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Duso, Tomaso; Gugler, Klaus; Yurtoglu, B. Burcin

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CENTER BERLIN

Tomaso Duso *
Klaus Gugler **
Burcin Yurtoglu **

EU Merger Remedies:
A Preliminary Empirical Assessment

* Humboldt University, Berlin
** University of Vienna

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Wissenschaftszentrum Berlin für Sozialforschung gGmbH,
Reichpietschufer 50, 10785 Berlin, Germany, Tel. (030) 2 54 91 – 0
Internet: www.wz-berlin.de

ABSTRACT

Merger Remedies: A Preliminary Empirical Assessment[†]

by Tomaso Duso[‡], Klaus Gugler, and Burcin Yurtoglu

Mergers that substantially lessen competition are challenged by antitrust authorities. Instead of blocking anticompetitive transitions straight away, authorities might choose to negotiate with the merging parties and allow the transactions to proceed with modifications that restore or preserve the competition in the involved markets. We study a sample of 167 mergers that were under the European Commission's scrutiny from 1990 to 2002. We use an event study methodology to identify the potential anticompetitive effects of mergers as well as the remedial provisions on these transactions. Stock market reactions around the day of the merger's announcement provide information on the first question, whereas the stock market reactions around the commission's final decision day convey information about the outcome of the bargaining process between the authority and the merging parties. We first classify mergers according to their effects on competition and then we develop hypotheses on the effects that remedies are supposed to achieve depending on the merger's competitive outcome. We isolate several stylized facts. First, we find that remedies were not always appropriately imposed. Second, the market seems to be able to predict remedies' effectiveness when applied in phase I. Third, the market also seems able to produce a good prior to phase II's clearances and prohibitions, but not to remedies. This can be due either to a measurement problem or related to the increased merging firms' bargaining power during the second phase of the merger review.

Keywords: Merger Control, Remedies, European Commission, Event Studies

JEL Classification: L4, K21, C12, C13

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‡ Corresponding author: Social Science Research Center Berlin (WZB), Reichpietschufer 50, D10785 Berlin, Germany. Tel: +49 30 25491 403, Fax: +49 30 25491 444, E-Mail: duso@wz-berlin.de.

ZUSAMMENFASSUNG

Auflagen im Fusionskontrollverfahren der EU: Eine erste empirische Bewertung

Fusionen, die den Wettbewerb auf einem Markt vermindern oder verhindern, werden von Antitrustbehörden angefochten. Anstatt wettbewerbswidrige Zusammenschlüsse direkt zu blockieren, können die Behörden beschließen, mit den Parteien zu verhandeln und die Fusion mit Auflagen zu genehmigen, durch die der Wettbewerb in den entsprechenden Märkten wieder hergestellt oder aufrechterhalten wird.

Wir analysieren eine Stichprobe von 167 Fusionen, die von der Europäischen Kommission zwischen 1990 und 2002 überprüft worden sind. Wir verwenden eine „event study"- Methodologie, um sowohl die möglichen wettbewerbswidrigen Wirkungen von Fusionen als auch die Wirkung der von der Behörde beschlossenen Auflagen zu untersuchen. Die Reaktion der Aktienpreise der beteiligten Unternehmen - sowohl der fusionierenden als auch der Wettbewerber - um den Tag der Fusionsankündigung liefert Informationen für die erste Frage, während die Reaktionen von Aktienpreisen um den Tag der EU-Kommissionsentscheidung Informationen über das Ergebnis der geheimen Verhandlungen zwischen der Behörde und den involvierten Parteien geben. Zuerst klassifizieren wir Fusionen entsprechend ihrer Effekte auf den Wettbewerb und dann entwickeln wir Hypothesen auf die Wirkung, welche die Auflagen in Abhängigkeit von den Wettbewerbseffekten der Fusion erzielen soll. Unsere Analyse ergibt einige stilisierte Fakten. Zuerst finden wir, dass die Auflagen von der EU-Kommission nicht immer adäquat angewandt wurden. Auflagen scheinen jedoch eine Wirkung auf die fusionierenden Unternehmen zu haben. Sie sind besonders effektiv, wenn sie bereits in Phase I des Fusionskontrollverfahrens eingesetzt werden. Jedoch scheint der Markt unfähig zu sein, eine gute Vorhersage für die Wirkung von Auflagen in Phase II zu produzieren. Dieses Ergebnis kann entweder auf einem Meßproblem beruhen oder es wird durch eine erhöhte Verhandlungsstärke der fusionierenden Unternehmen während der zweiten Phase der Fusionskontrolle verursacht.

1. Introduction

Few major mergers are completed without some conditions being imposed by an antitrust authority such as divestitures, provision of access, termination of agreements or other behavioral requirements. These conditions that seek to remedy the competition concerns caused by the merger are an important instrument in merger control, yet an under-researched topic in the economic literature. Looking at the European experience (see table 1), the economic importance of merger remedies is evidenced by the fact that 191 of the 2,592 merger cases (around 7%) notified to the European Commission (EC) until the end of 2004 have been decided as being compatible with the common market only with commitments (either article 6.2 or 8.2).[1] More than *half* of phase II decisions (72 out of 121 – 59%) are compatible only with commitments, yet only 19 mergers have been blocked since 1990. What is more, mergers that are cleared with commitments are apparently the most important ones in terms of competition policy concerns, since market power is most likely to increase due to the merger.

Table 1: Merger Cases and European Commission's Decisions

Article, kind of decision.	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	All
6.1.a	2	5	9	4	5	9	6	4	6	1	1	1	1	0	0	**54**
6.1.b	5	47	43	49	78	90	109	118	207	236	293	299	240	203	220	**2237**
6.1.b remedies (6.2)	0	3	4	0	2	3	0	2	12	19	28	13	10	11	12	**119**
9.3.	0		1	1	1	0	3	7	4	4	6	7	13	9	3	**59**
Tot. Phase I	7	55	57	54	86	102	118	131	229	260	328	320	264	151	235	**2469**
8.2.	0	1	1	1	2	2	1	1	3	0	3	5	2	2	2	**26**
8.2. remedies	0	3	3	2	2	3	3	7	4	8	12	10	5	6	4	**72**
8.3.	0	1	0	0	1	2	3	1	2	1	2	5	0	0	1	**19**
8.4.	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	**4**
Tot. Phase II		5	4	3	5	7	7	11	9	10	17	20	9	6	7	**121**
Total final decisions	7	60	61	57	91	109	125	142	238	270	345	340	273	157	242	**2590**

Source: European Commission, Directorate Competition.
Note: 6.1.a.: Out of scope of merger legislation; 6.1.b.: compatible; 6.1.b. remedies (6.2.): compatible with commitments; 9.3.: referral to member states; 8.2.: compatible; 8.2. remedies: compatible with commitments; 8.3.: prohibition; 8.4.: restore effective competition.

[1] See http://www.europa.eu.int/comm/competition/mergers/cases/stats.html for statistics on EU merger control.

The situation is quite analogous in the USA. In its 1998 and 1999 fiscal years, the Federal Trade Commission (FTC) challenged 63 mergers; of these 41 (65%) involved negotiated restructuring, 18 (29%) were abandoned, and only four (6%) were litigated.

Despite their economic importance, remedies are an under-researched topic as far as their economic effects are concerned. In particular, there is no systematic econometric evidence on the question of whether ordered remedies achieve what they are supposed to achieve, namely to assure that proposed mergers do not lead to an increase in the firms' market power net of any efficiency gains. We review the existing evidence in the next section.

This paper answers these questions by analyzing the effects of remedies in a sample of 167 mergers analyzed by the European Commission between 1990 and 2002. We use an event study methodology to identify the potential anticompetitive effects of mergers as well as the remedial provisions on these transactions. Stock market reactions around the day of the merger's announcement provide information on the first question, whereas the stock market reactions around the day of the commission's final decision convey information about the outcome of the bargaining process between the authority and the merging parties.

We isolate several stylized facts. First, we find that remedies were not always appropriately imposed. That is, sometimes remedies were unduly imposed in mergers that we found being efficiency increasing (type I errors), while some other times remedies were not imposed in mergers that we found to increase market power (type II errors). Second, judging from our results on abnormal returns the market seems to believe that remedies are effective when applied in phase I, since positive abnormal returns for rivals are decreased when remedies are announced. Third, it appears that the market is able to produce a good prior to phase II's clearances and prohibitions, but not for remedies in phase II. We suggest that information leakage between phase I and phase II decisions plays an important role in explaining these results. An additional explanation would be due to the merging firms' increased bargaining power vis-à-vis the commission during the phase II investigation, in those cases where a prohibition is politically unfeasible.

The paper proceeds as follows. In section 2 we describe the existing literature on remedies as well as event studies that have been used to assess antitrust decisions. In section 3 we present the institutional background of the European Union (EU) merger control, while section 4 discusses the policy issues related with the use of remedies and presents an international comparison. In section 5 we discuss our approach, describe the event study methodology that we use to assess mergers' competitiveness as well as remedies effectiveness, and formulate hypotheses concerning the use and the effects of remedies. In section 6 we introduce the data, present the

results of the event studies and, accordingly, give taxonomy of mergers. The results of our empirical analysis are presented in section 7, while section 8 sums up and concludes with some remarks and directions for further research.

2 The Evidence on Merger Remedies

2.1. General

Elzinga (1969) is perhaps the first study, which tried to evaluate the ex post effectiveness of ordered remedies in challenged mergers. Using a random sample of 39 antimerger cases, he analyzes the effectiveness of remedies under the Celler-Kefauver Amendment of 1950, which revitalized the antimerger statute contained in Section 7 of the Clayton Act. He rates remedies using a four category ranking system: successful, sufficient, deficient, or unsuccessful. The cases are also measured by the time required to achieve the remedy. Elzinga's results suggest that only one out of ten cases can be classified as successful or sufficient. These two categories correspond to cases where a full or partial divestiture was achieved and where these assets created viable competitors in less than two years time.

Rogowsky (1986) extends Elzinga's analysis to 104 merger cases brought by the FTC or DOJ from 1968 to 1980. His case by case evaluation shows that in less than half of the cases only a full or partial divestiture was achieved. Once the timeliness of remedies is taken into account, he concludes that only two out of five cases remain successful or sufficient, because the ordered assets were divested more than two years after the acquisition.[2]

Ellert (1976) is the first study that analyzes the valuation effects of antimerger complaints. He studies the abnormal returns of 205 acquirers challenged under Section 7 of the Clayton Act from 1950 to 1972 and shows that acquirers' returns increase substantially over a long period before the antitrust complaint. The cumulative abnormal returns average 23% (7%) over 100 (48) months before the complaint. In 123 mergers where defendants were ordered to divest acquired assets, the cumulative abnormal returns are much higher, reaching 31% (13%) over 100 (48) months leading to the complaint. In the month of the complaint, both types of companies experienced negative abnormal returns of almost 2%.[3] Since the decrease in returns during the complaint and settlement periods is much smaller than the increase over the period that led to the complaint, Ellert argues that antimerger law has been largely unsuccessful in reversing the discounted monopoly gains achieved by these mergers.

[2] Pfunder, Plaine and Whittemore (1972) offer a similar analysis of US divestiture orders.

[3] According to Ellert, the magnitude of this effect is consistent with the direct legal costs, loss of executive time, and uncertainty affecting business decision-making introduced by the antitrust challenge.

More recently, Baer (1999) reviewed FTC divestiture orders entered during the agency's fiscal years 1990 through 1994. He examined 35 orders involving 50 divestitures from a broad set of industries by interviewing 37 buyers, eight respondents and two third parties. The divestiture study reached three overall conclusions. First, most divestitures appear to have created viable competitors in the market of concern (28 out of 37), whereas a higher percentage (19 out of 22) of divestitures were successful when they involved the sale of an entire ongoing business. Second, respondents tended to look for marginally acceptable buyers (those least likely to become serious competitors) and engage in strategic conduct intended to impede the success of these buyers (e.g. late and poor supply of indispensable inputs). Third, most buyers of divested assets did not have access to sufficient information to prevent mistakes in the course of their acquisitions and/or had incentives that differed from those of the FTC. Despite its novelty, however, the divestiture study suffers from severe drawbacks, namely that only qualitative information (interviews) has been used to assess the effects of a limited number (35) of divestiture orders.

Motta et al. (2003) present a descriptive analysis of the use of remedies in EU merger control and enumerate the most important pros and cons of the different provisions used by the European commission. One can group merger remedies in two categories. (1) Structural remedies modify the allocation of property rights and possibly create new firms. The most important structural remedy is divestitures of entire ongoing businesses. Others involve the disposing of shareholdings or the break up of other structural links such as interlocking directorates. (2) Non-structural remedies or behavioral remedies constrain the merging firms' property rights. They might consist of contractual arrangements such as compulsory licensing or access to intellectual or infra-structural property. Also, many merger decisions involve a package of different remedies. The most important advantage of structural remedies is that they are supposed to fully and timely solve the competition concerns and need no (or not much) further monitoring by antitrust authorities. However, while Motta et al. (2003) in principle favor the use of structural remedies to clear problematic mergers, they point to information asymmetry and incentive problems as well as to the increased possibility of pro-collusive effects of divestitures. Thus, they suggest the same double test that the EC uses to assess mergers also for structural remedies, namely that both single firm and joint dominance will not likely arise after divestiture (unilateral and pro-collusive effects).

Moreover, as mentioned by Farrell (2003), the effectiveness of structural remedies may suffer from inadequate buyers, "over" (or miss-) fixing and the discounting of merger efficiencies. Cabral (2003) also qualifies the superiority of structural remedies, in his case asset sales.

Assuming a “free entry" equilibrium before and after the merger in a spatially differentiated oligopoly, the author shows that by selling assets (e.g. stores) to potential rivals, merging firms effectively "buy them off", that is, dissuade them from opening new stores, which may be detrimental to consumers. The crucial assumption is the "free-entry" assumption: If the two firms merge and there is no entry, then a monopoly with two stores arises; whereas if merging firms sell assets (stores) to a third firm, then duopoly competition is maintained. This rationale highlights the importance of assessing the counterfactual to the remedy decision, i.e. would entry occur in the absence of imposing (structural) remedies or not.

2.2. Evidence Using Event Study Methodologies

One common prediction of some prevalent models in Industrial Organization, e.g. the Cournot model, the Bertrand model with differentiated products and the dominant firm model, is that horizontal mergers, ceteris paribus, result in higher product prices in equilibrium.[4] While profit increases for the merging (insider) firms can be due to two effects - the market power effect but also (desirable) efficiency gains - profit increases of rival firms unambiguously must result from the post merger increase in market power.

This latter effect may stem from several sources. First, in the logic of the aforementioned papers, firms in an oligopolistic setting have a unilateral incentive to raise prices after the merger if there are no efficiency gains. Second, an increased possibility for collusive behavior post merger might also arise, because for instance the number of firms has gone down.[5]

Under the market power hypothesis, the merging firms’ combined stock prices should increase at the time of the merger announcement. Any antitrust complaint that decreases the likelihood of this event or reduces its market power related impact (such as an ordered divestiture) is expected to have a negative impact on stock prices. The same pattern of abnormal stock price reaction is expected for firms that are merging to achieve efficiency gains.

Since effective collusion generates monopoly rents, the collusion hypothesis implies that the merging firms’ rivals in a horizontal merger will earn higher profits after the merger and, hence, experience positive abnormal returns around the merger announcement. Any antitrust complaint that decreases the likelihood of this event is again expected to decrease the rival firms’ market value. Thus, a direct test of the collusion hypothesis, which relies on the efficient capital market hypothesis, is based on the abnormal stock returns of rivals that are observed around the date of

[4] See for instance Salant, Switzer and Reynolds (1983) and Farrell and Shapiro (1990).

[5] These are called “unilateral” and “coordinated” effects in the EU merger regulation’s guidelines.

the merger's announcement and around the announcement date of the antitrust complaint. The fact that positive abnormal returns around the merger's announcement for both the merging firms and their rivals are reversed around the time of the announcement of the antitrust complaint, suggests that the proposed merger is anticompetitive and the remedy is effective.

If the new firm resulting form a merger is more efficient than the merging companies, the product market competition is intensified and consequently there will be an increase in output and lower prices. Merging firms are expected to have higher profits due to their enhanced efficiency and this change should be reflected in an abnormal stock price reaction of companies announcing such mergers. The horizontal rivals of the merging companies have to cope with lower prices in the product market and, hence, they are expected to have lower profits compared to the pre-merger market structure. This product market effect implies a negative abnormal return for the rival firms' shares around the time of the merger announcement. Any event that decreases the likelihood of such an efficiency increasing merger to go through should be good news for the rivals. Consequently, the efficiency hypothesis predicts that rivals in an efficiency increasing merger exhibit positive abnormal returns upon the announcement of an antitrust complaint or an ordered remedy that reduces the efficiency effect of the merger.

A complicating factor concerning efficiency increasing mergers is the possibility that the merger announcement signals some additional information that might reverse the rivals' expected profitability. Eckbo (1983) and Eckbo and Wier (1985) argue that if the production technologies of competitors are related, then the proposed efficiency increasing merger can also signal opportunities for the rivals to increase their productivity. Under this scenario, the merger announcement is good news from the rival firms' perspective, because it makes them (or the market) aware of real profit opportunities that were so far unknown. The potential magnitude of this "information effect" can be, according to Eckbo and Eckbo and Wier, so large that it might offset the product market effect. Hence, they make no ambiguous prediction with respect to the rivals' abnormal returns around the merger announcement and around the announcement of the antitrust complaint. They analyze a sample of 259 horizontal and vertical mergers in mining and manufacturing industries of which 76 were challenged by government agencies. Though they find significantly positive abnormal returns to shareholders of the rival firms, they explain that the positive valuation effect may be due to positive information released by the merger. To separate the market power effect from the information effect, they also estimate abnormal returns to rival firms around the time of an antitrust challenge to the merger. They find no statistically significant abnormal decreases in the stock prices of rival firms and they claim that this is inconsistent with the market power hypothesis. In a similar paper, Stillman (1983) analyzes 11

horizontal mergers attempted between 1964 and 1972 that were challenged by antitrust enforcement authorities. Instead of looking at the portfolio of rivals, he studies the valuation effects for each of the 11 mergers. His findings suggest that only for one merger the market power hypothesis cannot be rejected.

The second complicating factor concerning the rivals' stock price is the possibility that the merger announcement signals that a rival is more likely to become a merger target. The sign pattern of the rivals' abnormal returns would then generally be the same as under the collusion hypothesis. If the proposed merger increases the likelihood that a rival will become an acquirer, then the implied sign pattern would be the same as for the collusion or efficiency hypotheses, depending on whether the market predicted higher or lower profits as a result of the expected acquisition (McGuckin et al. 1992).[6]

Schumann (1993) argues that the impact of antitrust complaints on the value of rival firms will also depend on the relative size of the rivals. For example, an antitrust complaint to an efficiency increasing merger between the larger firms in an industry, will increase the probability that small rivals will be subsequently acquired (the "small firm in play" hypothesis). Alternatively, if the merger with a small rival (by either a large or small rival) cannot create the efficiencies achievable through a combination of large firms (because of different technologies), the antitrust complaint benefits smaller rivals at the expense of larger ones by protecting them from the efficiency gains that their larger rivals might otherwise have achieved (the "disadvantaged small rival" hypothesis"). Schumann (1993) conducts an event study analysis of 37 acquisitions that were challenged by the FTC over the period 1981-1987 and comes up with the same pattern of abnormal returns as in Eckbo (1983) and Eckbo and Wier (1985). Consistent with his arguments, he also finds that rivals' abnormal returns around the time of the antitrust complaint are positive and larger for rivals with smaller market shares.

In an analysis of trust formation during the first U.S. merger wave (1897-1903), Banerjee and Eckard (1998) find that merging companies exhibit value gains of about 12% to 18%. They conclude that these gains are due to the enhanced operational efficiency, because the trust

[6] A recent test of the acquisition probability hypothesis (Song and Walkling, 2000) suggests that rivals earn significantly positive abnormal returns and rivals that become targets in the subsequent year earn significantly larger abnormal returns at the initial merger announcement than untargeted rivals. The sample of rivals in this study is, however, based on Value Line classifications and not on some type of relevant market based on antitrust considerations. Hence, their results are also consistent with the argument that acquisitions have a disciplining effect in an industry and lead to a reduction in agency costs of the rival firms (Servaes and Tamayo, 2005).

competitors suffer an economically and statistically significant value loss (ranging from 3.5% to 9.5%).

Simpson (2001) employs the same methodology to test the collusion and efficiency hypothesis in a merger of department stores in Denver and Southern California. He finds positive abnormal returns for merging firms and their rivals consistent with an increased concentration due to this merger. He also reports that rivals that operate in areas more likely to be affected by the merger experience much higher abnormal returns. To discriminate between the collusion and acquisition probability hypothesis, Simpson looks at the abnormal returns of likely targets among all rivals and finds that these had returns, which were 2.3% higher than other rivals. The rivals which are most likely to gain from the collusion have, however, still substantial (7.7%) abnormal returns.

McAfee and Williams (1988) criticized the Eckbo-Stillman methodology on two grounds. First, the failure to detect market power may be due to the fact that rivals were large conglomerates, which received only a small portion of their profits from the relevant market. Second, the existence of an anti-merger policy may have had a deterrent effect on the types of mergers that were attempted.[7]

Mullin et al. (1995) do find evidence for the market power hypothesis. They investigate the U.S. Steel consolidation and incorporate an examination of downstream firms in addition to merging and rival firms. They find reaction patterns that imply a dissolution of U.S. Steel lowers steel prices and raises output. Slovin, Sushka and Hudson (1991) analyze whether airline consolidation post-deregulation generates monopoly profits. They find insignificant abnormal returns for the acquiring firms, but significantly positive abnormal returns to airline target firms and argue that there is no evidence of monopoly gains from carrier consolidations after deregulation. In contrast, Singal (1996) documents both significantly positive abnormal returns to airline bidding firms and their target in a sample of mergers from the airline industry during 1985-1988. His tests show that mergers have enhanced both the market power and the efficiency of merging firms.[8] It is worth noting that Singal's results are confirmed by an analysis of product prices and profit changes from mergers.

More recent evidence is also inconclusive. Fee and Shaw (2004) find only slightly supportive evidence consistent with collusion. They look at the upstream and downstream product market

[7] However, Eckbo (1992) comparing US and Canadian experiences rejects this conjecture. Song and Walking (2000) propose an alternative explanation to the market power hypothesis when finding positive abnormal returns for rivals, namely that these positive returns are due to the investors' anticipation of further M&A activity in the same industry.

[8] Kim and Singal (1993) show that the impact of efficiency gains on airfares is more than offset by the post merger increased market power.

effects of horizontal mergers and acquisitions and identify the customers, suppliers, and rivals of the merging firms. In their sample of 554 US mergers, the net effect of a merger on a particular supplier depends largely on the supplier's ability to retain its product market relationship with the merged entity. Consistent with previous studies, Fee and Shaw (2004) also report positive abnormal returns to rivals of merging firms around announcements which range from 0.67% to 2.61%. An antitrust challenge to such mergers, however, does not lead to negative abnormal returns for rivals. These findings concerning the rival firms' stock price reaction is corroborated by those presented by Shahrur (2005) in a more recent study using a sample of 463 US mergers and takeovers. His results suggest that the average merger in his sample is driven by efficiency considerations rather than collusion and buyer-power motives. The evidence provided by Bittlingmayer and Hazlett (2000) on the antitrust action against Microsoft also rejects the joint hypothesis that (a) Microsoft's conduct was anticompetitive and (b) antitrust policy enforcement produced net efficiency gains.[9]

In contrast to this fairly long list of event studies on the merger activity in the US and partly in Canada, there are only a few studies of mergers that were analyzed by the European Commission.[10] Duso *et al.* (2003), using the same sample and, partly, the same methodology as utilized in this paper, find evidence in favor of the market power hypothesis for a sub-sample of EU mergers. Yet they look only at the reactions around the time of the merger's announcement. By contrasting the markets' reactions with the actual commission's decisions, they define type I (i.e. procompetitive mergers blocked or modified by the authority) and type II errors (anticompetitive mergers that were unconditionally cleared). In a second step, they use regression analysis to study the determinants of such mistakes. They show that procedural issues, market definition, as well as the merging firms' country and industry of origin play a crucial role in predicting both kinds of errors. However, they do not find any evidence of lobbying by firms to be effective.

Aktas, de Bodt and Roll (2004a) provides another notable exception. They look at 602 decisions by the EU Commission involving 1070 firms. Consistent with the rest of literature they document significant abnormal returns for the target firms and smaller and less significant bidder abnormal returns. They also estimate the abnormal price reaction to phase I and phase II decisions and show that outright prohibitions are associated with negative abnormal returns and

[9] Carstensen (1999) offers a less favorable conclusion on the Microsoft case. See also Comanor (2001), who discusses the problem of remedy in the specific Microsoft case.

[10] Brady and Feinberg (2000) used event studies to evaluate the impact of the introduction of the EU merger regulation. They focus on merging firms and do not consider the effect on competitors.

approvals subject to conditions are relatively good news. In another paper the same authors (Aktas *et al.*, 2004b) suggest that European merger control is protectionist. They reach this conclusion by showing that the likelihood of an intervention by the EU Commission is higher, whenever the merger is proposed by a bidder from outside the EU and has a negative effect on European rivals.

3. Institutional Background

There are four stages in the application of merger policy (Lyons, 2004): (1) The review (investigation) decision, (2) Review, (3) Decision to prohibit or require remedies, and (4) Appeal.

The first stage, which corresponds to phase I in the EU Merger control, selects the cases that might raise a competitive concern. The second stage (phase II investigation) leads to an assessment of the transaction's competitive effects.[11] The third stage (phase II decision) either leads to a prohibition decision or to the choice of remedies that are aimed to remove the competitive issues detected in stage 2. The fourth and final stage constitutes an important disciplining mechanism for the soundness of decisions taken in the earlier stages.

In the US, stages 1 and 2 are concentrated in the hands of the two competition agencies (FTC and DOJ). They then present their analysis to the court for a preliminary injunction which corresponds to stage 3. While most of the cases are resolved before the agency goes to the court, the immediacy of the courts has an important disciplining effect (Lyons, 2004).

In the EU, however, stages 1, 2 and 3 are concentrated in the hands of the Directorate General Competition (DG Comp).[12] A single team conducts the entire investigation and an appeal system takes a period of several years.[13] The role of the courts in Europe is limited to a formal and not substantial control of the commission's decision. However, in the last years some very controversial cases (prohibitions) were overturned by the Court of First Instance and, in second

[11] Eventually, remedies can also be imposed in Phase I. For details see the next section.

[12] Every DG in the European Commission is headed by a politically appointed Commissioner. In our sample period Karel Van Miert and Mario Monti were the DG Comp commissioners. Currently, Neelie Kroes is the head of DG Comp.

[13] In the Kali+Salz/MDK/Treuhand merger (M.308) of December 1993 the Court annulled the Commission's remedies on the basis of insufficient evidence to support collective dominance. The Court's decision (C-68/94 & C-30/95) came in March 1998.

instance, by the European Court of Justice.[14] This is considered one major factor that triggered a substantial review of the merger regulation as well as some fundamental changes in the institutional details such as the creation of the Chief Economist Office.

3.1. The EU Merger Regulation

Merger control in the EU began in 1989 with the European Communities Merger Regulation (ECMR), which came into force in September 21st 1990. The regulation was amended on May 1, 2004 after a 3-year review process.[15] Since 1990 more than 2,500 mergers were under the scrutiny of the European Commission.

According to the ECMR, a merger has community dimension if it takes place between firms with a combined worldwide turnover of at least 5 billion Euros and a turnover within the European Economic Area of more than 250 million Euros for each of at least two of the undertakings. This definition also includes mergers between firms that produce outside of Europe and sell into Europe. If necessary, a merger can be referred back to the member states for review.

Art. 2(3) of the ECMR states that "A concentration, which creates or strengthens a dominant position as a result of which effective competition would be significantly impeded in the common market or in a substantial part of it, shall be declared incompatible with the common market." This is commonly referred to as the dominance test (DT). DT constitutes an important difference to the SLC (Substantial lessening of competition) test, which is used by the US competition authorities. Some observers (e.g., Lyons, 2004) argue that the DT puts unnecessary weight on the concept of dominance in cases where the more important issue concerns the *significant impediment of effective competition*.[16]

The regulation defines the legal steps, which serve to control concentrations between undertakings (see figure 1). Merging parties are obliged to notify their intentions to merge to the commission when the deal has a community dimension. After receiving notification of the

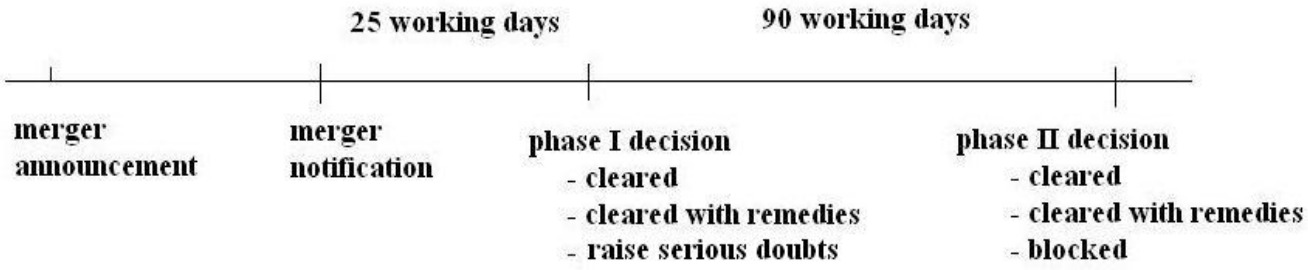
[14] The cases were Airtours/First Choice (M.1524), Tetra Laval/Sidel (M.2416), Schneider/Legrand (M.2283), and General Electric/Honeywell (M.2022). Interestingly, according to our analysis, three out of four of these cases were type I errors, i.e. procompetitive mergers that were unduly blocked by the Commission.

[15] Council Regulation (EEC) No. 4064/89 was amended by Council Regulation (EC) No. 139/2004 on the control of concentrations between undertakings that entered into force on January 20, 2004. Commission Regulation (EC) No.802/2004 implements the Council Regulation (EC) No. 139/2004. See http://europa.eu.int/comm/competition/mergers/review/ for a description of the review process.

[16] The new merger regulation, which is applicable from May 1, 2004, focuses on the impact of a merger on competition.

concentration, the commission has 25 working days to asses whether the concentration is compatible with the common market (the so called phase I).

Figure 1: The EU Merger Control



After this short period of time, the commission can either clear the proposed concentration unconditionally (Art 6.1.b), can decide to let it go through after verifying that the commitments and obligations proposed by the undertakings can effectively restore competition (Art. 6.2.), or it can decide that the proposed concentrations raise serious doubts as to its compatibility with the common market (Art. 6.1c) and, therefore, a more in depth analysis is needed. In this case, the commission opens the so-called phase II, which consists of 90 working days. During this period of time, an in depth investigation is carried out. Generally, the commission makes use of the entire available time, given the problematic nature of these cases, after which it has to come to a final decision: either to block the merger (Art. 8.3) or to let it through unconditionally or with commitments and obligations (Art. 8.2.).

Looking at figure 1, there are three events, which are important for our empirical analysis. The first one is the merger announcement, which we define as the first rumor appearing in the press about the proposed merger, and should help us identify the market assessment of the competitive effects of the merger. The other two relevant events are the phase I and the phase II decision dates, which should help us identify the effect of remedial action, as we will discuss in section 5.

4. Merger Remedies

Before describing how different jurisdictions deal with the use of remedies in merger control, we shall illustrate several commonly accepted principles guiding most antitrust authorities.[17]

[17] See the study on merger remedies by the OECD (2004) on this issue.

Largely, these principles were stated in the FTC's Remedies Guidelines, which were issued at the end of 1999 and were strongly influenced by Baer's (1999) study mentioned earlier.[18]

First of all, the use of remedies should be considered only if they are demonstrably necessary, i.e. the competition authority has the burden to prove that the mergers might impede or reduce competition. In this case, the merging parties have to come up with proposed solutions to the competitive concerns raised by the deal.

Structural remedies, in particular divestitures, should be preferred to behavioral remedies - such as termination of exclusive agreements, obligations on licensing and access to essential infrastructures or technology, use of patents etc. - because they are supposed to fully and timely solve the competitive harm caused by the merger. Moreover, they need not much further monitoring by antitrust authorities. Conduct remedies are, however, not prohibited and might be used, mostly in a remedies-package proposed by the merging parties

The divestiture should be a demonstrably autonomous on-going business unit comprising the entire business of one of the merging parties. This preference for "as is" divestitures is supported by the higher success rate of such divestitures as compared to a limited divestiture in the FTC's divestitures study (Baer, 1999). In some cases (mostly in retail markets) the agencies require the divestiture of overlapping assets to ensure that there is no increase in concentration.

A second aspect of the preferred divestitures is the increasing use of up-front buyers, which has been considered as the "most vital tool in assuring a successful divestiture" (Parker and Balto, 2000).[19] An up-front buyer is less commonly required when the divested assets constitute a standalone business. The agencies are also using crown jewel provisions, which require the divestiture of additional highly marketable assets, if the merging firms fail to divest the original asset package as required by the consent decree. Finally, a divestiture trustee shall oversee the implementation of the commitments.

[18] The EU guidelines were very much affected by this study as well. Former EU competition commissioner Mario Monti (2003) stated: "The Commission's approach to remedies as set out in the notice was influenced by the FTC's previous study on the divestiture process […]. Furthermore, the EU and US antitrust authorities discussed their respective approaches to remedies within the framework of a working group on merger control. The exchange of expertise in this group proved invaluable to the drafting of the Notice on Remedies"

[19] Unlike the FTC, the DOJ generally does not insist that the parties identify the buyer upfront, and is amenable to divestitures arranged independently by the parties that do not require entry of a formal consent decree (the "fix-it-first" approach). Halverson and Ewing (2005) argue that the DOJ believes that it has no power to review and block a different transaction from the one, which the parties have not already agreed to ("post-fix"). The EU Commission, instead, seem to follow the FTC approach and requires the merging parties to propose the buyer.

4.1. The Use of Remedies in the EU

At the end of 2001, the European Commission issued the Commission Notice (2001/C 68/03) on remedies acceptable under Council Regulation (EEC) No 4096/89 and under Commission Regulation (EC) No 447/89, which gives guidelines on the use of remedial action in merger control. These guidelines were an important step in making the process of using remedies more transparent, to increase legal certainty, as well as to achieve convergence towards the American antitrust procedure.[20]

The notice on remedies clearly states that the commission is required to demonstrate that the proposed concentration raises competition concerns. However, it is then the responsibility of the parties to prove that the proposed remedies fully eliminate such concerns (see Monti, 2003). Moreover, the parties must provide specific details and procedures, called in the EU antitrust jargon "obligations", relating to the commitments' implementation.

The preferred remedy is the divestiture of viable standalone businesses, i.e. structural remedies, but other remedies are possible such as exclusive agreements, licensing, and access to the necessary infrastructure or technology. The divested activities must be preferably an already existing business unit that can operate on a standalone basis. The purchaser must be suitable and has to be approved by the commission.

Parallel to the introduction of the remedies guidelines a Remedies Enforcement Unit was established within the DG Comp with the aim of developing and ensuring a consistent policy for remedies in merger cases. The unit is expected to follow the implementation of remedies and their revision, as well as monitor their effectiveness. Therefore, it is supposed to develop over time best practice guidelines and enhance transparency in the remedies' policy.

The implementation of the commitments is an equally delicate step, which involves the monitoring of accepted divestitures, the approval of mandates to trustees and, finally, the approval of proposed buyers for the divested assets. The role and powers of trustees have been reinforced by the remedies notice. The trustee should ensure that no competitive harm comes to the assets by the divestiture during the period between the implementation of the original operation and the sale.

[20] The FTC had already issued remedies guidelines in 1999. The Antitrust Division of the DOJ, instead, issued its remedies guidelines in 2004.

4.2. The Use of Remedies in the USA and other Jurisdictions[21]

USA

Section 7 of the Clayton Act (*15 USC § 8*) prohibits mergers that have the likely effect of substantially lessening competition (SLC) or tending to create a monopoly in the relevant market. Merger remedies have received little attention until Congress enacted the Hart-Scott-Rodino Antitrust Improvements Act in 1976 (*15 USC § 18a*) (HSR Act).[22] Subject to certain exemptions, the HSR Act requires merging parties in transactions above certain thresholds to file a notification form with the FTC and the Antitrust Division of the DOJ before closing the transaction. The two agencies have 30 days to investigate the merger and, if their competitive concerns are not resolved, they may issue a second request for additional significant information.[23] The waiting period is then extended by a further 30 days after the parties declare themselves in substantial compliance with the second request, at which time the parties are allowed to proceed with the deal unless the government has initiated proceedings to block the transaction. The pre-closing notification guarantees the agencies timely knowledge of potentially anticompetitive mergers. The HSR filing and second request processes provide them with information to analyze the competition issues, to prepare for a preliminary injunction hearing, and to evaluate any proposed remedy. Accordingly, the average number of FTC merger enforcement actions after the HSR Act increased significantly.[24]

Both the FTC and the DOJ prefer to resolve concerns about anticompetitive effects by using structural remedies that require the parties to divest business lines or assets to restore the competition reduced by the merger.[25] In general, such remedies are negotiated by the parties with

[21] We will not discuss the remedies' policy for the UK and Germany in this section, since the key authority in Europe is the European Commission. However, German antitrust principles and tradition have very strongly influenced the European approach to competition policy since its beginning. See Motta (2004) for a historical perspective on European vs. US antitrust policy.

[22] Baer and Redcay (2001).

[23] "Second Request" refers to the official "Request for Additional Information and Documentary Material," which the agencies may issue pursuant to 15. USC § 18(a)e.

[24] Baer and Redcay (2001) report that between 1983 and 1989 HSR filings averaged 1877 per year. Over the same period the FTC averaged 11 merger enforcement actions annually. For the period between 1993 and 1999, those figures were 3090 and 30, respectively. The workload statistics of the Antitrust Division of the DOJ for the fiscal years 2000 and 2003 show that these numbers are 2375 and 10, respectively.

[25] See *http://www.ftc.gov/bc/mergerfaq.htm.*

the agency staff and then incorporated into a binding consent order issued by the FTC; or a binding consent decree issued by a federal court at the request of the DOJ.

Behavioral remedies are considered to be a less satisfactory solution than a divestiture, since they often involve some form of ongoing regulation (Parker and Balto, 2000). On the other hand, structural remedies are "relatively clean and certain" (McDavid and Breed, 2005). In some cases the FTC has used behavioral remedies such as firewalls and nondiscrimination provisions in vertical mergers.

Japan

The Japan Fair Trade Commission (JFTC) is responsible for the initiation of an investigation of conduct that may violate the Antimonopoly Act (Act Concerning Prohibition of Private Monopolization and Maintenance of Fair Trade - Act No. 54, 1947). The Act prohibits mergers or acquisitions where the effect may be to substantially restrain competition or where such a transaction is implemented through an unfair trade practice. The Act has been clarified by guidelines published by the JFTC in 1998. Recently, JFTC (2004) has published a new set of guidelines, which also devote some space on potential remedies.

The JFTC guidelines consider the divestitures as the most effective means to restore competition. The divestitures aim to establish new competitors or strengthen the existing competitors of the merging parties. Besides the usual divestitures, such measures include the reduction in the voting rights or cancellation of interlocking directorates in another company.

If a divestiture is not a viable option, then JFTC considers promotions of imports or entry as remedial measures as well. Behavioral remedies include the prohibition of discriminatory treatment of competitors with respect to essential facilities for business and regulatory policies by fixing some aspects of the behavior of the merging parties.[26]

Australia

The Australian Competition and Consumer Commission's (ACCC) Guidelines (1999) outline the merger review process under the Trade Practices Act 1974. The ACCC considers divestitures as a more viable remedy than behavioral undertakings such as price, output, quality or service guarantees and obligations. In practice, very few mergers attract ACCC concern and of those a

[26] Besides a reduction of their turnaround slots, the remedy package in the merger between Japanese Airlines Co. Ltd. (JAL) and Japan Airsystem Co. Ltd. (JAS) included remedial measures in favour of new airlines as well as regulatory measures such as a reduction of 10% on normal fares and the requirement that fares would not be raised during a period of 3 years (Arai, 2004).

vast majority goes forward after slight changes to their structure. For example, in 1996-97 147 mergers were considered by the ACCC, of these 140 were not opposed and of the remaining seven, two proceeded with remedies and the other five were withdrawn.

Canada

In Canada, the Commissioner of Competition oversees the Competition Bureau, which is part of the Federal Department of Industry. Under the Competition Act, the commissioner commences an inquiry and, in case of a presumed violation, a formal recourse is taken by applying to the Competition Tribunal for an order. The tribunal exercises no investigative functions and is purely a body to make findings and issue remedial orders. The Tribunal has a wide range of remedies available when it finds that the Competition Act has been violated. In case of mergers, these include orders of divestiture assets and/or shares, the dissolution of the transaction or orders regulating conduct. Out of 215 (267 in 2002/2003) merger cases concluded in 2003/2004, 6 (6) cases were agreed with remedies and 6 (3) were abandoned either as a direct result of the commissioner's position or for other reasons.[27]

While divestitures have traditionally been the favorite remedy, behavioral remedies have been used very frequently (Neylan, 2002). Campbell and Halladay (2002) analyze a number of merger cases reviewed by the commissioner and suggest that the bureau has in fact been willing to use diverse and innovative remedies in a considerable number of mergers.

5. Approach and Hypotheses

The evaluation of remedies' effectiveness is intrinsically an empirical question. The first task is to identify those mergers that are most likely to lead to an increase in market power and where remedies should theoretically be applied. In particular, we classify mergers according to the likely net effects of market power versus efficiency gains. We shall assume that the antitrust authority follows a consumers' surplus standard, which is the adopted welfare measure in the US as well as EU merger control.[28] An anticompetitive merger is then defined as such to reduce consumers' surplus. We look at the profit change of the rival firms at the merger's announcement date to assess the merger's competitiveness, since there exists a correspondence between the

[27] See the Annual report of the Commissioner of Competition (Competition Bureau Canada, 2003 and 20043).

[28] Actually, the old EU merger regulation did not explicitly state the use of a consumer surplus standard. However, Commissioner Monti stated several times that the ultimate scope of European competition policy is to serve consumers' interest.

decrease in consumers' surplus and the increase of competitors' profits following a merger, as long as the considered merger is profitable for the merging firms.[29]

In principle, a merger might have four possible effects on the merging and rival firms' profits. Table 2 lists these four possibilities as well as the optimal incidence of remedies. If the merger generates positive profits for both the merging and the rival firms ($\Delta\Pi_M > 0$ and $\Delta\Pi_R > 0$), the market power effect following from the merger is likely to outweigh any efficiency gains (the "umbrella effect"). In this case appropriate remedies should be imposed on the merging parties, which reduce the market power effect (at least) until the point where the two effects neutralize each other on consumer or total welfare (depending on which standard the competition authority chooses).

If the merger generates positive profits for the merging firms but has a negative effect on rival firms' profits ($\Delta\Pi_M > 0$ and $\Delta\Pi_R < 0$), the efficiency effect of the merger is likely to outweigh the market power effect, since only merging firms enjoy the positive effect of increased efficiency. There should be no remedies in this case, at least none that (also) reduce the efficiency gains from the merger.[30]

Table 2: Possible Effects of Mergers on Merging (M) and Rival (R) Firms' Profits and the Optimal Incidence of Remedies

	$\Delta\Pi_M > 0$	$\Delta\Pi_M < 0$
$\Delta\Pi_R > 0$	Market Power Increase; Remedies	Efficiency Reduction; Possibly Remedies (if $\Delta\Pi_I > 0$)
$\Delta\Pi_R < 0$	Efficiency Increase; No Remedies	Efficiency Reduction; No Remedies

[29] The correspondence between the sign of the rivals' profit change and the change in consumers' surplus holds in a class of models such as homogenous good Cournot competition and differentiated goods price competition (see Neven and Röller, 2005 and Duso *et al.* 2003 on this point). However, in this model unprofitable mergers would not occur.

[30] Remember that, according to the merger regulation, efficiencies should be "merger specific" and should "benefit consumers". See Röller *et al.* (2001) on considerations about the role of efficiency gains in merger control.

The fact that mergers, which reduce the efficiency and profits of merging firms, happen cannot be well explained by standard industrial organization models.[31] Nevertheless, there is overwhelming evidence that many of such mergers do take place. For example, Gugler *et al.* (2003) find several of these mergers taking place around the world and attribute them to managerial motives, such as growth and size maximization.[32] Within this category, two cases can be distinguished: mergers that reduce the profits of the merging firms but increase the profits of the rival firms and mergers that reduce profitability of both parties.

If a merger decreases insider profits but increases rival firm profits ($\Delta\Pi_M < 0$ and $\Delta\Pi_R > 0$), the net effect of the merger on welfare depends on the relative magnitudes of the profit effects. If industry profits go up ($\Delta\Pi_I > 0$), the merger may be considered as being predominantly anticompetitive since rival firms react to the reduced efficiency of the merging firms by increasing their prices. Here remedies may be considered, although the source of the problem is not one of competition policy but one of inadequate corporate governance. If industry profits go down, nothing can be said about the anticompetitive effects and necessary remedies.

The same holds true in the last case when both merging and rival firms' profits decrease ($\Delta\Pi_M < 0$ and $\Delta\Pi_R < 0$). One possible interpretation of this cell is that the merger not only reduced the efficiency of the merging firms, but at the same time had an effect on industry conduct. That is, the strategic interaction between firms has changed and reduced the collusiveness in the industry. Alternatively, the merger led to an increase in competition in the market, e.g. in technology markets leading to unambiguous improvements in consumer welfare. Finally, these are also mergers, which could be explained by the pre-emption theory (Fridolfsson and Stennek, 2005): firms rationally engage in apparently unprofitable mergers because being an insider is better than being an outsider. In any case no remedies should be observed.

[31] One exception is the literature on pre-emptive mergers (see Fridolfsson and Stennek, 2005 and Molnar, 2003). In these models, profit maximizing firms rationally do unprofitable mergers in order to pre-empt rivals, in those cases where being an insider is more profitable than being an outsider.

[32] Molnar (2003) uses a sample of all horizontal mergers that resulted in 100% ownership of the target between 1981 and 1998 where both the acquiring and the target firms were quoted in the NYSE, AMEX, or NASDAQ stock exchanges. He claims that, in his sample, pre-emptive motives for mergers find stronger support than hubris and agency theories.

5.1. Measuring the Effects of Mergers and Remedial Actions: The Event Study Methodology

The first aim of this paper is to provide a taxonomy of mergers by empirically estimating their effects on merging firms' as well as rivals' profitability (also see Duso *et al.*, 2003 on this point). Therefore, the question is how to measure profitability. There are two strands of literature that look at the effects of mergers and propose empirical methodologies to quantify them. One possibility consists of using balance sheet data and following the performance of the involved firms several years after the merger (see Gugler *et al.*, 2003 as a recent example). The other strand of literature, which we discussed in section 2, looks at stock market reactions to mergers' announcements, under the assumptions that markets are able to efficiently process information about the mergers. We follow this second approach and run event studies on the firms' stock prices to measure the merger's profitability effects.

Under the assumptions of efficient markets and rational expectations, the market model predicts that firm *j*'s stock return at time *t* ($R_{j,t}$) is proportional to a market return:

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

To study the stock price reaction to the mergers' announcements, we estimate the market model over 240 trading days, starting 20 days prior to the announcement day and using the Scholes–Williams (1977) method. We obtain estimated values for the model's parameters α and β, which we can use to predict what firm *j*'s stock price would have been, had the merger not been announced or, more in general, had the event under consideration not occurred ($\hat{R}_{j,t}$). For firm *j*, we calculate then the abnormal return around the mergers' announcement day *t* ($AR_{j,t}$) as:

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

We then calculate a cumulative abnormal return over an event window of $2x+1$ days (x = 0, 1, 2, etc.):

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

We calculate these measures for merging firms and all rivals for each merger. In order to obtain the aggregate effects on merging firms and on rivals ($\Delta\Pi_i^d$, $i = M, R$), we took the weighted

average of the cumulative abnormal returns of all firms in each of the two groups ($i=M,R$), the weight being firm j's market value (MV_j^d):

$$\Delta\Pi_i^d = \frac{\sum_{i=1}^{N_i} CAR_j^d MV_j^d}{\sum_{i=1}^{N_i} MV_j^d} \qquad j = 1,...,N_i, \quad i = M, R, \quad d = A, D \ .$$

These give us a measure of the merger's and remedies' profitability effects.

5.2. Measurement Issues

We use the above explained methodology to quantify two effects. First, we asses the merger's competitive effect by looking at the reaction of merging and rival firms' share prices around the deal's announcement date. This allows us to measure the merger's profitability effects on merging (M) and rival (R) firms, which we label $\Delta\Pi_M^A$ and $\Delta\Pi_R^A$, and thus classify mergers as problematic and not so problematic according to table 2. Second, we look at the different merger review's decision dates and try to infer information about the effectiveness of antitrust intervention from the stock market reactions to these events.

There are some measurement problems in doing this exercise, since one has to understand how much the market predicts, or can predict, about the antitrust action around each event date as well as how much information was disclosed to the market and when it happened.

We start with the merger's announcement reactions. This measure is an unbiased measure of the merger's effects if the market assumed clearance without later commitments at the announcement day. Indeed, the observed abnormal return around the announcement day is equal to the real value of the merger ($\Delta\Pi_i^*$) minus the expected value of the remedies ($E\left[R_i \middle| I_A\right]$) given the information available in the market at that time about remedies:[33]

$$\Delta\Pi_i^A = \Delta\Pi_i^* - E\left[R_i \middle| I_A\right].$$

[33] This formulation allows us to include clearances (remedies=0) and prohibitions (the strongest form of remedies).

As long as the expected value of remedies is low, one should expect the observed abnormal return ($\Delta\Pi_i^A$) to have the same sign as the real value of the merger ($\Delta\Pi_i^*$).[34] Therefore, even though we might wrongly measure the real merger value with our event study, we still should be able to have an accurate prediction of the sign of this effect. This is what we are mostly interested in for the first step of our analysis, since we need to know whether profits from the merger are positive or negative in order to categorize mergers according to table 2.

To measure remedies' effectiveness we look at the stock market's reactions around the date when the information about the commission's decision was disclosed. The main problem is to understand how much the market knows about, or how good the market can predict, the outcome of the bargaining process between the commission and the merging parties, which results in the imposed remedies.

The first important date is the phase I decision. After the first four weeks of investigation, the commission has different possible choices - as discussed in section 3. If the merger does not raise serious market power concerns, the commission clears the merger either unconditionally or with conditions and obligations. In this case, our event study should capture the effect of this decision, under the assumption of no information leakage during this first investigation period. Hence, for these cases, the phase I decision effect is the difference between the remedies' real effect (R_i) and the market expectation about remedies, given the information available around the announcement date:

$$\Delta\Pi_i^{P1} = R_i - E\left[R_i \middle| I_A\right] \qquad i = M, R$$

The worst decision from the merging firms' perspective - and therefore the decision that should trigger strongest price reactions - is when market power concerns are substantial and the commission decides to open a phase II investigation. In this case, the market reaction corresponds to the update of the market's beliefs about remedies. Indeed, when a case goes into phase II, the probability of a commission's intervention increases sharply.[35] Therefore, the abnormal returns around the day of the phase I decision for mergers that go into a phase II

[34] Indeed, we would not expect a benevolent agency to impose remedies, which are higher than the value of the merger for merging firms.

[35] Table 1 shows that the incidence of remedies in phase I is 4%, while it increases to over 60% in phase II. Moreover, a merger can be prohibited only after a phase II investigation.

investigation should simply be the update of the market expectation about remedies, given the newer information set available at this point in time (I_{P1}):[36]

$$\Delta\Pi_i^{P1} = E\left[R_i \middle| I_A\right] - E\left[R_i \middle| I_{P1}\right] \qquad \text{i} = \text{M,R} .$$

Similarly, around the day of the phase II decision, the abnormal return should measure the difference between the real value of phase II remedies (prohibitions are the extreme case of remedy) and the expectation that the market built given the information available on the phase I decision:

$$\Delta\Pi_i^{P2} = R_i - E\left[R_i \middle| I_{P1}\right] \qquad i = M,R .$$

Only under the assumption that not all relevant information about remedies is available on the announcement date, other events such as the commission's decision should trigger significant stock price reactions even in presence of efficient markets. Therefore, we will measure only the unexpected component of these announcements. Yet, there are several reasons why it might be difficult for the market to know a priori the real effects of remedies. First and most importantly, remedies are the outcome of a (secret) bargaining process between the merging parties and the commission. Second, during the sample period the commission still did not have any kinds of official guidelines for the use of remedies, which made the policy process not perfectly predictable.

As in all event studies, there is a final problem regarding information leakages. It might be possible that some information about the final decision was disclosed to the market during the investigation period. Hence, around the day of the decision, we would only measure the market updates with respect to the already revealed information. While this can be a major problem during the phase II investigation, since it is a long process and the probability of information disclosure might be high, we do not think that this should be particularly relevant during the phase I investigation, which is conducted over a very short period of time.[37] Abnormal returns around the day of the phase I decision should therefore be a quite accurate measure of the effects of phase I decision and of the market's priors about the phase II procedure.

[36] Actually at the beginning of a phase II investigation, the market could also value the cost of such a procedure. Therefore the abnormal return around the phase I decision for those mergers that went into a phase II investigation might also reflect the high costs these firms are expected to pay.

[37] Indeed, we also estimate abnormal returns for an 11-day window, which would cover one fourth of the phase I investigation period.

5.4. Hypotheses

A comparison of the incidence of mergers and remedies allows us to formulate our first hypothesis: Are remedies targeted at the *right* mergers (i.e., mergers that increase market power)? Or, put another way, did the commission make type I errors (impose remedies in procompetitive mergers) and type II errors (not impose remedies in anticompetitive mergers) when compared to the counterfactual given by the market merger's assessment?

We can then further evaluate the effectiveness of remedies by looking at the profitability effects around the various decision dates. In general, we expect remedies that effectively reduce market power to shrink rivals profitability in anticompetitive mergers. Analogously, we expect remedies to reduce merging firms' profitability in these mergers. However, if remedial action works in the right way, it should not completely destroy profits stemming from the increase of merging firms' productive efficiency. Hence, the reduction of merging firms' profitability should not be drastic, at least where the merger produces some efficiency gains.

In procompetitive mergers one should not observe remedies. If, however, the commission mistakenly applied them in such cases (type I errors), the remedies should not have a strong impact on both firms' profitability otherwise the commission's action would be detrimental to efficiency.[38]

6. The Data, the Estimated Abnormal Returns, and Mergers Taxonomy

Our sample consists of 167 concentrations that have been analyzed by the European Commission from the period 1990-2002. Our starting database was developed in Duso *et al.* (2003). Our sample includes almost all phase II mergers completed by the EU till the end of 2001, and a randomly matched sample of phase I cases, which run up to June 2002. Because of difficulties in identifying competitors or their stock, we end up with 78 phase II cases and 90 phase I cases for which we have complete information. We identify 880 different firms involved in several mergers either as merging parties or as rivals.

[38] One potential problem of our analysis is that we look at the "average competitiveness" of a merger. In many cases, however, there are several product/geographical markets involved. Hence, there might be cases, which are on average procompetitive but where competitive concerns are present in some, but not in all of the relevant markets. In such a situation, it would then be right for the Commission to intervene in order to solve these problems in the specific markets. Yet, with our methodology, we would define such a case as a type I error, since the deal was on average procompetitive.

Table 3 presents a short description of relevant variables that illustrate some of the main characteristics of the mergers in our sample. These variables are mostly derived from the commission's decision files.

The market value of the merging firms is on average 45 billion US dollars. The aggregate market value of rivals is of course much larger (385 billion US dollars on average) since we have several competitors involved in one merger, whose values are summed up.[39] The merger's average number or rivals for which we have data is 3.66, since we are not able to identify all competitors listed in the commission's reports and varies between 1 and 14.

The majority of the concentrations in our sample (56.9%) were full mergers, 24% joint ventures, 13.1% partial acquisitions, 11.4% were tender offers, and only 6% consisted of asset acquisition.

In 41.3% of cases the geographical market definition is the European Economic Area, in 34.7% it was defined to be national, and for the rest (21%) it was worldwide.

Remedies have been imposed in 35.3% of the mergers (6.6% in phase I and 28.7% in phase II).[40] Only 12 mergers in our sample (7.1%) were blocked. Considering these prohibitions as an extreme type of remedies, we have 43.1% of cases where the commission intervened to modify the merger in order to restore effective competition. We will use these cases to identify the effect of remedies by contrasting them to the rest of the sample, which consists of mergers that were cleared outright.

Remedies are categorized as structural or behavioral using the information contained in the commission's decision. In 15.6% of the mergers, the commission adopted a "remedies mix" consisting of structural and behavioral remedies together. In only 13.2% of the cases, pure structural remedies have been imposed, while behavioral remedies have been adopted alone in only 5.4% of the mergers in our sample.

The most adopted kinds of remedies are divestitures, which were imposed in 23.6% of the cases. This corresponds to 67% of the mergers where remedies have been applied. The selling of shares was imposed in 10.3% of cases, licensing agreements in 11.5%, the access to essential technologies or facilities in 9.7%, the dismissing of exclusive agreements in 7.3%, and the dissolution of interlocking directorates only in 3.6% of the mergers in our sample.

[39] This information comes from our calculations on Datastream data and might therefore diverge from the (mostly censored) figures reported in the Commission's files.

[40] Note that mergers where remedies were imposed in phase I are a little overrepresented in our sample (6.6%) in comparison to the entire population (4.6% of cases).

Table 3: Variables Definition and Summary Statistics

Variable	Description	Mean	Std. Dev.
mvd_mer_a	Market value of the merging firm in million US $	44416	84507
mvd_com_a	Market value of the rivals in million US $	385498	3858280
competitors	Average number of competitors	3.6687	2.5216
full	Full acquisition	0.5689	0.4967
partial	Partial acquisition	0.1317	0.3392
jv	Joint Venture	0.2395	0.4281
assetacq	Asset acquisition	0.0599	0.2380
tender	Tender offer	0.1138	0.3185
phase1	The merger was cleared in phase I	0.5329	0.5004
phase2	The merger was cleared in phase II	0.4671	0.5004
national	The geographical market is national	0.3473	0.4775
EEA	The geographical market is the European Economic Area	0.4132	0.4939
world	The geographical market is worldwide	0.2096	0.4082
remedies	Remedies have been applied	0.3533	0.4794
prohibitions	The merger was prohibited	0.0719	0.2590
sremedies	Strong remedies: prohibitions are strongest type of remedy	0.4251	0.4959
structural	Structural remedies have been imposed	0.2909	0.4556
behavioral	Behavioral remedies have been imposed	0.2121	0.4101
remed_mix	A remedies mix (structural and behavioral) was imposed	0.1557	0.3637
p_structural	Only structural remedies have been imposed	0.1317	0.3392
p_behav	Only behavioral remedies have been imposed	0.0539	0.2265
divestiture	The remedy consisted in a divestiture	0.2364	0.4261
shares_sell	The remedy consisted in selling shares	0.1030	0.3049
interlocking	The remedy consisted in dissolving interlocking directorates	0.0364	0.1878
exclusive_agree	The remedy consisted in eliminating exclusive agreements	0.0727	0.2605
licensing	Merging firms must license some products / processes	0.1152	0.3202
access	Merging firms must guarantee access to an essential technology/ facility	0.0970	0.2968

All variables excluding the market values and the average number of rivals are dummy variables**.**

For each case, merging firms and competitors have been identified from the published commission's decisions.[41] The mergers' announcement date was collected from the financial press by using the Dow Jones Interactive database.[42] For each firm *j* (merging and rival firms),

[41] This is a big advantage of our data set, since we can rely on the Commission's analysis concerning the market definition (the relevant competitors). However, this has also the disadvantage that we might have picked the wrong competitors because the Commission made mistakes in defining the relevant market.

[42] This is a customizable business news and research product that integrates contents from newspapers, newswires, journals, research reports, and web sites. The peculiarity of our approach is that we looked at the first rumours about the merger, i.e. the first time a discussion of the mergers appeared in the international press, and not necessarily the

we have computed the abnormal return around the merger's announcement day, as well as phase I and phase II decision dates. We then calculated the cumulative 3-day, 5-day, and 11-day abnormal returns for each firm. In order to obtain the aggregate effects on merging firms' and on competitors ($\Delta\Pi_i^d$, $i = M, R$), we took the weighted average of the abnormal returns of all firms in each of the two groups ($i=M,R$), the weight being the firms j's market value (MV_j^d), as we described in paragraph 2.

Table 4 reports the preliminary statistics of the various measures of estimated aggregated abnormal returns for merging firms and competitors around various points in time and using different event windows.

According to our estimates, the mergers in our sample were on average profitable since the average aggregated cumulative abnormal returns for the merging firms around the announcement date ($\Delta\Pi_M^A$) are positive and statistically significant at the 1% level for all used windows. The size of the profitability effect ranges from 1.1% (1 day window) to 2.07% (5-day window).

This result seems however to be in line with the literature.[43] The cumulative abnormal returns for the rivals around the announcement date ($\Delta\Pi_R^A$) are, instead, not statistically significantly different from zero and very small in size.[44] On average, these mergers seem to be welfare-neutral, in the sense that neither they increase nor decrease the average rivals' profits.

The notification date effects are for both merging and rival firms very small and almost always insignificantly positive. Under the assumption of efficient markets, we would expect exactly these kinds of effects. The notification, in fact, is a required act by the parties and should not

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official merger's announcement by the involved parties. This has the advantage of reducing the noise in identifying the "right" event. On the other hand, our measure of abnormal returns might be downward biased by the fact that the market might still not be sure whether the merger will take place or not. What we observe is, therefore, the value that the market attaches to a particular merger times the expected probability that this merger will really be consumed.

[43] See for instance Andrade et al. (2002). In fact, $\Delta\Pi_i^d$ is the weighted sum of the acquiring and of the target firms' abnormal returns. Depending on the event window, we estimate average abnormal returns for acquirers in the range between -0.54% and 0.12% (not statistically significantly different from zero) and for the targets in the range between 3.4% and 6.2% (statistically significantly greater than zero at the 1% level). These results are quite similar to those reported by Aktas et al. (2004a) using a comparable sample of mergers analyzed by the EU Commission. Note however that in their sample the phase II cases are much more underrepresented than in ours.

[44] The abnormal returns for rivals are measured with errors, since we lost part of them due to the fact that they are small - not quoted - firms. Because we have mostly the biggest competitors in our sample we possibly have another bias towards "no significance": big firms derive probably only a small fraction of their revenues from the market under consideration and are, therefore, only partially affected by the merger.

convey any relevant information to the market since it is common knowledge that merging firms must notify the transaction.

Table 4: Estimated Abnormal Returns

Variable	1 day	3 days	5 days	11 days
Announcement day				
$\Delta\Pi_M^A$	**0.0114**** (0.0049)	**0.0157***** (0.0059)	**0.0207***** (0.0065)	**0.0191***** (0.0072)
$\Delta\Pi_R^A$	0.0038 (0.0041)	0.0029 (0.0023)	0.0005 (0.0031)	0.0056 (0.0075)
Notification day				
$\Delta\Pi_M^N$	0.0028 (0.0028)	**0.0072 **** (0.0032)	0.0044 (0.0035)	**0.0081*** (0.0058)
$\Delta\Pi_R^N$	0.0041 (0.0063)	0.0030 (0.0045)	0.0024 (0.0034)	0.0050 (0.0136)
Phase 1 Decision				
$\Delta\Pi_M^{p1}$	**-0.0034**** (0.0016)	**-0.0112**** (0.0058)	**-0.0115**** (0.0061)	**-0.0143**** (0.0075)
$\Delta\Pi_R^{p1}$	**-0.0026 *** (0.0019)	**-0.0033 *** (0.0025)	**-0.0050 *** (0.0036)	0.0098 (0.0145)
Phase II Decision				
$\Delta\Pi_M^{p2}$	0.0022 (0.0018)	**0.0068**** (0.0029)	0.0033 (0.0038)	0.0068 (0.0087)
$\Delta\Pi_R^{p2}$	-0.0002 (0.0025)	-0.0039 (0.0043)	-0.0054 (0.0057)	-0.0043 (0.0081)
Final Decision [a]				
$\Delta\Pi_M^D$	**-0.0024*** (0.0017)	**-0.0082*** (0.0059)	**-0.0101*** (0.0062)	**-0.0112*** (0.0085)
$\Delta\Pi_R^D$	-0.0027 (0.0022)	**-0.0052*** (0.0033)	**-0.0076*** (0.0047)	0.0078 (0.0151)
Sum				
$\Delta\Pi_M^A + \Delta\Pi_M^D$	**0.0093*** (0.0054)	0.0075 (0.0085)	0.0104 (0.0089)	0.0074 (0.0112)
$\Delta\Pi_R^A + \Delta\Pi_R^D$	0.0012 (0.0031)	-0.0023 (0.0035)	-0.0071 (0.0059)	0.0134 (0.0209)

We report the mean and standard errors (in parentheses) of the different abnormal returns. We use a one tailed t-test to test whether the abnormal returns are significantly positive or negative, and report significance: 1%, 5%, and 10% significance level are represented by ***, **, * respectively.

[a]This variable is defined as the abnormal return around the phase I decision date for cases cleared (with or without remedies) in phase I and as the sum of the abnormal returns around the phase I and phase II decision dates for the cases that went through the phase II procedure.

Looking at phase I decisions, we observe negative and statistically significant abnormal returns for the merging firms as well as for the competitors for almost all event windows. This suggests that the phase I decision is on average bad news for both merging firms (around -1%) and competitors (-0.5%). Especially, the negative effect on merging firms' stocks is relatively big, since it comes close in absolute value to the average positive effect observed around the announcement date. This would mean that, on average, around the phase I decision already almost the entire profitability effect for the merging firms disappears. The interesting question is then to look whether this average negative effect is driven by the cases where conditions and obligations have been imposed by the commission, or whether it is a pure "decision effect" independent of the use of remedies. We will turn to this question later on.

In the case of phase II decisions, almost all measures of abnormal returns are statistically insignificant. The only exception is the measure of the cumulative 3-day abnormal returns for the merging firms, which is positive (0.68%) and statistically significant at the 5% level. The effect for the merging firms is on average positive, even though small, while the rivals' abnormal return is on average negative, and also very small.

As we pointed out before, we are interested in the stock market reactions around the final decision date, since at this point in time all information about the outcome of the antitrust legacy is provided to the market. First of all we have to define this event and which measure of abnormal returns we consider. For mergers cleared in phase I, this is an easy task: the final decision effect is simply the abnormal return around the phase I decision date. For cases that go to phase II, we chose to use the sum of the phase I and phase II abnormal returns as the final decision effect, since around the phase I decision the market updates its beliefs about the final outcome. In fact, the probability that the merger will be blocked or cleared with remedies sharply increases when a merger goes into a phase II investigation. Looking at this event, we observe negative and significant abnormal returns for merging firms as well as competitors. The size of this effect ranges from -0.24 to -1.1 % for the merging firms and from -0.27% to -0.78% for the rivals.[45]

[45] Just to give an idea, using the average market values, these effects amount to a loss of between 106 and 489 million dollars for the merging parties and between 1 and 3 billion dollars for the rivals.

According to our estimates for the 3-day abnormal returns, 52% of the mergers in our sample were on average anticompetitive in the sense that they increased the profitability of rivals. Almost 33% increased profits of competitors as well as merging firms.[46]

Table 5: Mergers Taxonomy Based on Profitability of Merging and Rival Firms and the Incidence of Remedies: Frequencies

	$\Delta\Pi_M > 0$	$\Delta\Pi_M < 0$	Tot.
$\Delta\Pi_R > 0$ With remedies [a] Prohibitions	55 (32.9%) 24 3	32 (19.1%) 13 6	87 (52.0%) 37 9
$\Delta\Pi_R < 0$ With remedies [a] Prohibitions	43 (25.8%) 17 1	37 (22.2%) 17 2	80 (48.0%) 34 3
Tot. With remedies [a] Prohibitions	98 (58.7%) 41 4	69 (41.3%) 30 8	167 71 12

[a] Prohibitions are considered as an extreme case of remedies.

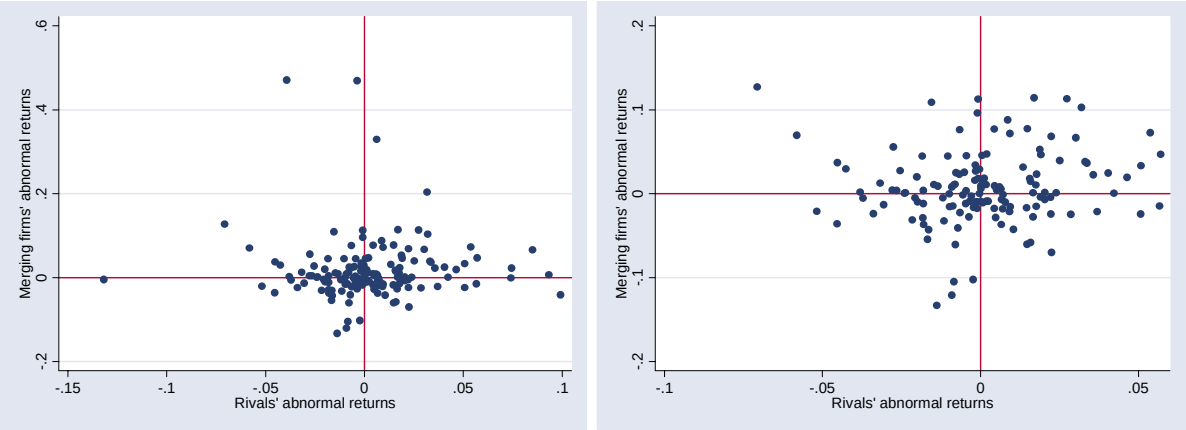
Almost 59% of the mergers in our sample were profitable, which is consistent with our previous findings of average positive and significant abnormal returns for the merging firms around the announcement day. Only 25.8% of the mergers were efficiency increasing - meaning that the merging firms had a positive abnormal return and the rivals had a negative one - while 41.3% were efficiency decreasing mergers in the sense that the merging firms' profitability effect was negative. Among the latter, 22% were really bad mergers with all involved parties registering some losses.

The second row in table 5 reports the number of cases where remedies were applied, while the third row reports the number of blocked mergers. We should only observe remedies (and prohibitions) in anticompetitive mergers. Yet, this is clearly not the case. Remedies (and prohibitions) have also been applied in all kinds of mergers, suggesting that the commission made type I errors. Out of the 80 procompetitive mergers, it unduly imposed restrictions in 37 cases and, even worse, blocked three mergers. The incidence of type I errors is therefore 20.36% (or 46.25% of the procompetitive mergers).[47]

[46] Results based on the 1-day and 5-day abnormal returns are almost identical. Small differences can be obtained when using the 11-day window.

[47] Note that this figure is an upper bound for the type I errors' probability because of the problems concerning the merging firms being involved in several product markets. See footnote 37.

Figure 2: The Distribution of Merging Firms' and Rivals' Abnormal Returns



a. with outliers **b. without outliers**

Moreover, the commission also made type II errors by not imposing remedies in some of the mergers that were anticompetitive. Out of the 87 anticompetitive mergers in our sample, the commission imposed remedies only in 37 cases (among which 9 prohibitions), which means that the incidence of type II errors is as high as 29.94% of all cases (57.47% of the anticompetitive ones). [48] This was the first question we wanted to answer. Yet, before moving to the testing of the previously developed hypotheses, we want to take a closer look at the data.

Figure 2 gives a graphical representation of the joint distribution of merging and rival firms' abnormal returns around the announcement date. A quite strong concentration around the origin (no abnormal returns for either group of firms) can be observed. However, the dispersion is also evident and generates the variation that is a prerequisite for our empirical tests.

It is also interesting to look at the size of the abnormal returns in the different sub-samples and test hypotheses about their sign. Table 6 reports the average abnormal returns and their standard errors along with a one-tailed t-test whether these are positive or negative.

The 3-day average abnormal return for merging firms is around 5% in profitable mergers and around -2.7% in non-profitable mergers (both figures significant at the 1% significance level). In these two sub-samples, the rivals have a positive abnormal return of 0.5% (significant at the 5% level) and a negative abnormal return of -0.03% (not statistically different form zero) respectively.

In anticompetitive mergers rivals have a positive and significant return of 2.3% and merging firms an average positive abnormal return of 1.76%. In the sub-sample of mergers where both the merging and the rival firms' abnormal returns are positive, the profitability effect for merging

[48] Duso *et al.* (2003) provide evidence on the determinants of type I and type II errors.

firms rises to 4.54%. In procompetitive mergers, merging firms still gain on average 1.37% (significant at the 10% level) while rivals lose on average -1.72%.

Table 6: Mergers Taxonomy, Abnormal Returns around the Announcement Date, and Hypotheses Testing

		$\Delta\Pi_M^A > 0$	$\Delta\Pi_M^A < 0$	Tot.
$\Delta\Pi_R^A > 0$	$\Delta\Pi_M^A$	0.0454***	-0.0240***	0.0176***
		(0.0083)	(0.0034)	(0.0064)
	$\Delta\Pi_R^A$	0.0246***	0.0203***	0.0230 ***
		(0.0033)	(0.0042)	(0.0026)
$\Delta\Pi_R^A < 0$	$\Delta\Pi_M^A$	0.0564***	-0.0302***	0.0137*
		(0.0169)	(0.0056)	(0.0102)
	$\Delta\Pi_R^A$	-0.0174***	-0.0171***	-0.0172***
		(0.0026)	(0.0038)	(0.0022)
Tot.	$\Delta\Pi_M^A$	0.0502***	-0.0273***	0.0157***
		(0.0087)	(0.0034)	(0.0059)
	$\Delta\Pi_R^A$	0.0052 **	-0.0003	0.0029
		(0.0031)	(0.0036)	(0.0023)

The mean values of the 3-day cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for positive or negative abnormal returns.

One possible objection to the methodology that we used so far is that in many cases in our sample both merging firms and rivals' abnormal returns are nearly zero. A less crude categorization should take this into account. Hence, we define as positive only those abnormal returns that, according to our sample**,** are bigger than the considered abnormal return's standard error and as negative those which are smaller than the standard error. We can then generate a third category of mergers having a "neutral" profit effect either for the merging or the rival firms. Table 7 reports this extended mergers' taxonomy.

The main message remains similar to what was observed before: the commission still made type I errors (imposed strong remedies in 30 out of 57 procompetitive cases equal to 52.63% of these cases) with an incidence of 17.96%, and type II errors (did not impose due remedies in 39 of 66 anticompetitive mergers, equal to 59.1% of these cases) with an incidence of 23.35%. Of course, the incidence of errors decreases when we consider this restricted sample.

Table 7: Mergers Taxonomy, Abnormal Returns around the Announcement Date, and Hypotheses Testing Considering Statistical Significance [a]

	$\Delta\Pi_M^A > 0$	$\Delta\Pi_M^A = 0$	$\Delta\Pi_M^A < 0$	Tot.
$\Delta\Pi_R^A > 0$	41	10	25	76
Remedies	18	5	9	32
$\Delta\Pi_R^A = 0$	16	1	7	25
Remedies	4	0	6	10
$\Delta\Pi_R^A < 0$	28	14	25	57
Remedies	16	4	10	30
Tot.	85	25	57	167
	38	9	25	72

[a] We consider to be zero all observations for which either the abnormal returns of the merging firms or those of the rivals are inside a symmetric confidence interval around zero and with a size equal to twice the standard error of the considered abnormal returns.

We can now move to the analysis of the effects of remedies and answer the second question of interest for our study: did remedies, when rightly applied, restore effective competition? Moreover, we can look at whether remedies that were incorrectly applied caused a further competitive damage.

7. Results and Discussion

In this section we shall look at the abnormal returns for merging and rival firms in different sub-samples and around different decisions dates, in order to infer how the commission's decision was valued by the market and hence to assess its effectiveness. We first analyze how stock markets reacted around the final decision date and look at the differences between pro- and anticompetitive mergers as well as whether the use of remedies had significant effects. Then we focus on the market's reaction to phase I decisions, since around this date the most important information is conveyed to the market. We claim that from this event we shall get the best prediction about the market's assessment of the commission's decision. Finally, we look at the phase II abnormal returns.

As we discussed in the previous section, the "final decision" abnormal return ($\Delta\Pi_i^D$, i=M, R) is equal to the phase I decision's abnormal return for cases that were cleared (with or without remedies) in phase I, and to the sum of the abnormal returns around the phase I and phase II

decisions for those mergers, which went through a phase II investigation. Table 8 reports the mean values and the standard errors of these measures in three different samples: the entire sample, that of anticompetitive mergers, and the procompetitive mergers' sample.[49]

The first striking result is that around the decision date all firms involved in the merger lost value: our measures of abnormal returns are negative independently of the sub-sample as well as of whether remedies were imposed or the case was cleared unconditionally.

The second compelling finding is that the market does not seem to significantly react to the announcement of remedies (prohibitions) in any of the different kinds of mergers, since the average final decision abnormal returns are never significantly different form zero neither for the merging firms nor for the competitors when remedies have been imposed. Note however that these are average effects for phase 1 and phase 2 decisions.

Table 8. Final Decision Abnormal Returns in Different Sub-samples and Remedies Effects

	Entire sample		**Anticompetitive**		**Procompetitive**	
	Remedies	**No Remedies**	**Remedies**	**No Remedies**	**Remedies**	**No Remedies**
$\Delta\Pi_M^D$	-0.0132	**-0.0046***	-0.0198	**-0.0083***	-0.0060	-0.0009
	(0.0134)	(0.0034)	(0.0239)	(0.0052)	(0.0067)	(0.0042)
$\Delta\Pi_R^D$	-0.0024	**-0.0087****	-0.0037	**-0.0148***	-0.0012	-0.0024
	(0.0054)	(0.0049)	(0.0068)	(0.0091)	(0.0034)	(0.0034)
Obs	71	97	40	51	31	46

The "final decision date abnormal return" is defined as the abnormal return around the phase I decision date for cases cleared (with or without remedies) in phase I and as the sum of the abnormal returns around the phase I and phase II decision dates for the cases that went through the phase II procedure. Remedies also include prohibitions. The mean values of the 3-days cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for negative abnormal returns. Anticompetitive are those mergers where the rivals' profitability increased; procompetitive are those where it decreased.

On the other hand, the effects on merging firms' profitability are on average economically more relevant when remedies have been imposed, though this is not true for rivals. While merging firms have more negative abnormal returns in anticompetitive mergers (-1.98%) than in procompetitive ones (-0.83%) - which is consistent with the hypothesis of remedies reducing the market power effect - exactly the opposite happens for the rivals' abnormal returns. We test whether average abnormal returns in cases with remedies are statistically different from those in

[49] In this section we will define as anticompetitive all those mergers where rivals' abnormal returns at the announcement date were positive. This allows us to work with bigger samples.

mergers cleared without remedies. We cannot reject the null hypothesis of equal means. Therefore, we conclude that, on average, remedies do not seem to have a significantly different impact than unconditional clearance on merging firms' and rivals' profitability.

Interestingly, we observe more statistical significance looking at the cases where remedies have not been applied. In particular, the average abnormal return around the decision date is negative and significant in anticompetitive mergers (rivals gain) both for merging firms (-0.83%) and for rivals (-1.48%). A similar result can be observed in the entire sample. Also in this case, the reaction around the final decision date is negative both for merging firms and competitors when no remedies were used, though only the rivals' abnormal return is significantly different from zero (-0.73%). This finding is quite puzzling. In order to more carefully interpret this finding, however, one should consider that the remedies' choice might be endogenous to the abnormal returns around the decision date. Regression analysis, which accounts for this endogeneity problem, could help to more cleanly measure the real effect of remedies.[50]

As we already stressed, the event that seems to trigger most of the market reactions is the phase I decision. It is well known that merging firms are very unwilling to go through a phase II investigation, since this is an extremely costly and risky process. Moreover, a commission's intervention in phase II is very likely, therefore the beginning of a phase II investigation should have a significant impact on firms' profitability.

Table 9 reports abnormal returns for merging and rival firms depending on the nature of the phase I decision and looking at the entire sample and the sub-samples of anticompetitive and procompetitive mergers. Figure 4 gives a graphical representation of these findings.

At the end of phase I, if the merger does not seem to be problematic in the sense that market power concerns are low or nonexistent, the commission applies Art. 6.1b and clears the merger unconditionally. In the entire sample, this event has a slightly negative but not statistically significant impact on both merging firms and rivals. However, if we divide the sample into anti- and pro-competitive mergers, we observe significantly different results. We find that the average abnormal returns in case of anticompetitive mergers are significantly lower than in the case of procompetitive mergers at the 5% significance level. Merging firms significantly lose almost 1% in anticompetitive mergers and have almost zero abnormal returns (0.3% not significant) in procompetitive mergers.

This result is quite surprising, since we would have expected the market to positively evaluate the future profitability of merging firms for anticompetitive mergers that are approved without

[50] See Duso et al. (2005) on this issue.

conditions. We cannot explain this result as being a pure update of the market beliefs, since merging firms in this sub-sample had an average abnormal return of 1.5% around the announcement day, which was significantly positive at the 10% level. Rivals' abnormal returns show a similar pattern, even though they are not statistically significantly different from zero, nor statistically significantly different from each other in the two sub-samples.

Table 9. Abnormal Returns around the Phase 1 Decision Date for Different Phase 1 Decisions

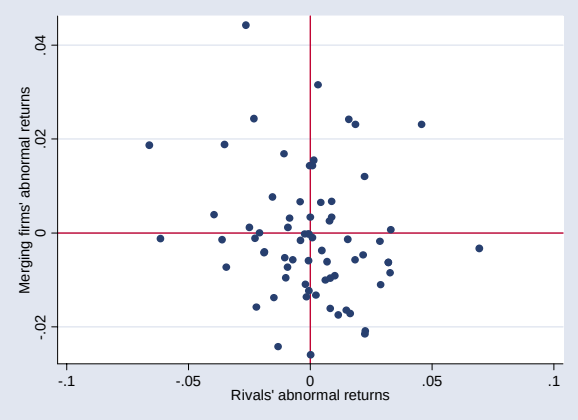
Decision		Entire sample	Anticompetitive	Procompetitive
Art. 6.1b Clearance	Merging Firms	-0.0031 (0.0038)	**-0.0094**** (0.0056)	0.0030 (0.0049)
	Rivals	-0.0070 (0.0055)	-0.0129 (0.0104)	-0.0013 (0.0036)
	Obs.	79	41	38
Art. 6.2 Remedies	Merging Firms	-0.0022 (0.0059)	-0.0030 (0.0067)	0.0012 (0.0175)
	Rivals	**-0.0182***** (0.0062)	**-0.0214**** (0.0098)	**-0.0118*** (0.0058)
	Obs.	11	7	4
Art. 6.1c Phase II	Merging Firms	**-0.0210**** (0.0121)	**-0.0318*** (0.0233)	**-0.0102*** (0.0066)
	Rivals	0.0003 (0.0026)	0.0007 (0.0033)	-0.0002 (0.0040)
	Obs.	78	43	35

The mean values of the 3-days cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for negative abnormal returns. Anticompetitive are those mergers where the rivals' profitability increased, procompetitive those where it decreased.

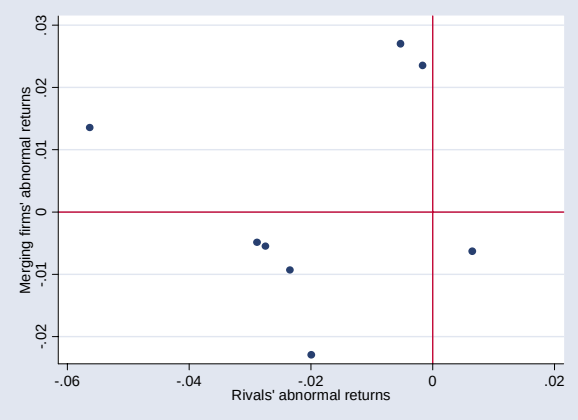
When the commission has concerns about the anticompetitive nature of a merger but it thinks that these problems can be easily fixed, it might choose to impose remedies in phase I. In our sample this happened in a limited number of cases (11 mergers), which reflects the relatively seldom use of remedies in phase I observed in the entire population of mergers analyzed by the commission. Also this event has a negative impact on both merging and rival firms' profitability. Yet, the effect of the former is small (-0.2%) and not significantly different from zero. For rivals, however, the abnormal loss is substantial, it is significant at the 1% level, and it ranges from -1.2% in procompetitive mergers to -2.13% in anticompetitive ones. This result is consistent with remedies effectively resolving the competitive problems. Indeed, if the market power concerns are solved by remedial actions, then rivals should be losing the most, since merging firms still might have the beneficial effect of efficiency gains. Moreover, the effect seems to be stronger in anticompetitive mergers, which is also expected. Finally, if remedies are (wrongly) applied in

phase I in procompetitive mergers, they negatively impact rivals but not the merging firms: it's bad news for rivals and good news for merging parties, when an efficiency increasing merger goes through even with remedies.

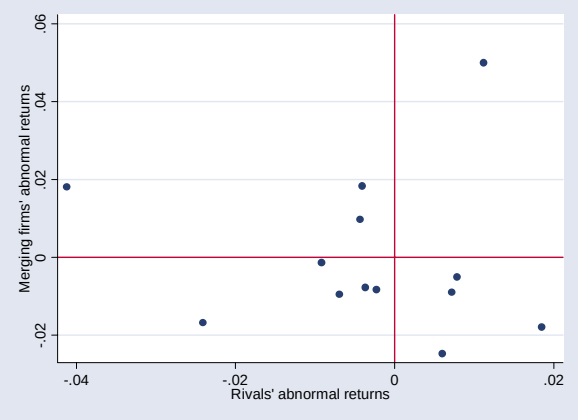
Figure 4: The Distribution of Merging Firms and Rivals' Abnormal Returns around the Phase I Decision Date for Different Decisions



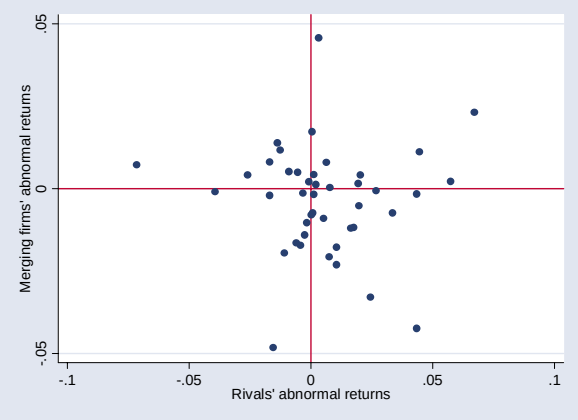
Art. 6.1b



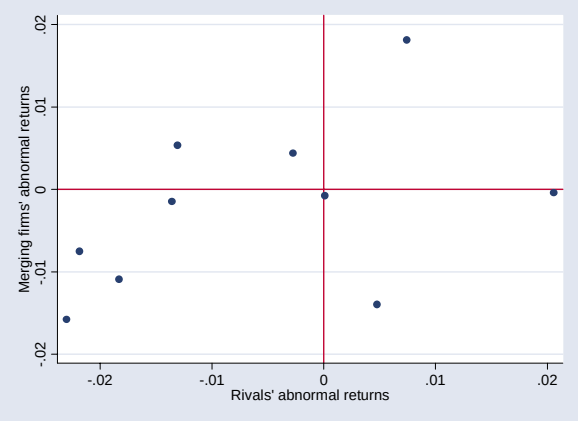
Art. 6.2



Art. 8.1.



Art. 8.2.



Art. 8.3

When mergers raise serious competition concerns, the commission decides to open up a phase II investigation. This is the event that triggered the largest, negative and strongly significant, reaction for merging firms in our sample. On average the abnormal return is equal to -2.1%, rising to -3.18% for those mergers that the market valued to be anticompetitive, and sinking to -1.02% for the procompetitive ones. This is however not the case for competitors. Since the variability is quite large, rivals face negligible average reactions when the commission announces the opening of a phase II investigation. The abnormal returns are around 0.01% and are not statistically significant different from zero.

From these last results, especially from the comparison between merging and rival firms' different reactions around the phase I decision, we make our first inference of what the market thought about remedies and about the occurrence of a phase II investigation.

First of all, it seems that the market values remedies to be successful in reducing the market power effect in phase I. In fact, rivals' profitability is reduced by the remedies but this is not true for the merging firms. And this is even more evident in anticompetitive mergers where the negative effect is almost double if compared to that in procompetitive mergers.[51]

Much more difficult to interpret are the results concerning the decision to open up a phase II investigation. For merging firms, the market might react to two different kinds of news. The first is related to the antitrust procedure. The market might value that the probability of remedies and, in the worst case, of prohibitions is now extremely high. Since remedies hurt the merging parties, the market reduces its predictions of the future value of these companies. The size of the abnormal return should then represent the value of the remedies times the probability that they will be imposed, given that the investigation is in the second phase.

The other kind of negative information that comes to the market at this point in time is that the merging parties will be involved in a long and costly process: phase II. If this is the main explanation, then the abnormal returns only represent the expected cost for the merging companies and, eventually, the cost of the delay with which the merger will be consumed.

Information about the competitors' reactions is particularly helpful in trying to identify which of the two explanations better fits the data. Rivals do not have to pay the costs of the antitrust procedure; therefore this explanation cannot be used to rationalize their abnormal returns. However, their profitability is influenced by the phase II decision. The fact that the rivals' abnormal returns are essentially equal to zero might suggest that the market does not think that

[51] Note however that, given the limited size of the sample, the difference between the two values is not statistically significant.

the phase II investigation will end with a decision that indeed solves the competitive problem recognized by the commission in the investigation's first phase.

We can look even more in depth at the profitability effects around the phase I decision and try to asses what the market predicted about phase II. In table 11, we report the abnormal returns *around the phase I decision* date for those mergers that went to phase II and divide them according to the commission's final decision. This is essentially a breakup of the last line of Table 10 and should allow us to test how wellthe market predicted a phase II decision given the information available around the end of phase I. Again, we look at three sub-samples: the entire sample, anticompetitive mergers, and procompetitive mergers.

Table 11. Abnormal Returns around the Phase 1 Decision Date for Different Phase II Decisions in Different Sub-samples

		Entire sample	Anticompetitive	Procompetitive
Art. 8.1. Clearance	Merging Firms	**-0.0105*** (0.0071)	-0.0094 (0.0097)	-0.0119 (0.0113)
	Rivals	-0.0035 (0.0039)	0.0021 (0.0031)	-0.0088 (0.0067)
	Obs.	17	10	7
Art. 8.2 with Remedies	Merging Firms	-0.0031 (0.0036)	-0.0029 (0.0055)	-0.0032 (0.0048)
	Rivals	0.0047 (0.0036)	0.0038 (0.0037)	0.0056 (0.0061)
	Obs.	48	20	28
Art. 8.3. Prohibitions	Merging Firms	**-0.0967*** (0.0667)	-0.1018 (0.0891)	-0.0814 (0.0511)
	Rivals	**-0.0111**** (0.0046)	**-0.0089**** (0.0045)	-0.0176 (0.0139)
	Obs.	13	10	3

The mean values of the 3-day cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for negative abnormal returns. Anticompetitive are those mergers where the rivals' profitability increased, procompetitive those where it decreased.

On average, the abnormal returns for merging firms are negative (-1.15%) and significant at the 10% level for cases that were cleared. Yet, they are significantly lower (at the 5% level) than the average merging firms' abnormal return for all cases that went to phase II (-2.1%, see Table 10 Art. 6.1c). We do not observe significant differences between anticompetitive and procompetitive mergers. Essentially, the negative effect of going to phase II is small and almost not significant for cases that were lately cleared. This would mean that the market has a much less negative prior for these cases, as if the market was predicting lower costs for these mergers. This is consistent with the idea of remedies/prohibitions being the cause for large negative

abnormal returns around the decision date. One can also read the negative abnormal returns in these cases by measuring the (opportunity) cost of the phase II investigation, which is higher for procompetitive mergers.

Rivals' abnormal returns, which are on average very small in size (-0.35%), do not appear to be significantly different from zero. The clearance of procompetitive mergers has, however, a larger negative, even if insignificant, effect on rivals' profitability: it is bad news for competitors that an efficiency increasing merger went through without remedies. This finding is consistent with our explanation as well.

A puzzling result is that the market does not have any significant prediction for those mergers that were cleared with remedies in phase II. In this sub-sample, the abnormal returns of both merging and rival firms are very small and not statistically significantly different from zero, as if the market would not give a negative valuation to the forthcoming remedies.

One possible explanation is as follows. Some firms know that the commission will experience political pressure not to block a merger in phase II, since they are "national champions" or firms in strategic industries. Since firms are, nevertheless, reluctant to go through the lengthy phase II investigation, they are willing to accept tougher remedies in phase I in order to avoid going into phase II (because it is probably more costly than the imposed remedies). The commission on the other hand might be willing to clear the case in phase I without a deeper investigation in order to avoid a situation where they have less bargaining power. In circumstances in which this does not happen and a phase II investigation is opened, the commission lost its threat because everybody knows that the merger cannot be blocked and must, thus, accept conditions which are not very severe.

Interestingly, the merging firms' average abnormal return around the phase I decision in mergers that were blocked by the commission in phase II is extremely negative and very significant. These firms lose on average 9.67% of their value around the announcement that a phase II investigation will start. The effect is even stronger for mergers valued to be anticompetitive, where the abnormal return is -10.18%, though not significant given the small sample size and the high standard error.[52] This result suggests that the market was able to build a good prior about prohibitions. Also rivals involved in mergers that were lately blocked significantly lose 1% of their value around the phase I decision date. This is also in line with the interpretation that prohibitions indeed solve the market power concerns, since otherwise there would not be any reason for rivals to lose value when the merger was not allowed.

[52] Note that the average abnormal return and its variability in case of a procompetitive merger are much lower than in anticompetitive mergers.

One possible reading of the discussed results is that the market is indeed not able to predict remedies in phase II, while it is able to predict prohibitions. Alternatively, one might think that the market does predict the use of remedies but it does not believe that remedies will have any kind of significant effect.

The second question we want to answer is whether the various types of remedies had different effects on future firms' profitability. As we extensively discussed, both in the US and in the EU remedies guidelines the use of structural remedies is strongly privileged. Table 12 reports results, which answer this question.

Table 12. Abnormal Returns around the Phase 1 Decision Date for Different Decisions and Depending on the Remedies' Types

Kind of Decision		Structural remedies	Pure behavioral
Art. 6.2 Remedies	Merging Firms	0.0020 (0.0056)	-0.0119 (0.0154)
	Rivals	**-0.0135**** (0.0063)	-0.0276 (0.0167)
	Obs.	8	3
Art. 8.2 with Remedies	Merging Firms	-0.0041 (0.0038)	-0.0009 (0.0078)
	Rivals	0.0048 (0.0042)	0.0043 (0.0060)
	Obs.	42	6

Remedies also include prohibitions. We consider as structural remedies also remedies-mix, since the "structural" part of the mix is usually the most important. The mean values of the 3-day cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for negative abnormal returns. Anticompetitive are those mergers where the rivals' profitability increased, procompetitive those where it decreased.

We saw that remedies reduce rivals' profitability when applied in phase I. However, according to table 12, only structural remedies *significantly* produce negative abnormal returns for competitors of -1.35%.[53] Pure behavioral remedies also have an average negative impact, which is even more pronounced (twice as big!) than in the case of structural remedies (-2.76%), yet the very small number of observations makes this figure not statistically significant.

The sample of mergers cleared with remedies in phase II is much larger. However, when we divide it into the various sub-samples according to the kind of remedies, we again have very few observations to conduct statistical tests.

At the phase I decision date the market predicts that all types of remedies will on average have a negative effect on merging firms' profitability. This effect though is not statistically significant.

[53] We consider remedies-mix as being primarily structural remedies.

For rivals, the effect of remedies is positive and around 0.4% independently of the different remedies' types and, also in this case, not statistically significantly different from zero. All together these results seem to suggest that there are no significant differences between the different types of remedies, even though they might strongly depend on the small sample size.

The final question we can answer is how the market reacts to phase II decisions. Table 12 reports results for the abnormal return around this date. Again, we look at three sub-samples: the entire sample, the sample of anticompetitive mergers, and the sample of procompetitive mergers. If it is true that the market can build a good prior of the effect of the commission's intervention, as it seems to be according to the previous result, the market's reaction around the final decision date should only reflect the presence of "surprises" in the decision that could not be anticipated by the market.

Table 12. Abnormal Returns around the Phase II Decision Date for Different Phase II Decisions

Decision		**Entire sample**	**Anticompetitive**	**Procompetitive**
Art. 8.1. Clearance	Merging Firms	0.0022 (0.0056)	0.0112 (0.0097)	**-0.0068**** (0.0037)
	Rivals	-0.0123 (0.0111)	-0.0182 (0.0180)	-0.0046 (0.0114)
	Obs.	17	10	7
Art. 8.2. Remedies	Merging Firms	**0.0047*** (0.0033)	**0.0104**** (0.0051)	0.0006 (0.0042)
	Rivals	-0.0004 (0.0054)	-0.0034 (0.0062)	0.0017 (0.0082)
	Obs.	48	24	24
Art. 8.3 Prohibition	Merging Firms	**0.0197**** (0.0094)	**0.0185*** (0.0121)	**0.0232*** (0.0126)
	Rivals	-0.0067 (0.0078)	-0.0003 (0.0090)	**-0.0261*** (0.0109)
	Obs.	13	9	4

The mean values of the 3-days cumulative abnormal returns in each sub-sample are reported; standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is represented by ***, **, * respectively. Significance refers to one sided t-tests for negative abnormal returns. Anticompetitive are those mergers where the rivals' profitability increased, procompetitive those where it decreased.

In the entire sample, each decision has a positive impact on merging firms' profitability. That is, the market probably expected even more severe measures and, on average, positively updates its beliefs. Especially for mergers that were blocked, the abnormal return for merging firms is quite substantial (1.97%) and largely significant. Remember, however, that the market reaction when a phase II investigation was announced was a reduction of the stock prices by 10% on average for merging firms. This result stays true in both the sub-samples of anticompetitive (1.85%) and

procompetitive mergers (2.32%). Also the announcement of remedies has a significant impact on merging firms' abnormal return, 0.47% in the entire sample, 1.04% in the sample of anticompetitive mergers, but only 0.06% (and not significant) in the sample of procompetitive mergers. Clearance has a positive but not significant impact on merging firms' profitability in the entire sample and when the market valued the deal to be anticompetitive. Instead, the effect is negative and significant (-0.68%) in procompetitive mergers.

The effects for rivals are negligible, in the sense that they are not significantly different from zero independently of the decision type and the kind of merger. There are however two exceptions. When the merger was cleared without remedies, abnormal returns for rivals have been on average substantial and negative (-1.23% in the entire sample, -1.82 for anticompetitive mergers, and -0.68% in procompetitive mergers). Yet, given the low number of observations and the high standard errors, these figures are not significant. A very strong and significant negative reaction on competitors' stock prices can be observed when the merger was blocked and the market had valued this deal as being procompetitive.

Results for phase II decisions are very difficult to interpret since they do not fit our predictions. We think that information leakage problems might play a crucial role during a phase II investigation given its length. Therefore, the phase II abnormal returns might be a bad proxy for the commission's decision effect since they just reflect an update to reactions that we did not observe and happened between the phase I and phase II decisions. In order to more cleanly answer this question, one should look at the development patterns of abnormal returns during this period of time and try to capture how much information was disclosed to the market before the final decision.

8. Conclusions

Merger control is an important and widely discussed policy instrument. Its proponents claim that it is necessary to maintain effective competition in markets subject to consolidations and at the same time ensures that efficiencies produced by merger activity are not lost. Antagonists claim that it is a costly process, subject to political capture, most likely used to reach other goals than protecting consumers, and therefore essentially useless. Which of the two ideas is more plausible is essentially an empirical question. Moreover, an ex-post policy evaluation might per se be useful to improve the quality of the policy intervention based on the available evidence on its effectiveness in the past.

This paper pursues several aims. First, we want to provide an extensive overview of the existing literature on the effectiveness of remedial actions. Particularly, we appraise the literature on the

use of event studies that have quite extensively been applied in the past to assess antitrust decisions. In doing so, we specifically tackle some issues related to the interpretation of such methodology that diverges in different disciplines (finance vs. IO).

Second, we provide an international comparison of institutional arrangements and regulatory approaches to deal with remedies in merger control. We conclude that there is a clear convergence on some shared principles that guide competition authorities in the application of remedies.

Finally, we present our own study based on an event study methodology of the European commission's decisions by examining a sample of 167 concentrations analyzed between 1990 and 2002. In particular, we aim at answering two interrelated questions: First, were remedies correctly applied? Second, did remedies reach their goal of restoring competition and solve the market power problem when applied?

Our empirical analysis reaches some first conclusions. We provide evidence that the commission made some mistakes in its evaluation when contrasted to the market's assessment of the merger competitive effects. Not only did the commission unduly impose remedies in mergers that were valued by the market to be procompetitive (type I errors), but also it unconditionally cleared some mergers where the market recognized the existence of market power concerns (type II errors).

We further look at stock price movements around the commission's decision date in order to infer how the market evaluated the commission's decision. We observe that the market seems to regard remedies as effective when adopted in phase I, since rivals mostly loose when remedies are applied, especially in anticompetitive mergers. This corresponds to our expectations based on a standard model of oligopolistic competition. Moreover, it seems that the market is able to generate a good prior for some types of phase II decisions, when information about the opening of an in depth investigation is provided. Particularly, the market predicts very clearly the negative impact of prohibitions and the less severe impact of clearance without conditions and obligations. Instead, the market seems not to be able to build a good prior about phase II remedies. Our results suggest that the period between the phase I and phase II decisions deserves special attention to assess the market's evaluation of remedies in phase II, since it is difficult to predict the outcome of the bargaining process between the authority and the merging parties. Moreover, we suggest that one possible explanation for the apparently lower effectiveness of remedies in phase II might be explained by the shift in bargaining power from the commission to the firms when moving into phase II in cases where to prohibit a merger is politically difficult.

To understand the robustness of our approach, we discuss its several drawbacks and suggest improvements and lines of further research. In particular, we tackle three essential issues. Most fundamentally, we point out the implicit difficulty to evaluate the remedies' effectiveness by looking at the impact of the commission's decisions on stock markets, since the policy choice might be endogenous to the market outcome (see Duso and Röller, 2003). Regression analysis might be a helpful development of the proposed methodology, since it allows for correcting this endogeneity problem, testing causal relationships, and controls for the influence of other factors (see Duso *et al.*, 2005).

Second, the importance of information leakage during phase II investigation is highlighted by the difficulties the market had to predict remedies. The findings about market reactions around the phase II decision date seem to confirm this prediction. We propose to look at the long run abnormal returns or, even better, at the evolution of stock prices during the in depth investigation period in order to answer this question.

Finally, we suggest matching our sample with information about firms' performance after the merger based on balance sheet data as a robustness test of the adopted methodology. This would allow us to create an alternative measure of the merger's competitive effects.

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