The Efficiency of EU Merger Control During the Period 1990–2008[*]

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Abstract

The main goal of this paper is to empirically test the function of European merger control in light of the 2004 regulatory reform, which was expected to introduce a more efficient regulatory framework for the assessment of mergers within the EU. We use stock market data to identify cases where there are discrepancies between the European Commission's decisions compared to market evaluations of the mergers in question. Using the PROBIT model, these cases are further investigated to discover the sources of these discrepancies.

In line with previous studies, our results suggest that the discrepancies are caused by procedural and institutional factors. Nevertheless, the regulatory reform introduced in 2004 has, to some extent, enhanced the efficiency of European merger control in the sense that the Commission's assessments of mergers under the new regulation are more consistent with the market evaluations. We found that the probability of an anti--competitive deal being cleared decreases significantly under the new regulatory framework. Nevertheless, the occurrence of unnecessary remedies has not decreased as the result of the new merger control system.

To the authors' best knowledge, this paper is the first study using stock market data to evaluate the recent reform of European merger control.

1. Introduction

European merger control dates back to the Treaty of Rome of 1957, which created the European Economic Community and its main institutions. Although merger control was not explicitly mentioned in the Treaty, the competition rules set out in Article 81 (formerly Article 85) and Article 82 (formerly Article 86) of the Treaty prohibited the abuse of a dominant position and to some extent also dealt with anti-competitive agreements which may have an appreciable effect on trade between Member States and which prevent, restrict or distort competition in the Single Market.

While initially both Articles 81 and 82 might have been applied to mergers only in a limited way, they still allowed some degree of influence by the European Commission over potentially very unattractive mergers (see Lyons, 2008). The Com-

mission did not obtain real merger control authority until 1989, when the main legislative text for merger regulation – the European Community Merger Regulation (ECMR) – appeared. This was viewed as one of many measures necessary to facilitate the development of a single European market (Vickers, 2004).

The ECMR gave the Commission vast power to enforce competition policy in the EU. All planned mergers of large companies that have significant business activities in the Member States have to be submitted for approval by the Commission.[1] The Commission then evaluates the proposed combination in a short proceeding known as a Phase I investigation. If the Commission finds the proposed merger to be generally compatible with the rules of the Common Market, it either approves the merger (Article 6.1. of the ECMR), or approves it with some conditions and obligations (Article 6.1.b). Otherwise, the Commission starts a more detailed Phase II investigation that can again result in the merger being approved (Article 8.1.), being approved with remedies (Article 8.2.) or being blocked (Article 8.3.). If the Commission finds the merger unacceptable and prohibits it, the decision is final unless it is revoked by the Court of First Instance (CFI). The decision of the CFI may come two or three years after the Commission decision and, given the delay, is likely to be irrelevant for the companies originally interested in merging.[2] Therefore, the Commission has an enormously strong bargaining position for enforcing various commitments by the merging companies (in comparison with its US and UK counterparts).[3]

In addition, the importance of the Commission is increasing with regard to the number of merger proposals it now evaluates. During the early years of merger control, the Commission yearly evaluated only a few merger cases, while in 2007 the number of cases evaluated exceeded 400 (see *Table 1*).

With the increasing number of cases evaluated, the confidence of the Commission in the adequacy of its decisions has risen too. The number of merger cases charged with some form of remedy rose significantly and the number of prohibited mergers reached its maximum in 2001, when five mergers were blocked. A major shock came, however, in 2002, when the CFI reversed three of those controversial decisions, raising serious concerns about the inadequate economic analysis and procedural weaknesses of the Commission's evaluation methods (Lyons, 2008).[4]

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[1] According to Article 1(2) of the ECMR, a concentration is deemed to have a Community dimension when (i) the combined aggregate worldwide turnover of all the undertakings concerned exceeds EUR 5 billion; and (ii) the Community-wide turnover of each of at least two undertakings concerned exceeds EUR 250 million, unless each of the undertakings concerned achieves more than two-thirds of its aggregate Community-wide turnover within one and the same Member State. For credit and financial institutions the turnover thresholds are replaced by consideration of financial income sources (i.e., interest income, income from securities) while for insurance companies turnover is replaced by gross premium written; see Turnover Calculation Notice, paragraphs 56–57.

[2] For example, the *Airtours/First Choice* case took almost three years from Commission decision to CFI final judgment. In another highly controversial case – *GE/Honeywell* – the CFI judgment came almost five years after the merger notification.

[3] For a detailed comparison of different regulatory practices see, for instance, Röller et al. (2000).

[4] According to CFI judgments, the Commission did not conduct a sufficiently rigorous economic analysis of the incentives for and ability to coordinate behavior in *Airtours/First Choice*, and it failed to take account of the different degree of competition in each of the national markets in the *Schneider/Legrand* case. In *Tetra Laval/Sidel*, the Commission's concerns over leveraging market power between two otherwise separate markets could not be legally justified. In addition, the CFI criticized the Commission for a low standard of proof and unnecessary structural remedies.

Table 1 EU Merger Cases, Sep 1990 to Dec 2008

	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	Total 90–08
FIRST PHASE DECISIONS																				
Art 6.1 (a) out of ECMR scope	2	5	9	4	5	9	6	4	4	1	1	1	1	0	0	0	0	0	0	52
Art 6.1 (b) compatible	5	47	43	49	78	90	109	118	196	225	278	299	238	203	220	276	323	368	307	3472
Art 6.1 (b) compatible with commitments	0	3	4	0	2	3	0	2	12	16	26	11	10	11	12	15	13	18	20	178
Art 6.1 (c) Phase II initiated	0	6	4	4	6	7	6	11	11	20	18	21	7	9	8	10	13	15	10	186
Total Phase I	*7*	*61*	*60*	*57*	*91*	*109*	*121*	*135*	*223*	*262*	*323*	*332*	*256*	*223*	*240*	*301*	*349*	*401*	*337*	*3888*
SECOND PHASE DECISIONS																				
Art 8.1 compatible	0	1	1	1	2	2	1	1	3	0	3	5	2	2	2	2	4	5	9	46
Art 8.2 compatible with commitments	0	3	3	2	2	3	3	7	4	7	12	9	5	6	4	3	6	4	5	88
Art 8.3 prohibition	0	1	0	0	1	2	3	1	2	1	2	5	0	0	1	0	0	1	0	20
Total Phase II	*0*	*5*	*4*	*3*	*5*	*7*	*7*	*9*	*9*	*8*	*17*	*19*	*7*	*8*	*7*	*5*	*10*	*10*	*14*	*154*
Other Decisions	*1*	*1*	*2*	*3*	*3*	*3*	*4*	*8*	*14*	*13*	*6*	*7*	*18*	*8*	*11*	*6*	*4*	*4*	*6*	*122*
TOTAL	**8**	**67**	**66**	**63**	**99**	**119**	**132**	**152**	**246**	**283**	**346**	**358**	**281**	**239**	**258**	**312**	**363**	**415**	**357**	**4164**

Source: European Commission

The Court opined that regulations were needed to introduce a "more economic approach" into the Commission's appraisal procedures, a concept already recognized in a Green Paper (2001).[5] The reform process culminated in 2004, when a new ECMR, together with guidelines for the assessment of horizontal mergers, was introduced.

In terms of the procedural and institutional changes, the new framework preserves the so-called "one-stop shop"[6] rule, but it also makes it easier for national authorities to take part in the decision-making process in merger cases that significantly affect competition within their member states. It also gives the Commission more time to cope with the increasing workload: new pre-notification rules have been put in place and both the Phase I and Phase II investigation durations have been extended moderately and made more flexible.[7] The new office of Chief Economist created within the Competition Directorate General, together with the newly established European Advisory Group on Competition Policy (EAGCP), should provide a more economic approach to the Commission's analysis.

The core of the reformed ECMR is a new prohibition criterion (SIEC)[8], which replaces the old dominance test and gives the Commission more "maneuvering space" for merger appraisals.[9] The newly published Horizontal Merger Guidelines (HMR)[10] should provide guidance on how the Commission assesses horizontal mergers and is in line with the modern economic theory of industrial organization. Among other things, the HMR explicitly differentiates between coordinated and non-coordinated effects, thus closing the existing enforcement gap in cases of oligopoly markets where mergers would have anti-competitive effects without creating or fostering dominance. On the other hand, the Guidelines also explicitly list the potential countervailing factors that can result in merger approval despite the market dominance of merging parties, thus giving merger parties more scope for defense against potential rejections from the Commission.[11]

The key goal of the new legislation was to provide a more transparent, efficient and "consumer oriented" approach in line with the competition criteria applied in the US and UK. The aim of this paper is to empirically test the quality of EU merger control in the last two decades and to provide an insight into the effects of the 2004 reform on the overall efficiency of the new merger regulation. We use stock

[5] See the Green Paper on the Review of Council Regulation (EEC) No 4064/89, COM (2001) 745/6 final, 11/12/2001.

[6] Under the "one-stop shop" rule, national authorities cannot carry out a competition review where the Commission has jurisdiction, and a decision by the Commission covers the whole EU.

[7] Phase I has been prolonged to a maximum of $25 + 35 = 60$ working days (formerly 10 weeks), while Phase II can currently take up to $90 + 20 + 15 = 125$ working days (formerly four months).

[8] SIEC stands for Significant Impedance of Effective Competition and is defined in Article 2 (3) of the ECMR as "*A concentration which would significantly impede effective competition, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared incompatible with the common market.*"

[9] While in the old test dominance could be considered a necessary condition for merger prohibition, the dominance criterion in the new test is incorporated only as an example of how concentration can impede effective competition.

[10] Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2004/C 31/03).

[11] For more details on the desirability of an efficiency defense in merger control, see Lagerlöf and Heidhues (2005).

market data to identify merger cases that the market expected to hurt (anti-competitive) or benefit (pro-competitive) consumers. We then compare this information with the real decisions made by the Commission and identify discrepancies between the assessment of the market and that of the regulator, i.e., instances in which the Commission blocked pro-competitive mergers or approved anti-competitive mergers. Consequently, we run a simple regression model to find the main factors driving the occurrence of these discrepancies and we test for significance in the effects of the recent regulatory reform on the data.

2. Literature Overview

The event study approach, using the movements of stock prices to assess the effect of a particular event on a firm's value, was first applied by Dolley (1933), then further developed mainly by Ball and Brown (1968) and later by Fama et al. (1969). A significant share of the event study research has focused on the ability of mergers to create value for shareholders of merging parties; see Andrade et al. (2001) for an extensive overview of M&A research.

Considerably less attention has been given to applications of this methodology for competition policy purposes. Such an analysis first appeared in Eckbo (1983), who evaluated 259 US mergers, of which 79 were challenged by the antitrust authorities. Eckbo examines movements in the share prices of competitors to see whether they supported the anti-competitive nature of the mergers and found they did not. According to his results, challenged mergers had been based on synergistic effects rather than increases of market power and potential collusive behavior. Stillman (1983) conducts a smaller study with a similar aim where the results were consistent with those of Eckbo. Both studies find a lack of significant statistical evidence from stock price movements to support referral to the antitrust authorities on competition grounds.

The first study using the event study method to examine EU merger control, conducted by Brady and Feinberg (2000), analyzes the effect of particular news on EU merger procedures, for instance regarding decisions to open Phase II investigations. They focused on stock market reactions to news of the merging parties and found that enforcement of the merger regulation has a substantial effect on individual company stock values.

Neven and Röller (2002) analyze 100 EU merger cases from the first ten years of EU merger control in order to explore the main factors that may account for discrepancies between the Commission's decisions and the reactions of the stock market. Using a simple correlation analysis, they found that discrepancies could be associated with the political economy of merger control, that discrepancies are more frequent in Phase I investigations and when large countries are involved, and that competitors may play an important role in favor of anti-competitive deals.

Bergman et al. (2003) use the insights of Coate and McChesney (1992) in analyzing EU merger cases and trying to account for decisions to open a Phase II investigation and decisions to prohibit a merger in terms of the factors listed in the final documentation. They test whether the Commission gives appropriate weight to factors regarded as important ex ante (for instance published in merger guidelines) and to factors regarded as important by economic theory (market shares, barriers to entry, etc.).

Duso et al. (2005) analyze the stock market's ability to identify potential anti-competitive effects and remedial provisions on transactions assessed by the Commission. They find that the market seems able to predict the effectiveness of the remedies applied in Phase I and to produce good estimates prior to Phase II clearances and prohibitions, but not remedies.

Duso et al. (2007) follow Eckbo (1983) and Stillman (1983) in order to identify "errors" in the Commission's merger decisions in the period 1990–2002. They rely on the theoretical framework from Farell and Shapiro (1990), using a unique correspondence between changes in profits of competitors and consumer welfare to identify anti-competitive mergers. They further apply the theoretical framework from Neven and Röller (2005), according to which an antitrust agency maximizes its own utility and third parties (firms, governments, etc.) can affect its utility, and they build a regression model to analyze the determinants of the Commission's decision making. Their results suggest that the Commission's decisions cannot be solely accounted for by the motive of protecting consumer welfare. Instead, they suggest that other factors – such as country and industry effects, as well as market definition and procedural aspects – affect the decision making of the EU antitrust agency.

Last but not least, Aktas et al. (2007) use an event study approach to evaluate the hypothesis that the EU merger regulation is protectionist. They analyze whether the market considers the prospect for regulatory intervention in its initial assessment of proposed mergers and test whether the Commission is biased against mergers involving non-EU firms. They conclude that for mergers initiated by foreign bidders, the probability of regulatory intervention was increasing with the magnitude of (negative) stock returns of European competitors around the merger announcement date.

Clearly from this review, merger control in the European Union is becoming an increasingly popular topic of empirical research, mainly due to the availability of relevant data. Nevertheless, none of the current studies assesses the most recent EU merger cases in light of the effects of the 2004 regulatory reform. In addition, most of the studies focus on a particular empirical question, while we apply a more holistic approach that provides an insight into the overall efficiency of EU merger control, as described further below.

3. Methodology

In our research, we follow the approach used by Duso et al. (2007), but we apply a slightly different (and in our view more appropriate) methodology for calculating abnormal returns and for the subsequent calculation of competitors' gains from the merger. In addition, we use a different method for estimating the marginal effects of dependent variables in our model, a method that is better suited to PROBIT models with dummy right-side variables. The main contribution of this paper is that we constructed a unique sample of 161 horizontal mergers evaluated by the Commission between 1990 and 2008. Our sample offers an opportunity to gain the first insight into the effects of the recent EU regulatory reform on proposed mergers. Note that none of the previous studies worked with merger cases evaluated after 2002.

Our methodology can be divided into four main steps. In the first step, we provide some rationale behind the evaluation of a merger's competitive effects using changes in the market value of competitors. In the second step, we create a repre-

sentative sample of horizontal mergers using publicly available information from the Commission's website and collect information about mergers and relevant competitors in our sample. In the third step, we use stock market data to calculate the abnormal change in the market value of competitors around the merger announcement date. This information is then used to identify the market's assessment of the competitive effects of the mergers in our sample and to recognize cases where there are discrepancies between the market's and the Commission's evaluation of the merger, i.e., cases where the Commission had prohibited mergers that the stock market regarded as pro-competitive as well as instances where the Commission had failed to prevent anti-competitive mergers. In the last step, we specify our econometric model using findings from the previous studies and we apply PROBIT regression to investigate the sources of the discrepancies between the market's and the Commission's evaluation of mergers, with a particular focus on the effects of the 2004 reform on the occurrence of these discrepancies.

3.1 Step 1: Merger Assessment Using the Event Study Approach

In order to evaluate the merger decisions of the Commission, we need to compare these to some independent criterion. In contrast to US antitrust procedures, where independent evaluations are undertaken by both the Federal Trade Commission and the Antitrust Division of the Department of Justice, the EU merger regulation does not offer any alternative institutional assessment and the Commission is solely responsible for the whole appraisal process. Instead, we use the stock market view on the expected effects of the merger on competitors to evaluate the merger's competitive effects.

In particular, we look at the effects of the merger announcement on share prices of competitors to assess the aggregate welfare changes resulting from the merger. This method relies on the theoretical framework developed by Farell and Shapiro (1990) showing that under some general assumptions there is a clear correspondence between the effects of horizontal mergers on consumers and competitors, i.e., if a merger results in increased profits of competitors, it will harm consumers and vice versa.

The main advantage of this approach is that we have an independent assessment of the merger's competitive effects which we can compare with the Commission's decisions. Moreover, we observe stock market reactions on the day of the announcement irrespective of whether the merger is approved by the Commission in the end. We thus avoid the censoring problem, as we can include in our sample cases where the merger was blocked by the Commission.[12]

The main disadvantage of this approach is that we need to rely on the ability of the stock market reaction to provide a timely and unbiased estimate of the firm's change in profit, even though that estimate may not be very precise. This assumption is closely connected to the semi-strong version of the efficient market hypothesis (EMH) (Brealey and Mayers, 1995). The empirical evidence of the EMH has a long

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[12] However, censoring is not fully eliminated, as we naturally need to exclude from our sample all cases where relevant competitors, or their parent companies, are not publicly listed. Another censoring problem may arise due to sample selectivity of EU merger data. Note that we cannot collect relevant information for withdrawn cases, cases with no documentation, and the cases that were resolved in the "simplified procedure" under the new ECMR. We thus recognize potential censoring problems in our analysis, but it should be noted that none of these issues has been tackled in any of the previous studies.

history and there are literally hundreds of finance papers confirming the general conclusion that developed stock markets are semi-strong efficient, although the general belief in the efficiency of stock markets has been seriously undermined by the recent financial crisis. In addition, there is a question about the ability of studies using stock market reactions of competitors to distinguish between the expected anti-competitive effects of a merger and the other information revealed by the stock reaction, such as changes in the likelihood of future market configuration.[13]

3.2 Step 2: Selection of Merger Cases and Identification of Relevant Competitors

First, we have to select a sample of suitable merger cases for our analysis. We use publicly available information from the Commission's website.[14] Given the large number of cases evaluated by the Commission (a total of 4,164 by the end of 2008) and the time intensity of the data collection process, we applied the following selective approach. We start with all 154 Phase II cases from the beginning of 1990 until October 2008. We have to exclude some of the most recent cases because of unavailability of Commission reports. We also exclude all the cases that the Commission considered to be of a purely vertical or conglomerate nature.

We then start with the identification of relevant competitors. One option, widely used in older studies focusing mainly on antitrust proceedings in the US, is to identify competitors according to their industry classification codes (i.e., SIC, NACE) and include all firms that belong to the same industry as merging parties.[15] Such a method assures a sufficient number of observations, but it increases the risk of including firms irrelevant to the competitive effects of the merger, as industry classification codes provide only a rough estimate of the real competitive setup of a particular market. Some firms with the same classification code might be customers or suppliers of the merging parties. Therefore, empirical results from such a sample might be significantly biased.[16]

In order to avoid the shortcomings of this approach, we follow the method applied in more recent studies that deal with the EU merger regulation and we work only with the competitors identified by the Commission's economic team. The biggest advantage of this approach is that the Commission's experts have made a careful market definition – every merger case report includes a clear definition of relevant product and geographical markets as well as a list of competitors present in those markets. The main disadvantage is obviously that we rely on the information provided by the Commission to evaluate its own decision making, and our results might be biased as a consequence of this endogenous inconsistency. If the Commission selectively picks relevant competitors to support its final decision, our results are likely to underestimate the occurrence of discrepancies between the Commission's

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[13] The main advantages and disadvantages of the event study method in the assessment of the competitive effects of mergers are also discussed in Duso et al. (2007).

[14] Available at http://europa.eu.int/comm/competition/mergers/cases.

[15] See Aktas et al. (2007) for an overview of relevant studies.

[16] As pointed out by Clougherty and Duso (2008), if we treated customer-firms as competitors, the abnormal returns would be biased upwards – synergies generated by merger will lead to lower prices for customer firms. Including firms with no relation to the merging parties in our sample would generate bias of competitors' abnormal returns toward zero, because such firms would be unaffected by the merger.

evaluation and the market evaluation based solely on movements of the share prices of competitors. Nevertheless, we still consider this approach to be more suitable for our purposes than identification using industry classification codes. The main reason – besides the above-described shortcomings of industry classification codes – is the transparency and replicability of the Commission's methodology whereby relevant product markets and subsequently relevant competitors are identified. The Commission's approach to defining relevant markets is clearly set in an official notice describing the main economic principles and procedures the Commission should follow.[17] The final case decisions are publicly available and reveal to what extent the Commission followed the recommended methodology. In addition, the Commission methodology can be subject to judicial review (both by the Court of Justice and by the CFI) and the Commission's decisions (including the market definition) are regularly challenged in court.[18] These significant constraints on the Commission's behavior thus limit the scope of the above-described bias in our analysis.

For horizontal Phase II mergers with available documentation, we further analyze the Commission's reports and collect information on companies identified as competitors, and we exclude from our sample all cases where main competitors (or their parent companies) are not publicly listed.[19] Similarly, we exclude all "2 to 1" cases, i.e., situations where the merging parties are the only two firms present in the relevant market and there is no competitor left after the merger.

Finally, we end up with 72 Phase II cases suitable for our analysis. In order to obtain a relatively representative sample and to avoid sample selection problems, we follow the approach used in previous studies, we randomly select a sub-sample of Phase I cases, we apply the identical elimination process described above, and we end up with a total number of 89 Phase I cases in our sample.[20] For our sample of 161 merger cases we then collect all the relevant information from the Commission reports: the names and locations of the merging firms, the names of all relevant competitors, the product and geographical market definitions, and the final decisions.

[17] See Commission Notice on the definition of relevant market for the purposes of Community competition law (97/C 372/03). In a preliminary analysis, the Commission investigates whether product A and product B belong to the same market and looks at the geographic market by analyzing market shares, prices charged, etc. The Commission then carries out a more detailed analysis based on the concept of demand and supply substitutability. In addition, it examines the conditions in which the firms in question operate, taking account of recent developments in the market, the results of market studies analyzing consumer preferences, regulatory and other barriers to entry, and the views of the merging parties' customers and competitors.

[18] See the comprehensive list of competition-related European courts judgments available at http://ec.europa.eu/competition/court/index.html.

[19] This is again a potential source of bias not discussed in previous studies. Estimating the direction and size of this bias is, however, very difficult. One of many possibilities is that by excluding cases with non-listed competitors, we are underestimating the foreclosure effects of pro-competitive mergers. Assuming that a large share of non-listed competitors are smaller firms with limited access to financing, a pro-competitive merger leading to lower prices that disrupt revenue streams of competitors is more likely to force a non-listed firm – unable to adapt to the lower prices – to exit the market. This would lead to higher market concentration and subsequently lower competition in the market.

[20] We realize that Phase II cases are over-represented in our sample compared to their real occurrence. We follow the approach of Duso et al. (2007) and do not consider this a significant measurement problem, although we realize the potential sample selection bias.

3.3 Step 3: Construction of Competitor Gains

For each merger in our sample we determine the first day the merger announcement appeared in the financial press.[21] For each of the 348 competitors in our sample, we collect data on stock prices[22] (P_{it}) as well as on the number of shares (S_{it}) on the announcement date, 260 days before this date as well as 3 days after it to construct the abnormal returns around the announcement date. We also collect "market data" for the same period; in particular, we used a country-relevant industry index provided by Datastream (I_{it}).

In order to estimate abnormal returns on the announcement date, we use the market model approach (Brealey and Myers, 1995):

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Note that Duso et al. (2007) apply an "index model" – a specific form of the market model where α is set equal to zero and β equal to one. However, this method is more suitable for the analysis of IPOs, where no historical data are available. We avoid this unnecessary simplification and we estimate parameters α and β using historical data. In particular, we employ stock returns over the 200-day trading period ending 60 days prior to the announcement date.[23] We exclude the 60--day period in order to minimize the potential "pre-announcement rumors" effect – information about a prospective merger usually appears in public before the official merger announcement. Including this period could thus bias our estimates.[24] Using the standard OLS approach we estimate the model parameters, which we then use to predict firm i's normal return on the announcement date, i.e., we estimate the stock price return for the hypothetical event where the merger would not have been announced ($\hat{R}_{it}$).

Consequently, we calculate the abnormal return around the merger announcement date t (AR_{it}). Given the possibility of information leaks, which influence firm i's return before (or after) the merger announcement, and the fact that the market might not absorb the announcement information quickly enough, we define the total

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[21] The announcement date was obtained from "Dow Jones Factiva" (a customizable business news and research product that integrates content from newspapers, newswires, journals, research reports, and web sites).

[22] Stock market data were obtained from "Thomson Datastream" (the world's largest statistical and financial database). All prices were transformed into constant 2000 USD thousands.

[23] Note that there is no clear agreement in the previous literature on the optimal length of the estimation period. Eckbo (1983) estimates the parameters of the market model using the 400 days surrounding the announcement day (day 0) excluding period -50 through 50. Brady and Feinberg (1998) stop the estimation period 10 days prior to the first announcement date. Duso, Gugler, and Yortoglu (2005) estimate the market model over 240 trading days ending 20 days prior to the announcement day, while Clougherty and Duso (2008) use an identical trading period that ends 60 days prior to the announcement date. Aktas et al. (2007) use 200 daily observations during a period that ends 30 days before the initial announcement day. In line with Duso et al. (2007) we follow a conservative approach estimating the market model over 200 trading days while excluding a relatively long period of 60 trading days before the merger.

[24] Including the period immediately before the announcement day would result in underestimation of abnormal returns, as the estimated parameters of the market model would already capture part of the effect of the merger announcement on the competitor's share price.

effect as a cumulative abnormal return (CAR): the sum of the daily abnormal returns within an event window of a particular length. We compute the CAR for event windows of different lengths (τ_1 before and τ_2 after the announcement date), in particular 1, 2, and 3 days around the announcement date:

$$CAR_{i,\tau_1,\tau_2} = \sum_{t=\tau_1}^{\tau_2} AR_{it} = \sum_{t=\tau_1}^{\tau_2} R_{it} - \left(\hat{\alpha} - \hat{\beta} R_{mt} \right)$$

Based on this data we construct the *main competitors' gain from merger* variable, which we use for the assessment of the merger's competitive effects. The *main competitors* for each merger are firms that the Commission identifies to be present in all relevant markets and are thus most likely to be influenced by the merger.[25] First, for each main competitor *i* we calculate the individual gain from the merger (Π_i^{CG}):[26]

$$\Pi_i^{CG} = \sum_{t=\tau_1}^{\tau_2} \left(AR_{it} \cdot P_{it} \cdot S_{it} \right)$$

For each merger case *J* in our sample, we then calculate the "average" competitors' gain from the merger (Π_J^{CG}) as the weighted average of the above-defined individual competitor gains.[27] The average market capitalization for a given 200-day trading period is used as the weight.

$$\Pi_J^{CG} = \frac{\sum_{i \in J} \Pi_i^{CG} \cdot \overline{P}_{it} \cdot \overline{S}_{it}}{\sum_{i \in J} \overline{P}_{it} \cdot \overline{S}_{it}}$$

For each merger case we compare the average competitors' gains with the Commission's final decision. We evaluate the Commission's decision as a "type I discrepancy" in cases where a merger was prohibited (Article 8.3) while the market considered it pro-competitive ($\Pi_J^{CG} < 0$). Given the low number of prohibitions in the history of EU merger control, we expanded the definition of a "weak type I discrepancy" to include cases where a merger was prohibited or approved with remedies (Article 6.1.b or Article 8.2), while the market considered the merger to be pro--competitive. Furthermore, we classify a "type II discrepancy" for cases cleared by the Commission with no objections (Article 6.1.b or Article 8.1) where the stock market reaction was positive ($\Pi_J^{CG} > 0$), thus indicating an anti-competitive nature of the merger.

[25] The right treatment of relevant competitors when estimating a merger's competitive effects is in fact a complex question. The method suggested by Duso et al. (2007) is to use all competitors available for one specific merger irrespective of the relevant market in which they are present. Another approach is to use each single relevant market as a separate observation and then correct for the correlation among these observations with a clustering procedure at the merger level. Our approach, where we work only with competitors present in all relevant markets, might be considered a compromise between these two methods.

[26] In those cases where main competitors are absent, we use major rivals from each relevant market and control for those cases in our further analysis.

[27] Note that in about 60% of cases the stock reaction of individual competitors had the same sign as the aggregate competitors' gain Π_J^{CG}.

3.4 Step 4: Econometric Model
3.4.1 Model Specification

Our econometric model is based on the theoretical framework of Neven and Röller (2005), which specifies that an antitrust agency maximizes its own utility and where third parties (firms, governments, etc.) can affect the agency's utility. We assume a linear relationship between the occurrence of both types of discrepancies (*type 1 discrepancies – T1, type 2 discrepancies – T2*) and various explanatory variables (*X*) that are observable and can potentially influence the decision making of the agency.

$$T1 = \sum_{i=1}^{k} \alpha_i X_i + \varepsilon_i \tag{1}$$

$$T2 = \sum_{i=1}^{k} \beta_i X_i + \varepsilon_i \tag{2}$$

Based on previous studies, we identify factors that might affect the occurrence of discrepancies and we specify equations *(1)* and *(2)* as follows:

$$T1 = \alpha_0 + \alpha_1 \tilde{\Pi}^{CG} + \alpha_2 BIG\_EU + \alpha_3 PH\_II + \alpha_4 TREND + \alpha_5 NATIONAL + \\ + \alpha_6 CROSS\_EU + \alpha_7 EXTRA\_EU + \alpha_8 ECMR\_2004 + \alpha_x X + \varepsilon_1 \tag{3}$$

$$T2 = \beta_0 + \beta_1 \tilde{\Pi}^{CG} + \beta_2 BIG\_EU + \beta_3 PH\_II + \beta_4 TREND + \beta_5 NATIONAL + \\ + \beta_6 CROSS\_EU + \beta_7 EXTRA\_EU + \beta_8 ECMR\_2004 + \beta_x X + \varepsilon_2 \tag{4}$$

Table 2 presents the list of variables used for the specification of the model.

The following section provides a more detailed discussion on the explanatory variables used in our model.

Power of Competitors

The Commission is often criticized for giving excessive attention to the welfare of competing firms.[28] Typically, during the merger evaluation procedure, the Commission takes into account the concerns of competitors and their views on the competitive effects of the proposed merger. This apparent willingness to listen to competitors gives rise to concerns about the possible influence of competitors on the final decision of the agency. For this reason, we include a proxy for the competitors' incentive to influence the Commission's decision, measured as the expected change in the market value of the main competitors ($\tilde{\Pi}^{CG}$).

Institutional Factors

There are a number of institutional and political economic variables that may influence the Commission's decision making. As suggested in previous studies[29], the size of the country in which the merging firms originate does play a role in

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[28] See Neven and Röller (2002) for further details.
[29] See Duso et al. (2007) for further details.

Table 2 Definition of Variables

Variable	Definition
	Dependant Variables
T1	Dummy = 1 if a pro-competitive merger was blocked or cleared with remedies.
T2	Dummy = 1 if an anti-competitive merger was cleared without remedies.
	Independent Variables
$\bar{\Pi}^{CG}$	Expected gains from mergers for the competitors. Cumulative change in stock market value (relative to an index) for the competitors on the day around the first announcement date of the merger. The value is expressed in 2000 constant USD (thousands).
Big_EU	Dummy = 1 if one of the merging part comes from one big EU country (France, Germany, Italy, Spain, UK).
Ph_II	Dummy = 1 if the merger decision was made in Phase II proceeding.
Trend	Official number of the merger case - captures increasing number of evaluated cases more efficiently then the date (year) of the official merger announcement.
National	Dummy = 1 if the relevant geographic market is national.
Cross_EU	Dummy = 1 if the acquirer comes from the country outside the EU and the merger target comes from the EU.
Extra_EU	Dummy = 1 if the both merging parties come from the countries outside of the EU.
ECMR_2004	Dummy=1 if the merger was evaluated under the new ECMR.
Network	Dummy = 1 if the merger concerns telecom, transports, electricity or the financial industry.
Vertical_Eff	Dummy = 1 if the Commission identified vertical or conglomerate effects.
No_Main_Competitor	Dummy=1 if there is not at least one competitor active at all merger-relevant product markets.
Same_Country	Dummy = 1 if the both merging parties come from the same country.

the Commission's decision – large countries might, for instance, exercise significant political pressure to have an anti-competitive transaction cleared if it benefits their national champions, thus increasing the occurrence of type II discrepancies. We therefore control for cases where the merging parties are from large EU member states (variable *Big_EU*).

Procedural Issues

Regarding procedural issues, some critics have pointed out the inadequacy of Phase I proceedings, as the Commission might not have enough time and resources to evaluate complex merger cases properly.[30] Therefore, we test whether the occurrence of type II discrepancies is positively correlated with Phase I proceedings (variable *PH_II*).[31]

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[30] See Neven and Röller (2002) for further details.

[31] Strong type I discrepancies, i.e., pro-competitive mergers blocked by the Commission, are in this case irrelevant as mergers cannot be blocked in Phase I proceedings.

Another question that arises with respect to the Commission's expert teams is their increasing workload. While the average number of transactions evaluated during the period of 1990–1999 was only 124 cases per year, the expert teams' workload almost tripled in the last decade, reaching 321 cases per annum between 2000 and 2008. We thus control for the effect of increasing workload in our model (variable *Trend*).

Another issue of concern is the market definition applied in the Commission's analyses. Neven et al. (1993) claim that EU merger guidelines are biased toward excessively narrow market definitions, both in terms of the wording of the guidelines and in actual practice. As a result, a narrow market definition may be associated with a higher frequency of type I discrepancies, i.e., too narrowly defined markets might result in exaggeration of the anti-competitive effects of the merger in particular sub-markets, neglecting the overall competitive dynamics of the market concerned. We use all cases where the Commission identified the relevant geographical market as national in scope as a proxy for narrow market definition (variable *National*).

Preference for Domestic Firms

Disagreements between the EU and US regulators in cases that fall under both legislations (in particular in the *GE/Honeywell* and *Boeing/McDonnell Douglas* mergers and in the *Microsoft* antitrust case) uncover another important issue –potential protectionism of domestic firms in the EU. The financial press has often raised the suspicion that the EU focuses more on the protection of domestic competitors rather than consumers.[32] Aktas et al. (2007) find that the more harm suffered by European rival firms when the acquirer is from outside the European Community, the greater the likelihood of European regulatory intervention against the proposed combination. Such evidence does not support an unambiguous conclusion of protectionism, but it certainly raises some doubts. We therefore distinguish the type of the mergers in our sample – intra-European, extra-European, and cross-euro-border mergers – to control for this potential effect (variables *Cross_EU* and *Extra_EU*).

Effect of the 2004 Reform

We include a variable that should at least partially capture the recent legislative changes in the EU merger regulation (variable *ECMR_2004*).[33] The promised consumer-oriented approach in the evaluation process, clear specification of countervailing factors, and prolonged investigation periods might have had a positive effect on the Commission's accuracy. We thus expect lower occurrence of both type I and type II discrepancies since the introduction of the new legislation.

In light of the above discussion, the right side of both equations consists of other factors that could affect the occurrence of both types of discrepancies. The vector *X* contains other important controlling variables, such as specific treatment of mergers in network industries (variable *Network*) and the presence of vertical effects (variable *Vertical_Eff*) – see above.

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[32] See for instance the Financial Times articles by J. Johnson, "A poor prescription for French national champions" from 27 March 2004 and by A. Michaels, "Ambassador for US blasts Rome on Protectionism" from 20 April 2007.

[33] The limited size of our sample allows us to test only the "base" effect of the regulatory reform, i.e., looking for the significant changes in the model intercept for the subsample of cases evaluated under the new merger regulation.

3.4.2 Model Estimation

PROBIT Regression

Following the methodology applied in previous studies, we use PROBIT regression to estimate equations (3) and (4). The PROBIT model can be derived from the assumption that there exists a latent unobservable variable P^* – in our case the Commission's view on the anti-competitive effects of the merger. If the latent variable takes a value above some critical level, then the merger is prohibited ($P = 0$), other-wise it is approved ($P = 1$). Thus, for each subsample (pro-competitive and anti--competitive mergers) we estimate the parameters of the model assuming that the latent variable is generated by the model:

$$P^* = \beta'X + \varepsilon$$

where β is a vector of parameters (weights), X is a vector of explanatory variables, and $\varepsilon \sim N(0,1)$ is a random shock. It is then easy to show that:

$$Pr(P = 1) = \Phi(\beta'X)$$

This gives us the likelihood for both cases, $P = 0$ and $P = 1$. Assuming the observations are i.i.d., it is easy to construct the sample log-likelihood. This can be maximized using standard nonlinear maximization algorithms.

However, we should note that the announcement of a merger states the intention of the merging parties and it is usually subject to review by antitrust agencies. Therefore, the stock market reaction to the particular event reflects not only the estimate of the change in the future performance of the merging parties, but also the likelihood that the deal will be cleared. The change in the value of the stock at the time of the announcement is equal to the probability of clearance times the value that will be generated by the transaction. Therefore, the anticipated profits cannot be exogenous, as the market takes into account the antitrust procedure (Aktas et al., 2007).[34] In order to overcome the endogeneity of the observed competitors' gains, we use the approach of Duso et al. (2007). First, we estimate the PROBIT model, regressing the probability of merger clearance on the subset of relevant exogenous variables. Then, for each merger case in our sample we divide the observable competitors' gains by the predicted probability of the merger being cleared, i.e., we are able to reconstruct the real effects of the merger on competitors' profits and use them in estimating equations (3) and (4).[35]

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[34] Note, however, that we only need the sign of the expected stock price change in order to evaluate the competitive nature of the merger used for identification of type I and type II discrepancies, as the probability of the merger being cleared is always non-negative.

[35] Let Π^{CG} be the abnormal change in the value of competitors' stocks on the day of announcement of the merger. Let the p be the probability that the market assigns to the event that the merger is cleared. Then $\Pi^{CG} = p\ \bar{\Pi}^{CG}$ can be interpreted as the expected change in competitors' value conditional on the event that the merger is cleared by the antitrust authority. Since p must be non-negative, $\bar{\Pi}^{CG}$ and Π^{CG} have the same sign, enabling us to identify anti-competitive (pro-competitive) cases using only the observed reaction of competitors' stocks.

Marginal Effects

The equation coefficients estimated by the PROBIT regression do not illustrate the partial effects of a change in a particular explanatory variable on the dependent variable, as is the case for linear regression models. A default method to overcome this difficulty, offered by most statistical packages, is to calculate the marginal effects (partial derivatives) at the values of the independent variables fixed at their sample means. This is the standard method used for the calculation of marginal effects in previous studies (Duso et al., 2007).

Note, however, that this approach has two main limitations. Firstly, the formula is not very intuitive in the presence of dummy variables: the sample means used in the calculation of marginal effects refer to nonexistent observations, as the dummy variable never takes the value of its sample mean. Secondly, this method might generate estimation bias in the presence of observations where one continuous variable takes extremely high (low) values.[36]

To remove these limitations, we follow the method suggested by Bartus (2005), which is becoming increasingly popular among researchers in social sciences working with large sets of dichotomous control variables.[37]

We define average marginal effects (AME) as the average amount of the change in the expected value of a dependent variable:

$$AME_i = \beta_i \frac{1}{n} \sum_{k=1}^{n} f\left(\beta x^k\right)$$

where βx^k denotes the value of the linear combination of the parameters and variables for the kth observation.

In order to estimate the marginal effects for dummy variables we use the following formula:

$$AME_i^D = \frac{1}{n} \sum_{k=1}^{n} \left\{ F\left(\beta x^k \mid x_i^k = 1\right) - F\left(\beta x^k \mid x_i^k = 0\right) \right\}$$

Using the formulas above, we calculate the average marginal effects across the full sample, thus avoiding the problem of setting dummy variables at their means, as well as the potential negative effect of extreme values of continuous variables. Note that we use "marginal effects" in the following sections only for explanatory purposes while in fact we always refer to the AME.

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[36] This is exactly the case of our sample. Π^{CG} takes extremely high values for observations where large corporations are indentified as competitors (such as AT&T with its market capitalization of almost USD 30 billion). Those observations push the sample mean of Π^{CG} well above its median value, and most of the observations in the sample have Π^{CG} below the mean. By computing the marginal effects at the fixed means we underestimate the effect of dummy variables, making the variable Π^{CG} the perfect predictor. Instead of excluding observations with extremely high Π^{CG}, we apply the method suggested by Bartus (2005), which overcomes this problem.

[37] See, for instance, Hyytinen and Ilmakunnas (2007) and Jens et al. (2008). Note that Bartus (2005) only focuses on AME calculation in STATA. For a more conceptual discussion, see Chamberlain (1984, p. 1,274).

4. Results
4.1 Descriptive Results

Our sample includes selected EU merger cases completed by the Commission in the period 1990–2008. We work with 72 Phase II cases, 89 Phase I cases, and a total number of 348 competitors with complete information. As described in the previous section, we computed the abnormal returns of competitors around the announcement day. The cumulative average abnormal returns (CAARs) of the competitors in our sample are -0.13%, -0.24%, and -0.33% for the 3-, 5-, and 7-day event windows, all being statistically significant at the 5% significance level. The negative competitors' CAARs would suggest that EU mergers are evaluated by the market as pro-competitive on average, which is in line with Aktas et al. (2007), who find the competitors' CAAR to be negative at -0.24% during an 11-day event window. On the other hand, Clougherty and Duso (2008) find a positive competitors' CAAR of 0.37% over the 3-day event window. In general, there is mixed evidence on the effects of mergers on rivals – see Aktas et al. (2007, p. 1106) for a recent overview.

For each merger case, we calculated the average competitors' gain (Π^{CG}) as the weighted average of changes in the market value of main competitors, and we identified the discrepancies between the Commission's evaluation and the market evaluation of the merger. As can be seen from *Table 3*, the distribution of discrepancies does not vary significantly and we therefore focus only on results from the 5-day window in our further analysis.

Table 4 reports the number of cases in our sample according to the decisions taken by the Commission and according to the stock market evaluation of the merger's competitive effects. Unconditional clearances 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). Cases cleared with remedies imposed on the merging parties are associated with Article 6.1b – decisions with conditions (Phase I) or with Article 8.2 decisions (Phase II). We observe that 52% of all cases are classified as pro-competitive. Given that a merger is pro-competitive, only 4 out of 84 cases (4.76%) are blocked and involve strong type I discrepancies. Weak type I discrepancies are observed in 19 out of 84 cases, or some 22.6%. Given that a merger is anti-competitive, 43 out of 77 cases (55.8%) involve type II discrepancies.

Note also that our data identify as strong type I discrepancies in two out of three cases that were later overturned on appeal by the CFI – namely, the *Airtours/ /First Choice* and *Tetra Laval/Sidel* cases. The other controversial case – *Schneider/ /Legrand* – was not identified as an error.[38]

Regarding conditioning error occurrence on the particular Commission decision, our data find that the number of strong type I discrepancies in relation to the total number of prohibitions is 4 out of 8 (50%). Excluding those cases where the Commission raised serious concerns about possible foreclosure of competitors, we get 3 out of 8 (37.5%).[39] With respect to weak type I discrepancies, the total

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[38] A fourth appealed case, *General Electric/Honeywell*, was not included in our analysis due to the fact that the merger resulted in the creation of a monopoly in the market for large commercial jet engines – a so--called 2-to-1 case. For more details on the selection criteria see section 6.1.1.

Table 3 Frequency of Discrepancies by the Different Window Lengths (in %)

	Frequency of discrepancies		
Window length	Type I	Weak Type I	Type II
3 days window	5,81	22,05	56,33
5 days window	4,76	22.62	55,84
7 days window	3,70	20,80	58,25

Table 4 Decisions and Competitors' Gains

	Phase I		Phase II			
	Art 6.1.b (Cleared)	Art 6.1.b (Cleared with remedies)	Art 8.1. (Cleared)	Art 8.2. (Cleared with Remedies)	Art 8.3. (Prohibited)	
Negative Gains (pro-competitive)	43	3	18	16	4	84
Positive Gains (anti-competitive)	33	4	10	26	4	77
Total	76	7	28	42	8	**161**

number is 23 out of 57 (40.4%), or 17 out of 57 (29.8%) when controlling for fore-closure effects. Regarding type II discrepancies as a percentage of all mergers that were cleared, our data suggest that the share is around 41.3% of the cases in our sample.[40]

The estimation of equations (3) and (4) proceeds by splitting our dataset into anti- and pro-competitive subsamples. In particular, we estimate (3) on the sample of pro-competitive deals ($\Pi_J^{CG} < 0$). We use the weak definition of type I discrepancies for construction of our dependent variable – we set $T1 = 1$ when a pro-competitive merger was blocked or cleared with remedies. Equation (4) is estimated on the sam-ple of all anti-competitive deals ($\Pi_J^{CG} > 0$) and we set $T2 = 1$ if an anti-competitive merger was cleared without conditions.[41] The summary statistics are provided in *Table 5 in the Appendix*.

4.2 Weak Type I Discrepancies

The results are presented in *Tables 6* and *7 in the Appendix*. Our results sug-gest that the occurrence of discrepancies between the Commission and market eval-uations cannot be explained by the random process, i.e., there are other factors that determine the occurrence of these discrepancies.

[39] In cases where a serious threat of foreclosure of competitors is identified, negative competitors' gains might reflect the possible exit of the competitor from the market rather than an expected increase of com-petitiveness in the market.

[40] Compared with the findings of Duso et al. (2007), our results also identified about half of all cases as pro-competitive, but the frequency of errors conditional on merger competitiveness diverge: 4.75% of type I discrepancies, 56% of weak type I discrepancies, and 42% of type II discrepancies. Our dataset thus shows a higher occurrence of type II discrepancies and a lower frequency of weak type I discrepancies. Duso et al. (2007) find similar probabilities of the occurrence of both types of discrepancies, but in their case discrepancies occur in roughly one in four mergers that are cleared (or blocked).

[41] The estimations were carried out using STATA 9.2 software. We controlled for collinearity and poten-tial outliers. All standard errors are heteroskedasticity robust.

Regarding the power of competitors, our results suggest that competitors have no influence over the Commission's decisions as far as pro-competitive mergers are concerned. With respect to preferential conditions for large EU countries, we find variable *Big_EU* to be significant at the 5% level. According to the estimates of marginal effects in *Table 7*, the large EU countries have about a 20% lower chance of getting a pro-competitive deal curtailed by the Commission.

Considering procedural issues, we see that variable *Phase_II* is significant at the 1% significance level and has a positive sign, implying that weak type I discrepancies are more likely in Phase II. The probability of a pro-competitive deal being curtailed is about 50% higher in Phase II. On the other hand, the steadily increasing number of cases (*Trend*) appraised by the Commission does not have any significant effect on the occurrence of weak type I discrepancies.

The effect of the variable *National* is not statistically significant. Thus, narrowly defined markets do not lead to an unnecessary burden being imposed on pro--competitive deals.[42]

Our estimates suggest that there is no evidence of protectionist behavior by the EU antitrust agency. While variable *Extra_EU* is statistically insignificant, the effect of *Cross_EU* is significant at the 5% level. Moreover, the probability of unnecessary remedies (or a prohibition) is about 23% lower when the acquirer comes from outside the EU. One possible explanation is that these large multinational mergers usually fall under the scope of several antitrust agencies. Therefore, the existence of multiple independent assessments might generate a disciplinary effect on the EU regulator.

With respect to the effects of the EU regulatory reform, we see that variable *ECMR_2004* is not significant at the 10% level. It should be noted, however, that the variable is not completely insignificant (the *p*-value being around 0.13) and that the marginal effect estimate suggests positive effects of the reform – weak type I discrepancies are 20% less likely for cases evaluated under the new ECMR.

Concerning the other controlling variables, we do not find any significant effect of network industries (*Network*), nor does the existence of vertical effects show any significant impact (*Vertical_Effects*). Cases where the merging parties come from the same country do not have any significant effect on the frequency of weak type I discrepancies either (*Same_Country*). The only significant controlling variable is *No_Main_Competitor* – the probability of weak type I discrepancies is about 17% higher for cases where several product markets were identified but none of the relevant competitors was present in all of the markets.[43]

We also control for the potential bias associated with the presence of foreclosure effects. As already mentioned, negative competitor gains might be induced by expected foreclosure of competitors rather than by increased competition in the relevant markets – these mergers would thus be wrongly classified as pro-competitive.

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[42] Note again that we assumed that imposed remedies increase consumer welfare. Therefore, from the definition of weak type I discrepancies, imposing conditions and obligations on particular product markets only increases the overall positive effect of mergers evaluated as pro-competitive by the stock market.

[43] The interpretation of this result is rather ambiguous. One possible explanation is to connect those errors with a too narrow product market definition. However, there is also a potential measurement error resulting from the inability to capture the overall competitive effect of a merger.

Therefore, we exclude cases where the Commission raised concerns about the fore-closure effects of the merger and we re-estimate equation (3) on this restricted sample. As we can see from *Table 4*, the parameter estimates do not change considerably. We observe a significant change in two parameters only.

First, the variable *National* becomes significant at the 10% level. If the Commission identifies at least one of the markets concerned as national, the probability of a weak type I discrepancy increases by approximately 13%. Second, the vertical effects of the proposed transaction seem to play a significant role now. The probability that unnecessary remedies will be imposed on a deal considered pro-competitive by the market decreases by 17% in the presence of vertical effects. The interpretation of this result is again ambiguous. One possible explanation is that our restricted sample does not cover any mergers where vertical (conglomerate) effects could potentially lead to the foreclosure of competitors. Vertical mergers that do not lead to the marginalization of competitors are usually considered beneficial for consumers, mainly due to elimination of double marginalization (Tirole, 1988). The incentive for the Commission to impose remedies might therefore be lower for merger cases where positive vertical effects are observed.

4.3 Type II Discrepancies

Turning to the analysis of type II discrepancies, our results again suggest that they cannot be considered random.

Regarding the influence of competitors, we find variable $\tilde{\Pi}^{CG}$ to be significant at the 1% significance level. Interestingly, the coefficient has a negative sign, implying that the more positive the expected increase in competitors' value, the less probable it is that an anti-competitive merger will be cleared. This is slightly counter-intuitive, as one would expect the effort of competitors to influence the agency to increase with the size of the anticipated gains from the merger, thus resulting in a positive relationship between $\tilde{\Pi}^{CG}$ and type II discrepancies. One possible explanation is that the Commission takes into account the stock market reaction to the merger announcement when evaluating the proposed transaction. An overly optimistic reaction of competitors' stocks might potentially trigger a more careful assessment of the merger by the regulator. Note, however, that the magnitude of this effect appears relatively marginal. For illustration, an increase in equity of about USD 240 million around the announcement date – which equals the median gain in our anti-competitive sample – would result in an approximately 5% lower probability of a type II discrepancy. We thus consider the influence of competitors to be of minor importance.

The variable *Big_EU* is not significant and our results suggest that large EU countries cannot use their political power to get the Commission to clear anti-competitive deals.

Regarding procedural issues, the variable *Phase_II* is again highly significant and large in magnitude. The marginal effect implicitly shows that the probability of approving an anti-competitive merger is some 48% larger in Phase I. This observation is further supported by the significance of the *Trend* variable representing the increased workload coupled with the higher proportion of cases decided in Phase I proceedings. According to our results, the probability that an anti-competitive merger will be cleared has increased slightly (on average by 2% p.a.) in the last decade.[44]

A narrow market definition (*National*) significantly increases the chances that the anti-competitive effects of a proposed merger will be recognized by the Commission. If the Commission identifies at least one of the markets concerned as national, the probability of an anti-competitive merger being cleared decreases by 13%. Note that, according to our data, the positive effect of the national market definition (a lower frequency of type II discrepancies) is of comparable magnitude to the negative effect arising from an unduly narrow geographic market definition (higher occurrence of weak type I discrepancies in our subsample corrected for foreclosure effects). However, given the significantly higher number of mergers cleared by the Commission and the negative effects of anti-competitive mergers on consumers, a higher frequency of weak type I discrepancies might be seen as a reasonable price to pay for the higher probability of identifying anti-competitive deals.

As in the case of weak type I discrepancies, our estimates suggest that there is no clear evidence of protectionist behavior by the EU antitrust authority. While the variable *Extra_EU* is statistically insignificant, the effect of *Cross_EU* is significant at the 5% level. The negative marginal effect implies that anti-competitive mergers involving EU firms (both target and acquirer) have about a 21% higher probability of being cleared. Again, this might be explained by more careful examination of cross-euro-border cases rather than by systematic discrimination against foreign acquirers by the Commission.

The variable *ECMR_2004* is significant at the 10% significance level. Our results suggest a positive effect of the 2004 reform; type II discrepancies are about 22% less likely under the new EU merger control system. It therefore appears that the promised "economic approach" and the procedural improvements of the new ECMR have helped the Commission to better align its merger evaluations with market expectations, at least with respect to combinations assessed as anti-competitive by the market.

Considering the control variables, none of them proved significant.[45]

5. Conclusion

We collected a unique representative sample of 161 merger cases evaluated by the Commission in the period 1990 to 2008 and we empirically analyzed the efficiency of EU merger control. We collected information on 348 relevant competitors and used stock market data to identify mergers that the market anticipated as anti-competitive. From this, we identified instances where the Commission had prohibited mergers that the stock market regarded as pro-competitive as well as instances where the Commission had failed to prevent anti-competitive mergers. Using the PROBIT model, we further investigated the sources of these discrepancies with a particular focus on the effects of the 2004 regulatory reform on the occurrence of these discrepancies.

[44] The average number of cases evaluated yearly is about 314 in the period 1998–2008. Using a rough estimate of the "average" marginal effect, we can simply multiply the average number of cases by the estimated marginal effect to get the change in the probability of a type II discrepancy.

[45] Note that we controlled for potential misspecification of our model by excluding the insignificant control variables and repeating the PROBIT regression. Nevertheless, neither the sign of the coefficients nor the significance of the other variables changed. Therefore, we present the results including the insignificant control variables as well.

In line with previous studies, our results suggest that the discrepancies between the Commission and the market are mainly driven by procedural and institutional factors. We also reject the claim that the Commission listens too much to competitors at the expense of consumers.

Our evidence further suggests that mergers involving firms from large EU countries have a significantly lower probability of bearing unnecessary remedies imposed by the Commission. However, we did not find any evidence that the Commission is willing to clear anti-competitive deals involving firms from large Member States. We do not find any evidence supporting the alleged protectionist behavior by the Commission, either. Our results suggest only that mergers involving a foreign acquirer are examined under closer scrutiny.

Procedural issues still play a significant role. The probability that an anti-competitive merger will be cleared is significantly higher if the final decision is made in a Phase I proceeding. This is accompanied by a significant effect of the increasing workload of expert teams on the occurrence of this type of discrepancy. On the other hand, Phase II proceedings often result in the imposition of unnecessary remedies on mergers evaluated as pro-competitive by the market. Nevertheless, given the significantly larger proportion of transactions decided in Phase I, the unnecessary remedies can be considered a reasonable price to pay for a higher probability of identifying anti-competitive mergers. Our data suggest a positive effect deriving from the 2004 reform, at least with respect to mergers evaluated as anti-competitive by the market. We found that for mergers appraised under the new regulation, the probability of an anti-competitive deal being cleared decreases significantly. We did not find any significant effect of the 2004 reform on the occurrence of weak type I discrepancies: the occurrence of unnecessary remedies has not decreased as a result of the new merger control system.

We recognize a need for further research in this area, and more data could confirm the robustness of our results and fully capture the real effects of the recent regulatory reform of the EU merger control system. A larger data sample would allow for more advanced econometric analysis, enabling us to test the effects of the 2004 reform in more detail. We could, for instance, look at the systemic effects of the reform by testing whether there is any significant change in the slopes of relevant explanatory variables, i.e., something that the limited size of our current sample did not allow for. Another potential approach would be to look at the real ex-post effects of mergers on competition and prices in the relevant markets, instead of relying on the ex-ante evaluation provided by the stock market. Although this approach has a number of shortcomings, it would allow us to move away from the controversial efficient market hypothesis, on which our current approach depends heavily.

APPENDIX: Results and Statistics

Table 5 Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
W_Type_I (T1)	84	0.4167	0.4960	0	1
Type_II (T2)	77	0.6753	0.4713	0	1
$\bar{\Pi}^{CG}$	161	63302	1704696	- 8105858	11500000
Big_EU	161	0.7019	0.4589	0	1
Trend	161	2275	1489	12	5123
National	161	0.3665	0.4833	0	1
Extra_EU	161	0.1180	0.3236	0	1
Cross_EU	161	0.1863	0.3906	0	1
ECMR_2004	161	0.2857	0.4532	0	1
Network	161	0.1429	0.3510	0	1
Vertical_Eff	161	0.3230	0.4691	0	1
No_Main_Comp	161	0.2360	0.4260	0	1
Same_Country	161	0.2609	0.4405	0	1

Table 6 Probit Results

Dependent variable	WType I discrepancies		WType I discrepancies Foreclosure Correction		Type II discrepancies	
	Coef.	*p*-Values	Coef.	*p*-Values	Coef.	*p*-Values
$\bar{\Pi}^{CG}$	-1.74E-07	0.2310	-2.59E-07	0.2550	-1.63E-06	0.0000
Big_EU	-0.9480	0.0470	-1.0807	0.0350	-0.8586	0.1280
Phase_II	2.0985	0.0000	2.0629	0.0000	-2.7779	0.0000
Trend	0.0002	0.3120	0.0001	0.7560	0.0005	0.0880
National	0.5671	0.1240	0.6832	0.0970	-1.1176	0.0530
Cross_EU	-1.1965	0.0340	-1.1272	0.0500	-1.6912	0.0120
Extra_EU	-0.2228	0.7710	-0.1091	0.8900	0.3541	0.6850
ECMR_2004	-1.0484	0.1370	-0.4232	0.5690	-1.7101	0.0930
Network	0.1995	0.7350	0.3486	0.5690	0.1978	0.7280
Same_Country	-0.1772	0.6760	-0.4050	0.3680	-0.7581	0.1590
Vertical_Eff	-0.7326	0.1240	-0.9050	0.0650	0.5698	0.2800
No_Main_Comp	0.8185	0.0160	0.8707	0.0100	0.0047	0.9940
_cons	-0.9263	0.1090	-0.7546	0.1910	3.6229	0.0000
Observations	84		78		77	
Log Likelihood	-30.738206		-28.687419		-16.832526	
Chi-Squared	53.26		44.85		34.12	
Significance level	0.0000		0.0000		0.0006	
Pseudo R2	0.4612		0.4527		0.6532	
Correct Predictions	0.8095		0.7949		0.8961	

Notes: The estimation of Weak Type I discrepancies is on the sub-sample of pro-competitive mergers, while the estimation of Type II discrepancies is on the sub-sample of anti-competitive mergers. The dependent variables are weak type1 (T1) and type2 (T2) discrepancies . The $\bar{\Pi}^{CG}$ variable is corrected for *p*, the predicted probability of the case being cleared obtained from a probit estimation on the full sample, where dependent variable is *Clear* and the exogenous variables are a constant, *Big_EU*, *Phase_II*, *Trend*, *National*, *Cross_EU*, *Extra_EU*, *ECMR_2004*, *Network*, *Same_Country* and *Vertical_Eff*.

Table 7 Marginal Effects

Dependent variable	WType I discrepancies		WType I discrepancies		Type II discrepancies	
			Foreclosure Correction			
	Coef.	*p*-Values	Coef.	*p*-Values	Coef.	*p*-Values
$\bar{\Pi}^{CG}$	-3.48E-08	0.2280	-5.22E-08	0.2440	-1.95E-07	0.0000
Big_EU	-0.1976	0.0240	-0.2262	0.0120	-0.0981	0.1580
Phase_II	0.4977	0.0000	0.4747	0.0000	-0.4705	0.0000
Trend	0.0000	0.3000	0.0000	0.7550	0.0001	0.0600
National	0.1107	0.1470	0.1299	0.1320	-0.1354	0.0630
Cross_EU	-0.2250	0.0050	-0.2104	0.0070	-0.2100	0.0090
Extra_EU	-0.0437	0.7650	-0.0217	0.8880	0.0411	0.6740
ECMR_2004	-0.2054	0.0850	-0.0845	0.5430	-0.2092	0.1090
Network	0.0407	0.7380	0.0730	0.5820	0.0233	0.7260
Same_Country	-0.0349	0.6710	-0.0784	0.3400	-0.0974	0.1820
Vertical_Eff	-0.1420	0.1030	-0.1720	0.0360	0.0736	0.2220
No_Main_Comp	0.1694	0.0270	0.1821	0.0200	0.0006	0.9940

Notes: Coefficients represent average effects of partial derivative of $E[y] = F[\beta X]$. For the binominal (dummy) variables, coefficients represent the effect of discrete change of dummy variable from 0 to 1.

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