* firms set their prices collusively. Denote the post-merger equilibrium by p_c^{**}, p_m^{**}, where $p_c^e < p_c^{**}$ and $p_m^e < p_m^{**}$. There are two cases, depending on whether the efficiency or the collusion effect dominates.

Case (i): Suppose $p_m^* < p_m^{**}$, that is post-merger prices of the merging firms are higher. Given that prices are strategic complements, we also have that $p_c^* < p_c^{**}$. Furthermore, we have

$$\Pi_c(p_c^*, p_m^*) < \Pi_c(p_c^*, p_m^{**}) < \Pi_c(p_c^{**}, p_m^{**}).$$

The first inequality is due to the assumption of substitutes (i.e. $\Pi_c(p_c, p_m)$ is increasing in p_m) and the second is from the equilibrium definition of p_c^{**}, p_m^{**}. This implies that a merger yields higher profits for competitors, while consumers are hurt (all prices rise), i.e. $CS < 0$ and $\Pi_c > 0$.

Case (ii): Suppose $p_m^* > p_m^{**}$, that is post-merger prices of the merging firms fall. Given that prices are strategic complements, we also have that $p_c^* > p_c^{**}$. Furthermore, we have

$$\Pi_c(p_c^*, p_m^*) > \Pi_c(p_c^{**}, p_m^*) > \Pi_c(p_c^{**}, p_m^{**}).$$

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39 We use the symbol "<" in matrix notation, i.e. $p_c^e < p_c^*$ is true if and only if all pairwise comparisons of the price vectors are true.

The first inequality is due the equilibrium definition of p_c^*, p_m^* and the second is from the assumption of substitutes. This implies that a merger yields lower profits for competitors, while consumers benefit (all prices fall) i.e. $CS > 0$ and $\Pi_c < 0$. Q.E.D.

Appendix 2 - EU merger control: The Data

We take the stock market and capitalization data before any news hits the market and when the merger is formally approved.

First Step: Selection of merger cases
We started by analyzing the EU decisions, which are available for the public on the internet at http://europa.eu.int/comm/competition/mergers/cases. We select all phase II mergers from the beginning of 1990 until December 2001.[40] For some of the most recent cases the reports were not available, leaving us with a total of 90 phase II cases. In order to obtain a representative sample we randomly selected a sub-sample of 110 phase I merger cases.[41] For all these cases (200 in total) we collect information on the merging firms (such as name, location, world-wide and EU-wide turnover[42]), the name of all reported competitors, the policy decision (Article, commitments/obligations/undertakings, notification and decision date), the geographic market of reference, and the product market of reference according to the NACE codes.

Second step: The "announcement date"
For each case we determined the first day that the merger appeared in the international press. This "announcement date" was found by using **"Dow Jones interactive"**, which is a customizable business news and research product that integrates content from newspapers, newswires, journals, research reports, and web sites.

Third step: The construction of the "gains" variables.
Stock market data for the day prior to the "announcement date" as well as on the announcement date was obtained from **"Datastream".** In particular, we collect data on the stock prices ($R_{i,t}$) and market value (MV_{it}) of all firms i (merging and competitors). In addition, we also collect information about a market index ($I_{i,t}$) for the sector and country that firm i belongs to. [43]

Based on this data, we construct the "gains from mergers" for both merging firms as well as competitors, as discussed in Section 2.2.

When firms were not quoted, we used information from the "parent firm". For other case, we use information from the competitors when we had information about the relative importance of the missing firms as measured by their market shares. Still we are unable to construct reliable data for Π_c and Π_M, such that we end up with 89 phase I cases and 78 phase II cases.[44] We are therefore left we final sample of 167 merger cases.

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[40] The last phase II case in our database is M.2533 - BP / E.ON (final decision on 20.12.2001).

[41] We select these cases randomly in order to avoid sample selection problems. The last phase I case in our database is M.2834 - ALCHEMY / COMPARE (final decision on 19.06.2002).

[42] For many cases this information is censored because the commission reported only a lower bound for the turnover. This lower bound is determined by the level of turnover which automatically triggers and Commission's investigation (World-wide turnover above 5 billions Euro and EU-wide turnover above 2.5 Billions Euro).

[43] All prices have been transformed in constant 1995 Euro. Information about the exchange rates and the CPI (Consumer Price Index) were collected from the OECD statistical compendium.

[44] These were cases for which we had stock market data for at least one of the merging firms and one of the competitors.

Appendix 3 - EU merger cases (1990-2002)

Case	Acquiring Firm	Target Firm(s)			Phase	Decision date
M.0004	Renault	Volvo			1	07.11.90
M.0012	Varta	Bosch [1]			2	12.04.91
M.0024	Mitsubishi Corp.	Union Carbide Corp.			1	04.01.91
M.0042	Alcatel	Fiat			2	21.01.91
M.0043	Fiat	Alcatel			2	21.01.91
M.0050	At&T	Ncr Corporation			1	18.01.91
M.0053	Boeing	Alenia			2	04.06.91
M.0057	Digital Equipment Int.	Mannesmann			1	22.02.91
M.0068	Tetrapak [1]	Alfa-Laval			2	19.03.91
M.0081	Viag	Continental Can			1	06.06.91
M.0121	Ingersoll Rand Co.	Dresser Inc.			1	18.12.91
M.0126	Accor	Wagons-Lits			2	16.12.91
M.0129	Digital Equipment Corp.	Philips Electronics			1	26.08.91
M.0141	Uap	Transatlantic HDG.			1	11.11.91
M.0165	Alcatel Cable S.A.	Aeg Kabel			1	18.12.91
M.0184	Gran Metropolitan	Cinzano S.A.			1	07.02.92
M.0190	Nestle'	Eaux Vittel			2	25.03.92
M.0214	Du Pont	Imperial Chemical Industries			2	03.06.92
M.0221	Asea Brown Boveri Limited	Trafalgar Hse			1	26.05.92
M.0222	Mannesmann	Hoesch			2	14.07.92
M.0236	Ericsson	Ascom			1	08.07.92
M.0253	Btr	Pirelli			1	17.08.92
M.0259	British Airways	.			1	27.11.92
M.0269	Shell	Montedison			2	07.02.94
M.0286	Zuerich Insurance Company	Municipal Mutual Insurance			1	02.04.93
M.0308	Kali	Mdk 2			2	16.09.93
M.0315	Mannesmann	Vlourec Dalmine			2	20.09.93
M.0331	Fletcher Challenge	Methanex			1	31.03.93
M.0354	Cyanamid	Shell			1	01.10.93
M.0358	Pilkington	Societa' Italiana Vetro 2			2	02.09.93
M.0430	Procter & Gamble	Vp Schickedanz 1			2	17.02.94
M.0437	Matra Marconi Space N.V.	British Aerospace Space	Systems Ltd.		1	23.08.94
M.0447	Schneider Electric S.A.	AEG A.G.			1	01.08.94
M.0458	Electrolux	AEG A.G.			1	21.06.94
M.0468	Siemens	Italtel (Stet) 2			2	14.10.94
M.0469	Bertelsmann	Deutsche Bundespost Telekom 2			2	18.07.94
M.0477	Daimler Benz	Kässbohrer 1			2	14.10.94
M.0484	Thyssen Stahl	Acciai Speciali Asti , Afl Falck 1			2	21.10.94
M.0498	Commercial Union	Suez			1	12.09.94
M.0508	Credit Commercial De France (CCF)	Berliner Handels Und Frankfurter Bank (BHF)			1	28.10.94

M.0550	Union Carbide Corporation	Enichem S.P.A.			1	13.03.95
M.0580	Daimler Benz	Asea Brown Boveri			2	23.06.95
M.0582	Orkla As	Volvo			2	23.05.95
M.0603	Crown Cork & Seal Company	Carnaudmetalbox Sa			2	25.07.95
M.0619	Gencor	Lonmin			2	20.12.95
M.0623	Kimberly-Clark	Scott Paper			2	12.09.95
M.0632	Rhône Poulenc Rorer Inc.	Fisons Plc.)			1	21.09.95
M.0685	Siemens	Lagardere			1	08.02.96
M.0689	Singapore Telecom	Belgacom			1	29.02.96
M.0706	Alcatel	Aeg			1	03.09.96
M.0731	Kvaerner A.S.	Trafalgar House Plc			1	15.04.96
M.0737	Ciba-Geigy	Sandoz			2	02.05.96
M.0754	Anglo American Corp.	Lonmin			2	16.12.96
M.0774	Saint Gobain	Hoechst Wacker			2	31.07.96
M.0794	Coca-Cola Enterprises	Cadbury Schweppes			2	13.09.96
M.0798	General Electric	Compunet Computer A.G.			1	19.08.96
M.0818	Cardo	Thyssen			1	02.12.96
M.0833	Coca Cola Company	Carslberg A/S			2	02.05.97
M.0850	Fortis	Abn-Amro Bank			1	06.02.97
M.0856	British Telecom	Mci (Ii)			2	20.01.97
M.0877	Boeing	Mcdonnell Douglas			2	19.03.97
M.0913	Siemens	Elektrowatt			2	28.07.97
M.0938	Guinness	Grand Metropolitan			2	20.06.97
M.0942	Veba	Degusta			2	02.09.97
M.0950	Roche	(Boehringer Mannheim)			2	02.10.97
M.0954	Bain Capital Inc.	Hoechst Ag			1	02.09.97
M.0967	Klm	.			1	22.09.97
M.0970	Thyssen Krupp Stahl	Itw Signode			2	22.12.97
M.0984	Dupont De Nemours & Co.	Imperial Chemical	Industries Plc.		1	02.10.97
M.0986	Bayer Group	Du Pont I De Nemours			2	09.10.97
M.0993	Bertelsmann	Taurus Entertainment Canal Plus			2	22.01.98
M.1027	Deutsche Telekom	Bertelsmann			2	29.01.98
M.1042	Eastman Kodak Company	Dainippon Ink & Chamicals			1	15.01.98
M.1069	Worldcom	Mci			2	03.03.98
M.1081	Dow Jones	General Electric			1	22.01.98
M.1094	Caterpillar	Lucas Varity			1	23.02.98
M.1142	Commercial Union Plc	General Accident Plc			1	06.05.98
M.1225	Enso Oyj	Stora Kopparbergs Bergslags Ab			2	31.07.98
M.1232	Ingram	Tech Data			1	17.07.98
M.1252	At&T	Tele-Commmunications Inc.			1	04.12.98
M.1258	General Electric	Finmeccanica			1	28.08.98
M.1265	Chs Electronics Inc.	Metro Ag			1	21.08.98

M.1332	Thomson-CSF	Lucas Varity Plc			1	21.12.98
M.1363	Du Pont De Nemours & Co.	Hoechst AG			1	05.02.99
M.1383	Exxon Corporation	Mobil Corporation			2	09.06.99
M.1405	Tnt Post Group N.V.	Jet Services Sa			1	15.02.99
M.1452	Ford Motor Company	Volvo Car Corporation			1	26.03.99
M.1466	Eaton Corporation	Aeroquip Vickers			1	31.03.99
M.1476	Adecco S.A.	Delphi			1	26.03.99
M.1484	ALSTOM	ABB Handels- und Verwaltungs AG			1	02.06.99
M.1524	Airtours	First Choice			2	03.06.99
M.1532	Bp Amoco Plc.	Atlantic Richfield Company			2	10.06.99
M.1539	CVC European Equity II Ltd.	Groupe DANONE S.A.	GERRESHEIMER Glas AG		1	05.07.99
M.1551	AT&T Corp.	MediaOne Group., Inc			1	23.07.99
M.1561	Getronics N.V.	Wang Laboratories Inc.			1	15.06.99
M.1571	NEW HOLLAND N.V.	CASE Corporation			1	28.10.99
M.1578	Sanitec	Konink. Sphinx			2	03.08.99
M.1596	ACCOR S.A.	The BLACKSTONE Group	COLONY Capital Inc.	VIVENDI	1	08.09.99
M.1601	AlliedSignal	Honeywell			2	01.12.99
M.1628	Total Fina	Elf Aquitaine			2	09.02.00
M.1630	L'Air Liquide S.A.	The BOC Group plc.			2	18.01.00
M.1636	Matra Marconi Space	Astrium			2	21.03.00
M.1641	Linde AG	AGA AB			2	09.02.00
M.1650	ACEA S.P.A.	Telefonica			1	01.12.99
M.1663	Alcan Aluminium Ltd.	Alusuisse - Lonza Group AG			2	14.03.00
M.1671	Dow Chemical	Union Carbide			2	22.12.99
M.1672	Ab Volvo	Scania Ab			2	25.10.99
M.1673	Veba Ag	Viag Ag			2	04.02.00
M.1687	Adecco SA	Olsten 2			1	29.10.99
M.1693	Alcoa Inc.	Reynolds Metals Company			2	03.05.00
M.1741	MCI WorldCom	Sprint			2	28.06.00
M.1789	INA Holding GmbH & Co KG	LuK Group			1	22.12.99
M.1797	Bae Systems+ Investor AB	Celsius AB			1	04.02.00
M.1806	Novartis AG	AstraZeneca Plc.			2	26.07.00
M.1845	AOL	Time Warner			2	11.10.00
M.1853	Electricite De France	Oberschwäbische Elektrizitätswerke Beteiligungsgesellschaft			2	07.02.01
M.1871	Arrow Electronics Inc.	Tekelec			1	13.04.00
M.1879	The Boeing Company	Hughes Electronics Corporation (subs. General Motors)			2	27.09.00
M.1882	Pirelli Cavi e Sistemi S.p. A.	BICC General			2	19.07.00
M.1892	Sara Lee Corporation	Courtaulds Textiles plc			1	08.05.00

M.1956	Ford Motor Company	Autonova AB			1	24.05.00
M.1982	Telia AB	Oracle Corporation	Drutt Corporation		1	11.09.00
M.1990	Unilever PLC and Unilever N.V.	Bestfood			1	28.09.00
M.2020	Metsä-Serla Corporation	Modo Paper AB			1	04.08.00
M.2033	Svedala Industri AB	Metso Corporation			2	24.01.01
M.2041	United Airlines (UAL Corporation)	US Airways Group Inc.			1	12.01.01
M.2050	Vivendi S.A.	Canal+ S.A.	The Seagram Company Ltd.		1	13.10.00
M.2059	Siemens AG	DEMATIC	VDO	SACHS	1	29.08.00
M.2060	Robert Bosch GmbH	Mannesmann Rexroth AG			2	13.12.00
M.2097	SCA Mölnlycke Holding BV	Metsä Tissue Corp.			2	31.01.01
M.2116	Flextronics International Ltd.	Italdata S.p.A.			1	25.09.00
M.2187	Zellulosefaser Beteiligungs Gesellschaft mbH	Lenzing AG			2	17.10.01
M.2202	Stinnes AG (E.ON AG)	Holland Chemical International N.V.			1	04.12.00
M.2220	General Electric Corp.	Honeywell International Inc.			2	03.07.01
M.2283	Schneider	Legrand			2	10.10.01
M.2302	H.J. Heinz Company	CSM NV			1	23.02.01
M.2314	BASF AG	Pantochim S.A.			2	11.07.01
M.2333	Riverbank	Sofidiv UK Ltd.			2	25.07.01
M.2337	Nestlé S.A.	Ralston Purina Company			1	27.07.01
M.2389	Deutsche Shell GmbH	RWE AG			2	20.12.01
M.2416	Tetra Laval, S.A.	Sidel, S.A.			2	30.10.01
M.2421	UMG-Beteiligungs-GmbH	Temic Telefunken microelectronic GmbH			1	11.06.01
M.2434					2	26.09.01
M.2498	UPM-Kymmene	Haindlsche Papierfabriken KGaA			2	21.11.01
M.2499	Norske Skog	Parenco			2	21.11.01
M.2504	Cadbury Schweppes plc	Pernod Ricard S.A.			1	29.10.01
M.2510	Cendant Corporation	Galileo International, Inc.			1	24.09.01
M.2533	British Petrol plc (BP)	Veba Oil GmbH (E.ON)			2	20.12.01
M.2577	General Electric Capital Corporation	Heller Financial, Inc			1	23.10.01
M.2598	TDC Mobile International A/S	CMG Wireless Data Solutions B.V	MIGway A/S		1	04.10.01
M.2602	Gerling-Konzern Versicherungs-Beteiligungs AG	Nederlandsche Credietverzerkering Maatschappij Holding N.V.			1	11.12.01
M.2608	INA Holding Schaeffler KG	FAG Kugelfischer Georg Schäfer AG			1	18.10.01
M.2629	Flextronics International	Xerox Corporation			1	12.11.01

		Ltd.				
M.2659	Fortum Oyj	Birka Energi AB			1	10.01.02
M.2679	Electricité de France	TXU EUROPE	24 SEVEN		1	20.12.01
M.2693	Archer Daniels Midland Company	Alfred C. Toepfer International GmbH			1	11.02.02
M.2705	EnerSys Holdings Inc.	Energy Storage Business			1	04.03.02
M.2726	Koninklijke KPN N.V.	E-Plus Mobilfunk GmbH & Co. KG			1	07.03.02
M.2738	General Electric Company	Unison Industries Inc.			1	17.04.02
M.2796	Siemens AG	Aerolas GmbH			1	11.06.02
M.2801	RWE Aktiengesellschaft	Innogy Holdings plc			1	17.05.02
M.2804	Vendex KBB Nederland B.V.	Brico Belgium S.A.			1	18.06.02
M.2834	Alchemy Partners Ltd.	CompAir Business			1	17.06.02