

## The political economy of European merger control: evidence using stock market data

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

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## ABSTRACT

### **The Political Economy of European Merger Control: Evidence using Stock Market Data\***

by Tomaso Duso, Damien J. Neven and Lars-Hendrik Röller

The objective of this paper is to investigate the determinants of EU merger control decisions. We consider a sample of 164 EU merger control decisions and evaluate the anti-competitive consequences of these mergers from the reaction of the stock market price of competitors to the merging firms. We then account for the discrepancies between the actual decisions and what the stock market would have dictated in terms of the political economy surrounding the cases. Our results suggest that the commission's decisions cannot be solely accounted for by the motive of protecting consumer surplus. The institutional and political 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. Instead, the evidence suggests that other factors – such as country and industry effects, as well as market definition and procedural aspects – do play significant roles.

*Keywords: Merger Control, European Commission, Political Economy, Lobbying, Stock Market Data*

*JEL Classification: L4, K21, C25, D78*

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## ZUSAMMENFASSUNG

### **Die politische Ökonomie der europäischen Fusionskontrolle: Evidenz anhand von Aktienmarkt-Daten**

***"...it boils down to whether you trust the agencies or the stock market. I'll take the stock market any day..."<sup>1</sup>***

## 1. Introduction

The objective of this paper is to investigate the determinants of EU merger control decisions. We consider a sample of 164 EU merger control decisions and evaluate the anti-competitive consequences of these mergers from the reaction of the stock market price of competitors to the merging firms. We then account for the discrepancies between the actual decisions and what the stock market would have dictated in terms of the political economy surrounding the cases.

An economic evaluation of merger control decisions seems particularly timely given that the Court of first instance of the European Community has recently overturned three prohibition decisions that were taken by the EU Commission (in the *Airtours/First Choice*, *Tetra Laval/Sidel* and *Schneider/Legrand* cases). In those cases, the Court found that the Commission had not established that the merger was anti-competitive but also pointed to important weakness in the Commission's analysis. For instance, 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 Electrics/Honeywell* case, which is still under appeal. These developments might raise the suspicion that systematic errors may have been made by the Commission, at least with respect to pro-competitive mergers. Particular features of the Commission's procedure have been highlighted, which may contribute to these errors (see, for instance, Kühn (2002) for a comprehensive discussion). Among those, the Commission's relative openness to capture figures prominently. According to this claim, which has been endorsed by US antitrust authorities (see James, (2001)) in the context of the *GE/Honeywell* merger, influence - and in particular influence by competitors of the merging firms - can be brought to bear on the Commission.

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<sup>1</sup> Bruce Kobayashi, former economist at the US Federal Trade Commission (FTC) and Department of Justice (Antitrust Division) quoted in Fortune Magazine, April 14th, 1997.

Possible shortcomings of the EU merger control procedures that have been alleged in the context of the prohibition of seemingly pro-competitive mergers may have broader application. In particular, anti-competitive mergers, which are not prohibited (or properly amended), are often not subject to Court scrutiny or public debate. As a result less evidence is typically available on the occurrence of such alternative errors. Still, if the shortcomings of the Commission's procedure that have been raised in the context of prohibitions prove significant, they should equally matter for the potential clearance of anti-competitive mergers. These are systemic features which potentially apply to all cases and it would seem that competitors, as well as merging firms, might be able to exercise influence in order to seek clearance.

In sum, one may ask whether the EU merger procedures is prone to systematic errors and that the political economy of merger control may account for this. The paper provides evidence on the merits of this issue.

We consider a sample of some 164 mergers that have been reviewed by the EU and collect evidence on whether the stock market anticipated that these mergers were anti-competitive. We identify instances where the EU has prohibited mergers 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). We further investigate the source 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 (2002), in which the decisions of an antitrust agency are modeled in terms of the characteristics of the institutional environment in which it operates and the influences that firms can exercise.

Our approach to the evaluation of merger control decisions differs from the existing literature in important ways. The existing literature typically tries to account for merger decisions in terms of the competitive characteristics of deals and in terms of other variables, which control for the political economy environment. For instance, Coate and Mc Chesney (1992) evaluate whether the decision to refer merger cases by the FTC can be well predicted by the factors listed in the merger guidelines (and in particular the concentration indices).<sup>2</sup> Bergman et al. (2003) perform a similar exercise for a sample of 96 EU merger cases, trying to account for

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<sup>2</sup> See Khemani and Shapiro (1993) for a similar exercise on Canadian enforcement.

the decision to open a phase II investigation and the decision to prohibit in terms of the factors listed in the decisions.<sup>3</sup> This approach provides important insights and in particular provides a test of whether the antitrust authorities give appropriate weights to the factors that they regard as important ex ante (for instance in published guidelines) and to factors that would be regarded as relevant according to the economic theory (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, are not quantified and remain highly judgmental, this approach provides limited insights with respect to the overall quality of the decisions. For instance, one expects that in most phase II and prohibition decisions, the Commission will have found or asserted that barriers to entry were high, or will have couched its analysis in such a way that post merger market shares will be high. Hence, trying to account for decisions in terms of those factors provides a good test of the consistency of antitrust authorities (and their ability to recognize factors that will support negative findings) but may provide limited insights with respect to the overall quality of the competitive assessment.

Of course, the endogeneity of the factors listed in the decisions could be alleviated if the competitive assessment was undertaken by a body which is independent from the decision maker. In this respect, the US procedure may offer more scope, as independent evaluations<sup>4</sup> are undertaken by the bureau of economics and the bureau of competition, while decisions are made by a college of seven commissioner (whose appointment has a political dimension). Coate (2002) exploits this feature of the US procedure and his analysis of FTC's referral decisions is thus better suited 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 decisions and the weight that is given to the competitive evaluation undertaken by the bureaucracy. Such an approach would be difficult to implement in the European institutional framework where no independent evaluation is undertaken by the bureaucracy.

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<sup>3</sup> 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.

<sup>4</sup> Of course, the evaluation undertaken by these two bodies could itself be made to please their political masters and hence could also be partly endogenous.

Our approach differs from those in that we construct an alternative evaluation of the competitive consequences of the mergers reviewed by the EU. As discussed below, the evaluation that can be inferred from the stock market reaction suffers itself from significant shortcomings. However, the stock market approach has the advantage that it relies on an independent alternative assessment of the competitive consequences of the mergers against which the Commission's decision can be evaluated. It does not rely on the information provided by the Commission decisions, which is possibly incomplete and endogenous.

Our main findings are as follows. In terms of descriptive results our data suggest that the Commission made a 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 and is being appealed. 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 cannot be explained solely in terms of a motivation to protect consumer surplus. In other words, the institutional and political 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 factors – such as country and industry effects, as well as market definition and procedural aspects– do play significant roles.

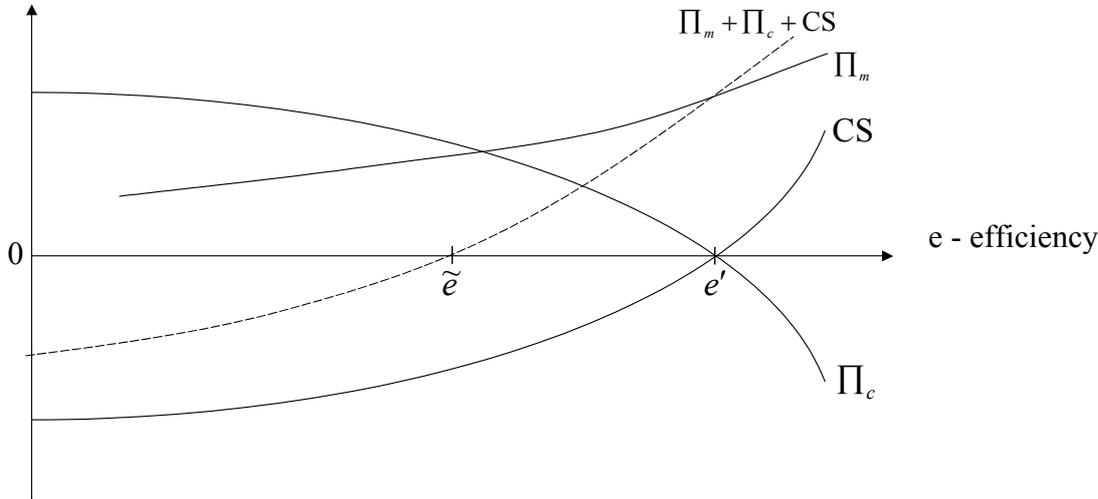
Section 2 presents our framework. We outline a prototype model of merger control in which the change in competitors' profit is an indicator of the merger's competitive consequences. Section 3 derives our econometric specification and formulates our hypothesis. Section 4 describes our data. Section 5 presents our econometric results. Section 6 concludes.

## 2. The Evaluation of Mergers through Reactions in Stock Prices

In order to assess the determinants of the performance of merger control, we need a measure of whether a merger is pro- or anti-competitive (i.e. increases or reduces consumer surplus). The empirical approach taken in this paper uses the stock market reactions for competitors' in order to assess the competitive effects of a merger. In particular, we classify a merger as pro-competitive whenever the impact of the merger on competitors' stock is negative. Conversely, a merger is presumed to be anti-competitive whenever competitors' stock benefit.

To illustrate 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**  
Profits and CS



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  $\Pi_m$ ); the *change* in the profit of competitors (all firms not involved in the merger, denoted  $\Pi_c$ ); 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,  $\tilde{e}$ , 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, in this framework, if a merger hurts competitors, it will benefit consumers and vice versa<sup>5</sup>.

The idea that mergers, which hurt competitors, will tend to be pro-competitive has long been recognized and has been first exploited by Eckbo (1983) and Stillman (1983). They propose to use the stock market reaction to the announcement of a merger (a so called “event study”) to evaluate the impact of the merger on competitors’ profits. A positive reaction will normally indicate that the merger is expected to enhance competitors’ profits and hence that it will be anti-competitive (and vice-versa). The change in the value of competitors’ equity can also be

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<sup>5</sup> Assuming that competitors are not hurt to such an extent that would prefer to exit the industry.

taken as a measure of the (discounted) additional profits that is expected to accrue to them as a consequence of the merger.<sup>6</sup>

In what follows, we will adopt the “event study” methodology and identify the competitive implications for consumers by the reactions in the equity of competitors on the first day where the merger was reported on in the international press (the “announcement” day). Before proceeding, however, we need to discuss the generality of the correspondence between the change in competitor’s profits and the change in consumer surplus – both in terms of underlying models of competition and empirical implementation. We begin with the underlying micro-structure.

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.<sup>7</sup> 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.

Note 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

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<sup>6</sup> 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. A recent paper by Aktas et al. (2003) also undertakes event studies for merging partners but consider a larger sample of cases (which partly overlaps with ours). They analyse 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.

<sup>7</sup> 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 imply 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.

whether a merger is pro- or anticompetitive, the sign of the change in consumer surplus is all we need.

Nevertheless, there are other situations where the identification of consumer surplus through competitors' profits may break down. The above framework focuses on unilateral effects in horizontal mergers.<sup>8</sup> However, conglomerate 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, it may also hurt consumers. For instance, consider a merger amongst firms selling complementary goods as a bundle (as in *GE/Honeywell* with avionics and engines). In this case, competitors will typically lose, even though consumers may gain or lose depending on particular features of demand. Similarly tied sales of substitute or independent goods (as in *Tetra Laval/Sidel* with carton machines and PET machines) will typically hurt consumers but may increase or decrease competitors' profits depending again on particular features of demand.

In sum, we observe that the correspondence between the change in consumer surplus and competitors' profits holds for a 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).

We now turn to the second main issue, which is the reliability of stock market data in identifying the impact of a merger on competitors.

There are several advantages to using stock market data. As already discussed above, the stock market is an independent assessment of the effects of a merger. It is not done by insiders and as a result can be viewed as exogenous to the decision. Second, stock market reactions are available whether the merger is allowed or not. 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 may not be feasible. Finally, relative to accounting data, stock market data are inherently 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.

However, there are also potential drawbacks of stock market data that have been explored in the literature. First, when participants in the stock market contemplate several possible mergers, the announcement of a particular merger will change the likelihood of many alternative configurations.<sup>9</sup> As a consequence, a change in the stock price of a firm not involved in the merger may reflect more the change in the likelihood of alternative mergers involving that firm rather than the consequences of the announced merger for its profit. First, the stock market reaction may reflect an "out of play" effect, if prior to the announcement, the market anticipated an increase in the value of the "competitor" in alternative merger configurations which become irrelevant when the merger is announced (see Stennek and Fridolfsson, 2001). 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). Second, the announcement of a merger may also induce an "in play" effects, 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. It is not clear however whether this later "in play" effect is important empirically; Salinger and Shuman (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. Overall, it is thus difficult to predict the direction of various potential "in and out of play" effects and it is

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<sup>8</sup> The correspondence would also hold with coordinated effects - which should increase the profits of competitors at the expense of consumers.

<sup>9</sup>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. (2003) 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 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.

unclear whether they matter. We therefore do not consider the issue further in our empirical work, while recognizing that it may be a source of measurement error.

Second, the quality of the information provided by event studies may be low. Even though the method is widely used,<sup>10</sup> it has also been subject to criticism (see, for instance, Ravenscraft and Scherer, 1987).<sup>11</sup> However, as confirmed by Schwert (1996), there is a lot of 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.<sup>12</sup> Using different samples of mergers, Ravenscraft and Pascoe (1989), Healy et al. (1992), as well as Kaplan and Weisbach (1992) all found 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. Overall, these studies show that the market predicts actual outcomes with some accuracy.

Besides the issue of consistency and efficiency of the stock market's anticipation of the consequences of mergers, the question also arises whether the information provided by the stock market is significant. Existing studies typically report that the announcement of mergers triggers relative large changes in stock market prices. This is confirmed by the recent study of Aktas et al. (2003) who consider the reaction to the stock market price of merging firms for a large sample of cases reviewed by the EU (which largely overlaps with our sample). The significance of the market reaction can be illustrated by looking at the absolute value of comparing the change in stock prices on the day of announcement with the absolute value of

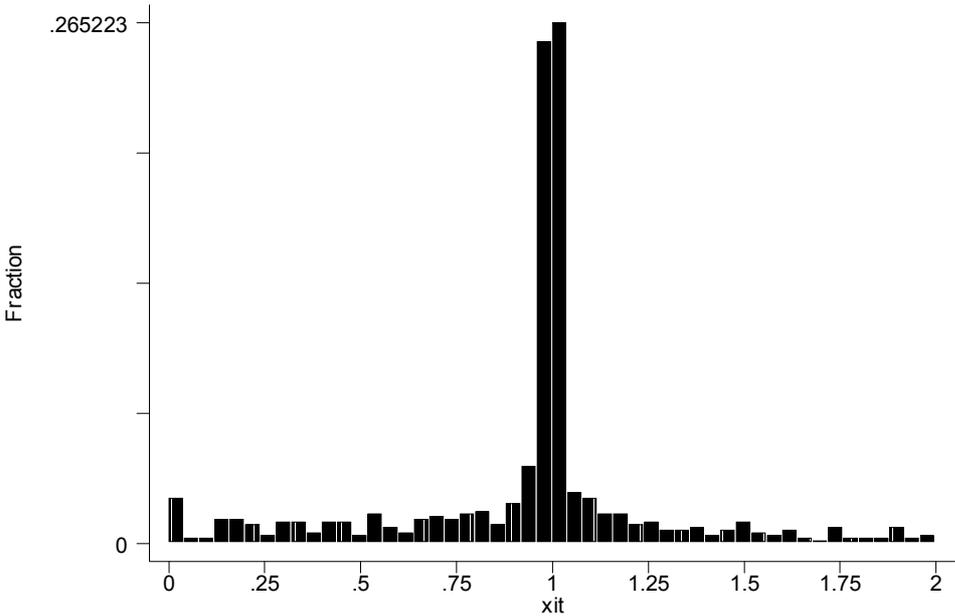
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<sup>10</sup> See for instance Pautler (2001) for a survey. If event studies are no longer used by US antitrust authorities in order to evaluate the anti-competitive consequences of particular mergers under review (as they were at one point in time), 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.

<sup>11</sup> Event studies are typically less reliable when the merger affects a small part of the firm being quoted.

the change of an appropriate stock market index on the same day. Indeed, one would expect a merger to trigger a large change relative to those induced by the news that moves the index (on average). Figure 2 provides some descriptive evidence on this: for each of the 164 merger cases in our sample, we have calculated the abnormal return on the day of announcement for both merging firms and competitors (using an appropriate index as a benchmark).<sup>13</sup> Figure 2 then reports the absolute value of the abnormal return as a proportion of the (percentage) change in the index. The average abnormal return relative to an index for the entire population of firms in our sample is about 40, which implies that the merger effect on firms' stocks is about 40 times larger than the change in the index. However, there are outliers. Considering only those firms for which the abnormal return relative to the index is smaller than 2 (this is about 89% of our population of firms), the average drops to about .95. Figure 2 plots the distribution of these proportional abnormal returns for the firms where it is less than 2.

**Figure 2. Abnormal returns relative to the index**



As can be seen, the average abnormal return as a proportion of the change in the index is around 1, indicating that the abnormal return is itself as large as the index. Overall, we

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<sup>12</sup> One should also note that these studies only consider merging firms. The reliability of the ex ante reaction to the stock market price of competitors has not, to the best of our knowledge, been investigated.

conclude that the merger announcements do have a sizable impact on firms' stock market prices.

### 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,

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

Let  $P$  be the actual decision taken by the agency, which is equal to 1 when the merger is cleared, and zero otherwise.<sup>14</sup> 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,

$$\begin{aligned} E1 &= 1 \text{ iff } P = 0 \text{ and } D = 1 \quad (\text{Type I error}) \\ E2 &= 1 \text{ iff } P = 1 \text{ and } D = 0 \quad (\text{Type II error}) \end{aligned} \tag{1}$$

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<sup>13</sup> The variable that we build is:  $x_{it} = \left| \frac{(\Delta R_{it}) - (\Delta I_{it})}{(\Delta I_{it})} \right|$ , where  $\Delta R_{it}$  is the percentage change in the stock price of firm  $i$  at time  $t$  and  $\Delta I_{it}$  is the percentage change in the corresponding index.

<sup>14</sup> 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 (2002), 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<sup>15</sup>.

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.

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<sup>15</sup> See also, for instance, Horn and Stennek, 2001, with regard to Nordic countries.

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,

$$E1 = \alpha_0 - \alpha_c \Pi^c - \alpha_m \Pi^m + \alpha_x X + \varepsilon_1 \quad \text{for } D=1 \quad [2]$$

$$E2 = \beta_0 + \beta_c \Pi^c + \beta_m \Pi^m + \beta_x X + \varepsilon_2 \quad \text{for } D=0 \quad [3]$$

where  $E1$  and  $E2$  are defined in [1],  $\Pi_m$  and  $\Pi_c$  are changes in profits due to the merger to the merging firms and the competitors, respectively.<sup>16</sup> Note that [2] specifies type I errors conditional on a merger being pro-competitive ( $D=1$ ) as  $E1$  can only occur when  $D=1$ . Similarly, [3] 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  $\Pi^c$  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 [2] and [3] includes several other important institutional and political economy variables (X) that may influence the anti-trust agency such as country and industry effects, market definition, as well as procedural issues. We will return to these variables in more details below.

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<sup>16</sup> 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 (2)-(3), this however only involves a scaling issue. There are up to 14 competitors identified in our sample (see Section 4). We have aggregated the returns of the competitors into a single

## 3.2 Hypothesis

Assuming that we can measure the variables and estimate [2] and [3] 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)**

$$\begin{array}{ll} \alpha_c > 0, \alpha_m > 0, \alpha_x \neq 0 & \text{type I} \\ \beta_c > 0, \beta_m > 0, \beta_x \neq 0 & \text{type II} \end{array}$$

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

**H3 (“listen to competitors more ”)**

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

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”)**  $\alpha_0 \neq 0, \beta_0 \neq 0$

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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.

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<sup>17</sup> 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. The opposite, however, is not true because the Commission's approach is asymmetric,<sup>18</sup> if the Commission finds that there is a competitive concern and that the

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<sup>17</sup> 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 for instance). 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.

<sup>18</sup> 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.

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 [2] and [3] 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  $\Pi_c$ . In other words, while a positive  $\Pi_c$  would always imply an anti-competitive merger, a negative  $\Pi_c$  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  $(\Pi_c, \Pi_m)$ . Recall that we need  $(\Pi_c, \Pi_m)$  to define  $D$ , as well as for estimation of [2] and [3]. However, we only observe  $(\Pi_c, \Pi_m)$  when  $P=1$ , i.e. when the merger actually takes place. Moreover, we also need to know what  $(\Pi_c, \Pi_m)$  would have been, when a merger is blocked. This is a censoring problem<sup>19</sup>.

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  $\Pi_c$  have the same sign (since  $p$  must be non-negative), which allows us to define  $D=1$  iff  $R_c < 0$ . 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  $R_c$  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. 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. Descriptive Results

Our sample includes all phase II mergers completed by the EU until the end of 2001, and a randomly matched sample of phase I cases, which run through the June 2002. A list of all cases and the decision dates are provided in Appendix 3. For each case, we have identified merging firms and competitors from the decision, as well as the date of the announcement from the financial press. For each firm (merging firm or competitor), we have computed the abnormal return<sup>20</sup> on the day of announcement as well as the abnormal change in the value of equity. We add the change in the value of equity across merging partners to obtain an aggregate measure of the value of merging firms. When several competitors are identified in the decision (as is often the case, in particular when several relevant markets are considered), we have added the change in the value of equity across firms to obtain the aggregate effects on competitors. Because of difficulties in identifying competitors or their stock, we end up with 73 phase II cases and 91 phase I cases for which we have complete information.

Table 1 reports the number of cases in our sample according to the decisions taken by the Commission and according to the stock market evaluation of their competitive consequences. We observe that 51 % of all cases are classified as pro-competitive. This implies that the

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<sup>19</sup> 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.

<sup>20</sup> See Appendix 2 for details on the construction of the variables.

distribution of efficiency gains across mergers has a median roughly equal to the level of efficiency that would ensure that consumers are benefiting ( $e'$  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 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<sup>21</sup> 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.<sup>22</sup> 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).<sup>23</sup> 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 1 distinguishes between different types of decisions depending on the article of the Merger Regulation that was applied. Unconditional clearance are associated with Article 6.1.b decisions in phase I, as long as they do not involve conditions, 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 known in EU jargon as undertakings, either in Phase (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

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<sup>21</sup> Assuming that the average is close to the median.

<sup>22</sup> The usual finding with respect to the creation of value for merging firms is broadly confirmed in our sample. We find 79 cases (out of 164) in which the merger creates value for the merging firms.

<sup>23</sup> 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.

assume that the stock market cannot anticipate the remedies<sup>24</sup>. 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 this perspective, our assumptions are thus conservative as they lead to fewer 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 1). Second, under our assumptions, remedies are not necessary in those mergers that the stock market anticipates as pro-competitive (top of Table 1). 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 thus 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.<sup>25</sup>

Table 1 indicates the frequency of type I and II errors. *Given* that a merger is anti-competitive, Table 1 shows that 34 cases (out of 80) are type II errors, some 42%. This implies that 42% of all anti-competitive mergers are cleared. On the other hand, *given* that a merger is pro-competitive, only 4.75% (4 out of 84) of the cases are blocked and involve strong type I errors. However, weak type I errors are observed in 47 out of 84 cases, or some 56%.

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 2 out of 84 pro-competitive cases.

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<sup>24</sup> 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 [2] and [3] 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.

<sup>25</sup> Note that there are only 4 strong type I errors. An econometric analysis using this alternative definition would be rather uninformative.

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 4 of the 14 (some 28%)<sup>26</sup>. 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 23 % of the cases (or 51% if we include the weak type II definition). This implies that both type I and II errors occur with similar probabilities: roughly one in four mergers that are cleared (or blocked).

## 5. Econometric Results

Estimation of equations [2] and [3] proceeds by splitting the sample into anti- and pro-competitive sub-samples, as defined by the dummy variable  $D$ . In particular, we estimate [2] 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  $EI=1$  when a pro-competitive merger is blocked or there are remedies. Similarly, equation [3] is estimated on the sample of anti-competitive deals.<sup>27</sup>

The explanatory variables that are available for each merger case are described in Table 3 with summary statistics provided in Table 2. As can be seen in Table 3, MGAINS denotes the expected change in the profit of the merging firms as measured through the abnormal return the day of the announcements, while CGAINS is the expected change in the profits of competitors.

There are also a number of other important variables that may explain EU decisions (see Table 2 and 3 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. We also include country and industry effects. BIG\_EU is a dummy that takes the value 1 if at least one of the merging company has its headquarter and main operation in one of the large EU countries (France, Germany, Italy, Spain or the UK). In terms of industries, we include dummies for NACE codes corresponding to “manufacturing”, “transport, storage, and

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<sup>26</sup> Excluding those cases where conglomerate effects were crucial, we get 2 out of 12 (some 17%).

<sup>27</sup> Alternatively, one can estimate equation [2] and [3] jointly – possibly allowing for correlation across equations- as a bivariate probit with sample selection, due to the definition of  $D$ .

communication”, as well as “financial intermediation”.<sup>28</sup> Finally, we introduce some variables that relate to procedure: a dummy variable (PHASE1) is 1 when a decision is taken in phase I, as well as a linear time trend (T).

The results are presented in Table 4. Considering weak type I estimation results first, it can be seen in Table 4, that the Chi-squared statistic is 23.49<sup>29</sup>, 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. We therefore reject H1 (benevolence).

Regarding the specific determinants, Table 4 shows that there is no evidence for hypothesis **H2** in our data. That is, we cannot reject the hypothesis that firms’ have no influence over the agency as far as weak type I errors are concerned. This is true for both competitors and merging firms. It appears that influence is not associated with firms’ rents.

While market definition is not statistically significant in terms of weak type I errors, procedural factors are important. The PHASE I variable indicates that the probability that a weak type I error occurs in phase II is more likely (p-value of 0.002). Table 5 reports the marginal effects of the explanatory variables. As can be seen the marginal impact of phase I is estimated at -0.411, which implies that the probability of a weak type I error is about 41% higher in phase II.

In terms of country and industry effects, the evidence is as follows. The effect of the BIG\_EU variable is statistically significant at an 11% level. In terms of magnitude, the estimates suggest that the bigger EU countries have a 21% lower chance of getting a pro-competitive deal curtailed (see Table 5). We also have industry effects. In particular, “transport, storage, and communication” industry has a significantly higher likelihood of getting a pro-competitive deal curtailed (p-value of 0.051).

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<sup>28</sup> 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.

<sup>29</sup> The Chi-squared statistic for testing  $H_0: \beta=0$  (not including the constant) and the significance level equals the probability that the  $\chi^2$  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.

The estimates in Table 4 further indicate that there is a systematic bias (hypothesis **H4**) as the constant in [2] is highly significant (p-value of 0.025). In other words, there is a persistent effect in favor of imposing unnecessary remedies or blocking pro-competitive mergers. In fact, the marginal impact is 0.52 (see Table 5), suggesting that other things being equal the probability of making this kind of error is 53%. This is indeed a large and significant effect. However, as indicated above, our method might wrongly classify mergers as pro-competitive in the presence of conglomerate effects.

In order to test whether the large and significant bias that we find in favor of curtailing seemingly pro-competitive mergers may not be associated with the presence of conglomerate mergers that we wrongly classified as pro-competitive, we identify those cases where the Commission has mentioned conglomerate effects as one of their leading arguments in support of the final decision. We then re-estimate [2] while assuming that those mergers do not involve an error (i.e. by setting  $EI=0$  for those cases where conglomerate effects play an important role such as in *Tetra Laval/Sidel* and *General Electric /Honeywell*). The resulting estimates are also in Table 4. As can be seen, most of the parameter estimates do not change<sup>30</sup>. In particular, the Chi-squared statistic is still 18.60. In other words, if we assume that mergers in which the Commission has identified conglomerate effects do not involve an error, we still cannot reject that the hypothesis that the Commission makes systematic errors in imposing unnecessary remedies or blocking pro-competitive mergers.<sup>31</sup>

Turning to the analysis of type II errors, we again find evidence that the decisions by the commission are not consistent with those that would have been taken by a benevolent agency making random errors (the Chi-squared statistic is 41.65). As far as hypothesis **H1** is concerned we reject benevolence with over 99% probability. Moreover, we cannot reject the hypothesis that firms have no influence over the agency as far as type II errors are concerned (hypothesis **H2**). As for the weak type I analysis, neither the merging firms nor the competitors are significantly related to type II errors. Interestingly, there is only weak evidence of a systematic bias (hypothesis **H4**) in type II errors, suggesting that dominance and the treatment of efficiency may not induce a systematic deviation away from the protection of consumers.

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<sup>30</sup> The  $BIG\_EU$  and the Phase I effects become smaller. Interestingly, the time trend becomes significant and the sign indicates that the likelihood of type I errors decreases over time.

<sup>31</sup> If instead of assuming that conglomerate mergers do not involve errors, we simply remove these cases from the sample, we obtain similar conclusions.

There are several other variables that characterize the merger process that are significant in explaining type II errors. Amongst those variables is the market definition that is used in a given merger. As can be seen in Table 4, a market definition that is national (as opposed to EU or World) significantly lowers the probability of an anti-competitive merger being cleared. Moreover, the marginal impact of a market definition that is national is estimated at some  $-0.60$ , which implies that an anti-competitive merger that was subject to a national market definition has a 60% lower chance of being cleared (see Table 5). The observation that the Commission is more likely to identify anti-competitive effects when market definition is national is consistent with the view that its geographic market definition is unduly narrow; indeed, in the presence of a such a bias, anti-competitive effects for mergers that were marginal in terms of market definition but evaluated at the national level will be overestimated relative to the anti-competitive that are found in broader markets. This will lead to a higher probability of finding anti-competitive in national markets (as observed in our data).

Country of origin effects are also statistically significant. If a merger involves a least one firm that is located in one of the four big EU member states (France, Germany, Italy, Spain, UK) an anti-competitive merger is more likely to make it through regulatory approval (p-value of 0.09, see Table 4). Moreover, the marginal impact of BIG\_EU according to our data is rather large (see Table 5), with the probability increased by some 26%.

Besides country effects, the findings in Table 4 indicate that industry effects play a major role. In particular, the “manufacturing” and the “financial intermediation” industries show statistically significantly lower levels of type II errors (p-values of 0.006 and 0.045, respectively). This suggests that the likelihood of getting an anti-competitive merger cleared is some 48% lower whenever a merger is in the manufacturing sector (see Table 5).

There are also significant factors relating to process. A variable that turns out to be very significant and large in magnitude is PHASE1, i.e. whether a merger is decided in phase 1 or phase 2. As expected, the estimates in Table 4 confirm that significantly more type II errors are made in phase 1. Table 5 indicates that the probability of waving an anti-competitive merger through is some 72% larger in phase 1. This is indeed a very high price to pay for a fast decision. Given the limited resources available at the Commission and the increased number of notifications, it is thus hardly surprising the number of type II errors has increased.

This observation is further explained by the significance of the time trend T (see Table 4), which may just represent an increased workload coupled with a relatively higher proportion of cases necessarily being decided in phase I. The recent reform plans discussed in the so-called Green Paper envisages an increase in the effective length of phase II. Our results suggest that extending the time and resources allocated to phase I, or alternatively opening phase II investigations more frequently, would be desirable.

In sum, we find some evidence that the decisions by the Commission are not in line with a benevolent agency would have done. However, we find no evidence in support of the claim that the commission is influenced by firms, either the merging firms or by competitors. Instead, the evidence suggests that other factors – such as country and industry effects, as well as procedural aspects – do play a role.

## 6. Conclusion

The objective of this paper is to investigate the determinants of EU merger control decisions. We consider a sample of some 164 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) as well as instances where the EU has imposed remedies on seemingly pro-competitive deals (weak type I errors) and 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 and is being appealed.<sup>32</sup> 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).

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<sup>32</sup> As discussed above, the evidence regarding *Airtours/First Choice* is more telling as the other two cases involved conglomerate effects.

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 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 factors – such as country and industry effects, as well as market definition – 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 72% 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.

## 7. References

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**Table 1. Decisions and Competitors' Gains**

	PHASE I		PHASE II			
	6.1.b	6.1.b with remedies	8.1.	8.2.	8.3.	
Negative Gains (pro competitive)	28	20	9	23	4	84
Positive Gains (anti competitive)	27	16	7	20	10	80
	55	36	16	43	14	164

**Table 2. Summary Statistics**

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>
BLOCK	164	0.0854	0.2803
CLEAR	164	0.4329	0.4970
REMEDIES	164	0.4817	0.5012
PHASE1	164	0.5549	0.4985
PHASE2	164	0.4451	0.4985
PROCOMP	164	0.5122	0.5014
ANTICOMP	164	0.4878	0.5014
WTYPE I	84	0.2142	0.4994
STYPE I	84	0.0476	0.5595
TYPE II	80	0.4350	0.4975
CGAINS2	164	1.2212	35.9017
MGAINS2	164	-0.2525	13.3765
BIG_EU	164	0.6524	0.4777
SMALL_EU	164	0.1951	0.3819
NATIONAL	164	0.3293	0.4714
EU	164	0.4207	0.4952
D	164	0.6585	0.4757
I	164	0.1159	0.3210
J	164	0.0549	0.2284
WORLD	164	0.2195	0.4152
T	164	82.5000	47.4868

**Table 3. Definition of Variables**

Variable	Definition
<b>Decisions</b>	
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
<b>Gains from merger</b>	
CGAINS ( $\Pi_c$ )	Gains from mergers for the competitors <sup>a</sup> . Cumulative change in stock market value (relative to an index) for the competitors on the day around the first announcement date of the merger in the international press. The value is expressed in million 1995 constant Euro.
MGAINS ( $\Pi_m$ )	Gains from mergers for the merging parties. Cumulative change in stock market value (relative to an index) for the merging parties on the day around the first announcement date of the merger in the international press. The value is expressed in million 1995 constant Euro.
<b>Competitiveness Assessment</b>	
PROCOMP	Dummy = 1 if the merger was pro-competitive (CGAINS < 0)
ANTICOMP	Dummy = 1 if the merger was anti-competitive (CGAINS > 0)
<b>Commission's errors</b>	
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 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
<b>Geographic dummies</b>	
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)
<b>Geographic and product market <sup>b</sup></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"
I	Dummy = 1 if the relevant product market is "transport, storage and communication"
J	Dummy = 1 if the relevant product market is "financial intermediation"
<b>Temporal variables</b>	
T	Time trend

<sup>a</sup> The competitors are those recognized as such in the Commission's report. <sup>b</sup> The product markets are defined according to the NACE codes.

**Table 4. Probit Estimation of Equation [2] and [3]**

	WTYPE 1 Errors		WTYPE 1 Errors Conglomerate Correction		TYPE 2 Errors	
	Coeff.	P-Values	Coeff.	P-Values	Coeff.	P-Values
CONSTANT	1.3597	0.0255	1.0217	0.0826	-1.1395	0.1180
CGAINS	-0.0008	0.9169	0.0013	0.8592	-0.0441	0.2022
MGAINS	0.0118	0.3595	0.0185	0.2813	0.0524	0.2841
NATIONAL	0.1702	0.7073	0.1303	0.7628	-1.7158	0.0134
EU	-0.3397	0.4240	-0.0733	0.8601	-0.0387	0.9414
BIG_EU	-0.5370	0.1117	-0.2567	0.4321	0.7274	0.0980
PHASE I	-1.0483	0.0021	-0.5679	0.0852	2.0463	0.0000
T	-0.0053	0.1126	-0.0055	0.0961	0.0114	0.0216
D	0.1797	0.5890	-0.3048	0.4034	-1.3859	0.0060
I	1.5025	0.0509	1.2915	0.0810	0.3278	0.6617
J	-0.5079	0.5209	-0.7975	0.3216	-1.8303	0.0449
Observations	84		84		80	
Log Likelihood	-45.88187		-48.83071		-33.72439	
Chi-squared	23.49168		18.59676		41.64796	
Significance level	0.0091		0.0457		0.0000	
Correct Predictions	72.62 %		66.67 %		77.50%	

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 type1 and type2. The Gains Variables are corrected for p, 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, MGAINS, CGAINS, NATIONAL, EU, BIG\_EU, D, I, J, T.

**Table 5 - Marginal Effects**

	WTYPE 1 Errors		WTYPE 1 Errors Correcting for conglomerate		TYPE 2 Errors	
	Coeff.	P-Values	Coeff.	P-Values	Coeff.	P-Values
CONSTANT	0.5330	0.0237	0.4061	0.0837	-0.4025	0.1082
CGAINS	-0.0003	0.9169	0.0005	0.8592	-0.0156	0.1366
MGAINS	0.0046	0.3601	0.0074	0.2798	0.0185	0.2912
NATIONAL	0.0667	0.7073	0.0518	0.7627	-0.6061	0.0128
EU	-0.1332	0.4239	-0.0292	0.8601	-0.0137	0.9415
BIG_EU	-0.2105	0.1124	-0.1020	0.4319	0.2569	0.1010
PHASE I	-0.4109	0.0021	-0.2257	0.0849	0.7228	0.0000
T	-0.0021	0.1140	-0.0022	0.0957	0.0040	0.0194
D	0.0704	0.5891	-0.1211	0.4030	-0.4895	0.0066
I	0.5889	0.0496	0.5133	0.0819	0.1158	0.6565
J	-0.1991	0.5214	-0.3169	0.3211	-0.6465	0.0509

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).

## 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  $\Pi_c$ . In other words, we need to show that the impact of the merger on *CS* and  $\Pi_c$  is such that  $CS > 0$  if and only if  $\Pi_c < 0$ . As is shown by Farrell 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<sup>33</sup>. 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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<sup>33</sup> We use the symbol " $\ll$ " 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.<sup>34</sup> 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.<sup>35</sup> For all these cases (200 in total) we collect information on the merging firms (such as name, location, world-wide and EU-wide turnover<sup>36</sup>), 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 number of shares ( $S_{it}$ ) of all firms  $i$  (merging and competitors) for the two dates  $t$  and  $t-1$ . In addition, we also collect information about a market index ( $I_{i,t}$ ) for the sector and country that firm  $i$  belongs to.<sup>37</sup>

Based on this data, we construct the “gains from mergers” for both merging firms as well as competitors. In particular, the cumulative return to the merging firms are calculated as follows,<sup>38</sup>:

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<sup>34</sup> The last phase II case in our database is M.2533 - BP / E.ON (final decision on 20.12.2001).

<sup>35</sup> 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).

<sup>36</sup> 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).

<sup>37</sup> 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.

<sup>38</sup> Several methods can be used to compute abnormal returns. Some authors estimate a Capital Asset Pricing Model (CAPM) equation 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 about 100 days around the announcement. Abnormal returns before the announcement are then computed as the difference between actual returns and the predicted returns obtained from the estimated equation. For the part of the window which follows the announcement, a symmetric procedure is used (such that a second CAPM equation is estimated on a sample which immediately follows the windows and use to compute normal returns during the second part of the window). Abnormal returns are then cumulated over the span of the window to obtain a cumulated abnormal return. A much simpler approach can be followed, in which the abnormal return is simply computed at the difference between the return on the stock and the return on an appropriate index on the day of announcement. Given the difficulty in obtaining unbiased parameter estimates in CAPM equations (in particular when the stock

$$\Pi_m = \sum_i^M \left( \frac{\Delta R_i}{R_{i,t-1}} - \frac{\Delta I_i}{I_{i,t-1}} \right) * R_{i,t} * S_{i,t}$$

while for the competitors we use,

$$\Pi_c = \sum_i^C \left( \frac{\Delta R_i}{R_{i,t-1}} - \frac{\Delta I_i}{I_{i,t-1}} \right) * R_{i,t} * S_{i,t}.$$

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  $\Pi_c$  and  $\Pi_m$ , such that we end up with 91 phase I cases and 73 phase II cases<sup>39</sup>. We are therefore left with final sample of 164 merger cases.

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accounts for a significant proportion of the index), we have adopted this simpler approach. There is also some evidence (see Brown et al. (1985)) that the simple measure of abnormal returns that we use tend to be highly correlated with more sophisticated measures.

<sup>39</sup> 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 <sup>1</sup>			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 <sup>1</sup>	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	Carsberg 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
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