



The impact of European antitrust policy: Evidence from the stock market



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ABSTRACT

We evaluate the impact of European antitrust policy by analyzing the stock market response to investigation announcements, infringement decisions, and appeals for 253 companies involved in 118 European antitrust cases over 1974–2004. We find significantly negative stock price responses of almost –5% around the dawn raid and –2% around the final decision, and a significantly positive response of up to 4% around a successful appeal. These numbers correspond to a total market value loss of €24 billion around the raid and the decision, of which roughly 75% cannot be explained by fines and legal costs. The stock market thus anticipates a decrease in profitability and reputational damage. The magnitude of the market response depends on the fine, infringement duration, and in particular firm size and media attention. Small firms suffer more from an infringement decision. Greater newspaper coverage is associated with a more pronounced response, suggesting the importance of reputational effects.

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1. Introduction

Antitrust policy aims at preventing companies from abusing market power, restraining free trade, and/or forming anticompetitive agreements. Its objective is to foster competition in the interest of consumer welfare. A number of studies try to quantify the costs of anticompetitive conduct for society and document substantial and prolonged increases in prices and profits by cartels.¹ Although it is widely believed that anticompetitive conduct has detrimental effects, it is unclear whether antitrust policy is effective in averting these effects (Baker, 2003; Crandall and Winston, 2003). The likelihood that price-fixing collusion is detected and prosecuted in the US and the EU is estimated at less than 20% (Bryant and Eckard, 1991; Combe et al., 2008). And even in cases where infringements of antitrust law are established, we know little about their impact on the prosecuted firms.

Advocates of antitrust policy maintain that a conviction results in the end of the illegal practice and consequently leads to product price decreases (e.g., Porter, 1983; Motta, 2004). Others argue that companies pay the fine related to their conviction and continue their illegal practices, repeat them in other markets, and/or that the wrong cases are targeted (e.g., Sproul, 1993). Several studies point at the large number of repeat offenders (Veljanovski, 2007; Stephan, 2008; Carree et al., 2010). Furthermore, there is an ongoing debate about the magnitude of the fine, which should serve not only as a punishment but also as a tool for deterring anticompetitive practice (e.g., Sproul, 1993; Geradin and Henry, 2005; Bos and Schinkel, 2006; Veljanovski, 2007; Combe and Monier, 2009).

Research on the stock market response to antitrust decisions can add to the debate on whether antitrust policy is effective in affecting firm behavior. First, if the stock market punishes companies for antitrust infringements, this can be an important deterrent to future anticompetitive practice by the same as well as by other companies. Second, it is standard in event studies to interpret the stock price reaction as the market's best estimate of the change in the value of the company as a result of the event. Hence, event studies of antitrust policy are informative about whether the market expects the value of the company to decline as a result of the antitrust conviction and whether the decline in value exceeds the magnitude of the fine—which would indicate that the market expects future profitability and reputation to be diminished. Bosch

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¹ See, e.g., Werden and Simon (1987), Posner (2001), Connor (2005), Connor and Bolotova (2006), and Connor et al. (2008, 2009) for evidence on cartels. Levenstein and Suslow (2006) survey this strand of the literature and conclude that cartels last on average five years and are able to increase prices and profits. Not only horizontal collusion, but also abuse of dominance and vertical agreements can have serious adverse welfare implications, although we are not aware of quantitative estimates.

and Eckard (1991) argued that the stock price drop can be decomposed into foregone future profit, loss of reputation, and legal costs.

The purpose of this paper is to evaluate the impact and effectiveness of European antitrust policy by studying the stock market response to European Commission antitrust investigation announcements and infringement decisions as well as European Court of Justice appeal judgments. We analyze a comprehensive sample of 253 companies involved in 118 European antitrust cases over the period 1974–2004. We show that there are substantial negative abnormal stock returns around the time of the dawn raid and around the final decision date. We find statistically and economically significant average abnormal returns of -4.7% for the dawn raid and -1.9% for the final decision. We also find significant stock price reactions around the appeal sentence. If the original decision is upheld by the European Court of Justice, there is a marginally negative stock price reaction. However, if the decision is partially or fully annulled, we observe a significantly positive average stock market response of 2–4%. The significance of our standard event study results is robust to the non-parametric inference developed by Gelbach et al. (2013).

Our estimates of the stock market reactions translate into a decrease of almost €24 billion in the aggregate market value of the involved companies. The valuation effects can only to a limited extent be explained by fines and legal costs, which suggests that the stock market anticipates a decrease in future profitability due to a loss of profits from anticompetitive conduct and/or reputational damage. We analyze the relation between the stock price reactions and several case and company characteristics. We show that small companies suffer more from antitrust convictions than large firms and uncover several important country and industry effects. Other factors determining the severity of the stock price response are the magnitude of the fine, the duration of the infringement, and especially print media attention around the antitrust investigation events. This latter finding suggests that reputational damage may be an important channel through which antitrust decisions affect firm value. Consequently, at least two of the three factors suggested by Bosch and Eckard (1991) seem to be important determinants of the stock market response to European antitrust decisions.

Overall, our results are consistent with the view that European antitrust policy has a significant impact on the convicted companies. Although we present no direct evidence on whether antitrust decisions lead to the end of the anticompetitive conduct and thus enhance consumer welfare, our results do indicate that the stock market anticipates the effects on the value of the companies to be substantial. Convicted companies suffer value losses due to the antitrust decisions that clearly exceed the magnitude of the fine and legal costs, which suggests that their expected future profitability is hurt by the termination of the anticompetitive conduct and loss of reputation. Our findings also suggest that the stock market response to infringement decisions may be an important additional deterrent to anticompetitive conduct.

2. Research on the stock market reaction to antitrust policy

The first event study of antitrust policy that we are aware of is Burns (1977), who finds no significant stock market reaction to the news that major US trusts had to break-up at the beginning of the 20th century. Subsequent studies investigate various aspects of US antitrust policy in different settings. Examples include Garbade et al. (1982; 34 companies that infringed the Sherman and Clayton Acts in the period 1934–1974), Binder (1988; 34 railroad companies convicted for trust forming in the 1890s), Gilligan (1986; 43 firms convicted for resale price maintenance in the period 1962–1985), Bosch and Eckard (1991; 127 firms involved in 57 US federal price fixing indictments), Mullin et al. (1995; the dissolution of US Steel

at the beginning of the 20th century), Bizjak and Coles (1995; 481 private antitrust litigation cases in the US in the period 1973–1983), Bittlingmayer and Hazlett (2000; US federal antitrust action against Microsoft in the 1990s), and De Vany and McMillan (2004; vertically integrated movie studios in the period 1939–1949).

Our study is related to those of Bosch and Eckard (1991) and Langus and Motta (2009). Bosch and Eckard (1991) analyze a sample of 127 firms involved in 57 US federal price fixing indictments and find a statistically significant -1.08% share price drop around the event date. They attribute the loss in the market value to three factors: legal costs (fines, legal and economic counseling, etc.), foregone potential future collusion profits, and loss of reputation. They show that the legal costs only account for 13% of the stock market reaction. They attempt to quantify the effects of expected foregone profits, but not of reputation.

While working on the first draft of this paper, we became aware of an independent study by Langus and Motta (2009) that also examines the stock market reaction to European antitrust cases. Langus and Motta find a statistically significant abnormal return of -2% around the raid and of -3% around the decision date in a sample of 55 cases involving 88 firms. Our paper uses a significantly larger sample of European antitrust cases, also analyzes appeals, and – in contrast to Langus and Motta (2009) – includes cases that did not involve a fine. Moreover, we perform a cross-sectional analysis in which we relate the stock market response of individual companies to a number of case and company characteristics, including the magnitude of the fine, the duration of the infringement, media attention (a proxy for reputational effects), and the country and industry of the companies involved. In addition, we are able to measure the relative importance of the sales generated on the market where the misconduct took place for a large subset of the firms in our sample. We use this variable as a proxy for the importance of profits generated as a result of anticompetitive conduct on this market for the firm as a whole.

3. European antitrust policy

The European Commission is the highest authority of competition policy enforcement in Europe and the only one to initiate regulations and modify existing antitrust law implementation. In this respect, the Commission is similar to the Department of Justice (DOJ) or the Federal Trade Commission in the US. In contrast to the US system, it is in charge of the entire investigation procedure and issues a decision without Court involvement in the first instance. Within the Commission, the Directorate General for Competition (DG Comp) is responsible for the enforcement of the European Community's competition policy law guarding over antitrust, mergers, and state aid cases. In this study, we focus on antitrust only and leave mergers and state aid aside.² The foundation of European antitrust policy was laid in 1957 when Belgium, France, Germany, Italy, Luxembourg, and the Netherlands signed the European Economic Community (EEC) Treaty in Rome. Articles 81 and 82 of the Treaty establish which types of agreements and concerted practice that affect trade and the well-functioning of a harmonized market within the European Community are prohibited.³ Article 81, similar to the 1890 Sherman Act introduced in the US, deals with agreements and concerted practices between companies and

² There is a large body of literature on the market response to anti-merger policy in North America (Ellert, 1976; Eckbo, 1983, 1992; Eckbo and Wier, 1985; Stillman, 1983; Banerjee and Eckard, 1998) and in Europe (Aktas et al., 2004, 2007; Brady and Feinberg, 2000; Duso et al., 2007).

³ The numbering of Articles 81 and 82 stems from the Treaty signed in Amsterdam in 1997. Since the Treaty of Lisbon came into force in December 2009, the numbering is 101 and 102, respectively. We use the former numbering because as it is applies to our sample period.

comprises four economic rationales: horizontal, vertical, licensing, and joint venture agreements. The majority of the Article 81 cases that have been investigated and convicted by the Commission involve horizontal conduct (Carree et al., 2010). Article 82 (similar to the Clayton act introduced in the US in 1914 though not focusing on Merger Regulation since 1990) deals with the abuse of dominance by companies. These cases account for approximately 9% of the Commission's antitrust cases (Carree et al., 2010).

In contrast to studies on US antitrust policy, we include all types of anticompetitive conduct in one analysis, and analyze any potential differences in the market reaction in our subsequent cross-sectional analysis. US studies focusing on collusion include Garbade et al. (1982), Binder (1988), Bosch and Eckard (1991), and Mullin et al. (1995). We note that the majority of these studies use historical data from the early 20th century on price-fixing cartels. This difference in sample period forms a potential explanation for why their results differ from those of Bosch and Eckard (1991) and our study. For studies on issues concerning dominance and vertical restraints, we refer to Bittlingmayer and Hazlett (2000) and Gilligan (1986). Since private litigation started only recently in the EU, we focus on public administrative law cases only (see Bizjak and Coles, 1995, for an analysis of private antitrust litigation cases in the US).

In 1962, Regulation 17 established the grounds for taking legal action by the Commission.⁴ Regulation 17 describes the procedural and legal process through which a case develops.⁵ It defines three different report routes: (application for) notification, complaint, or Commission's own initiative. Notifications refer to a company requesting the Commission's approval of a certain agreement or behavior the company is or will be involved in. Suppliers, distributors, or competitors can file a complaint when they perceive the business conduct of another firm to be anticompetitive. Historically, the most common report route has been notification or complaint (Carree et al., 2010). In recent years, the Commission has increasingly started to investigate cases on its own initiative (Carree et al., 2010). In 1996, a fourth type of report route was established. Since then, cartel members have the possibility to report a cartel of which they are a member to the Commission to gain partial or full immunity from fines. This report route is known as the leniency program. The first European case initiated by a leniency application was concluded in 1998.⁶ Opponents of the leniency program argue that the program does not trigger the members of profitable and well-running cartels to betray competitors, but that the only cartels where a member approaches the Commission are already near to death or unprofitable (e.g., Stephan, 2008). In the US, the leniency program is in place since 1973 with a major revision in 1993.

Chronologically, we observe the following events during a European antitrust investigation: first the dawn raid (which does not take place in all cases), then the statement of objection, and finally the decision. When an appeal was filed in response to the

Commission decision, we incorporate the proceeding of the appeal as well. We do not assess the stock market reaction around the date when a complaint and/or a (leniency) notification is filed. This information is only made public after the decision has been published, so the stock market is unlikely to react to this event.

When the Commission starts to investigate a case, it either sends a letter with a request for information to the suspects of the case and/or it raids (one of) the premise(s) of the suspected firms to gather information. The Commission only uses dawn raids if it has gathered compelling evidence that the firm is involved in an illegal conduct. Dawn raids are almost exclusively used in cartel cases. Only firms or their subsidiaries located inside the EC are vulnerable to dawn raids. Legally, the Commission does not hold investigative powers outside the EC and typically relies on national bodies to raid firms. Since there is no public information on when the Commission files a request for information, there should be no stock market reaction around this date. In contrast, when the Commission enters the premises of companies during a raid this knowledge is more likely to become public and attract attention. The official procedure continues with the statement of objections (SOO). After the collection of sufficient evidence against the suspects to formalize the case, the responsible Commissioner sends the SOO to the investigated companies. The process of hearing the suspects, gathering the final evidence, and formalizing the case takes 20 months on average (Carree et al., 2010). At the end of this process, the Commission draws up the decision document and determines the final fine.

Convicted companies can lodge an appeal to the European Court of Justice (ECJ). Article 164 of the EC Treaty defines the tasks of the Court in relation to Regulation 17; the ECJ is the highest legal authority for interpretation of the Treaty in the European Community. In 1989, the Court of First Instance (CFI) was established as the first appellate court for appeals headed by the European Court of Justice (ECJ).⁷ The ECJ and CFI can either uphold, partially, or fully annul the Commission decision. They also have the power to reduce the fine (or to increase it, which happened once during our sample period⁸). The CFI is only responsible for first instance judgments. In 1989, Article 49 of the EC Treaty introduced a second hierarchical layer for appeals against a CFI judgment, with the European Court of Justice. Consecutive appeals are not part of the study as they can only be filed on legal grounds and do not lead to a second round of additional fact finding.

4. Data and methodology

4.1. Sample selection and data sources

From 1964 to 2004, the European Commission formally decided on 538 antitrust cases. Three hundred and one of these cases were infringements of Article 81(1), 82, and 86 of the European Community (EC) Treaty or Regulation 17. The other 237 cases were negative clearances of Article 81(1) or exemptions under Article 81(3). In the 301 infringement cases, a total of 1519 parties were convicted. Following other event studies on antitrust enforcement, we only investigate companies convicted for infringing either Article 81 and/or Article 82.⁹ We discard seven companies that were

⁴ Regulation 17, First Regulation Implementing Articles 85 and 86 of the Treaty [1962] OJ 13/204, English special edition OJ [1959-62] 87. The current numbering of Articles 81 and 82 stems from the modified Treaty signed in Amsterdam in 1997.

⁵ In May 2004, Regulation 1/2003 came into force replacing Regulation 17 (see Regulation 1/2003 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty [2003] OJ L 1/1). One of the changes is that under Regulation 1/2003 there is no possibility to file an application for notification. As this study focuses on the period before the emplacement of Regulation 1/2003, we only describe the legal procedures based on Regulation 17.

⁶ See the Commission Notice on immunity from fines and reduction of fines in cartel cases (the "Leniency Notice") of 18 July 1996; Commission Notice on immunity from fines and reduction of fines in cartel cases of 19 February 2002; Commission Notice on Immunity from fines and reduction of fines in cartel cases (New Leniency Notice) of 8 December 2006. The first leniency case was the British Sugar (II) case, in which Tate & Lyle sent two letters to the Commission reporting the agreements between four companies.

⁷ Council decision 88/591 of 24 October 1988 L 319/1.

⁸ Bayer's fine stemming from the Choline Chloride cartel in 2004 was increased on appeal (*Choline chloride* Commission decision of 9 December 2004, published on DG Comp website, Case COMP/E-2/37.533)

⁹ Article 86 involves Member State regulations and is directed at either a Member State or a company mainly held by a Member State that is rarely publicly listed. Regulation 17 is purely procedural and therefore not included in our study. Out of all infringements, the ones decided under Article 86 and Regulation 17 account for 47 cases.

granted full immunity under the EC's leniency program. We also exclude 19 observations from the analyses due to contaminating events around the event date (details can be obtained from the authors).

We obtain information on the names of the involved parties, the duration of the investigation, the length of decision document, the date of the final decision, the date of the statement of objections (SOO), the number of parties involved in the case, whether a company lodged an appeal against the final decision or not, the result of the appeal case (if applicable), the report route, the OECD industry, the country of incorporation, the sales on the product market on which the misconduct took place expressed as a fraction of total sales (a variable we refer to as "relative sales"), the duration of the infringement, and the nature of conduct from the decision documents of the Commission, which were published over the years in the Official Journal as well as the Annual Reports on Competition (Volumes I–XXXIV).

We collect information on the dates of the dawn raids using the final decision documents and Factiva. When we find the date of a raid in Factiva for one particular company in a case, we assign that date to all the firms involved in that case. We also verify the dates of the final decision and of the issuance of the SOO obtained from the decision documents by a search in Factiva. In the few cases where the date of the dawn raid, the decision, or the SOO appeared later or earlier in Factiva than the official release date of the Commission, we use the official date. We run robustness checks (unreported) with the Factiva dates and conclude that using these dates instead of the official dates does not materially affect our findings.

We obtain data on daily local currency stock returns (including dividends) and market capitalization from Datastream. Our analysis requires companies to be listed on a stock exchange at the time of the decision, the time of the SOO, and/or the time of the dawn raid as well as the appeal proceeding if initiated by the party. For all unlisted companies, we check whether the company has a parent controlling 100% of the company—in which case we include the parent in the dataset. We start our analysis in 1974 because Datastream coverage starts in this year. Overall, our sample for the decision event includes 166 different listed companies with a stock exchange listing involved in 118 different antitrust cases. The total number of observations is 253, as several of these companies are involved in multiple cases during the period 1974–2004. Our dawn raid analysis involves 69 different companies involved in 29 different antitrust cases for a total number of 82 observations. We have 240 observations (100 cases, 159 different companies) for the issuance of the SOO. For 124 observations (52 cases, 85 companies) we have sufficient information for an event study around the date of the appeal judgments.

To obtain proxies for the potential for reputational damage to the companies involved as a result of the antitrust investigation, we collect information on the number of newspapers referring to the individual companies involved in each case in the window of 25 days before to 25 days after each event date from Factiva. Fang and Peress (2009) show that media attention – and in particular newspaper coverage – is a significant determinant of the pricing of stocks. Besides a potential reputation effect, we expect companies from countries with larger economies, more efficient stock markets, and a longer history of antitrust enforcement to show a more pronounced market reaction to antitrust decisions. In our sample, those countries are France, Germany, Japan, the UK, and the US—in contrast to smaller European and Asian economies that did not have any antitrust enforcement authority before the 1990s. Variable definitions are in Table A1 in the Appendix.

In contrast to other event studies on antitrust decisions, our study also features a cross-sectional analysis to understand variation in the stock market response to antitrust decisions, based on an international sample of affected firms involved in different

economic conduct. Some prior studies proxy affected profits and/or legal costs, e.g., Garbade et al. (1982), Binder (1988), and Bosch and Eckard (1991). We are the first to also attempt to proxy for reputational impact by studying newspaper coverage around the decisions. Since the US antitrust system imposes the highest fines and has the longest history in enforcement globally, such analysis could also potentially be relevant in a US setting.

4.2. Event study methodology

We use a standard event study procedure (see Brown and Warner, 1985) to compute abnormal stock returns around the dawn raid, the SOO, the decision, and the appeal. To calculate daily abnormal returns, we estimate the market model:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \quad (1)$$

where, $R_{i,t}$ is the total stock return of firm i on day t and $R_{m,t}$ is the total stock return on the domestic stock market index (the Datastream local market index expressed in local currency) of the country of firm i on day t . We use an estimation period of 220 trading days that ends 30 days before the event window to estimate α and β . We compute abnormal returns as follows:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}), \quad (2)$$

where, $AR_{i,t}$ is the abnormal return of firm i on day t and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the estimated parameters from Model (1). We compute average abnormal returns (AAR) as:

$$AAR_t = \frac{1}{n} \sum_{i=1}^n AR_{i,t} \quad (3)$$

and cumulative average abnormal returns (CAAR) as:

$$CAAR = \sum_{t=t_1}^{t_2} AAR_t \quad (4)$$

where, t_1 is the beginning and t_2 is the end of the event window. We use standard parametric tests to assess the statistical significance of the CAARs.

For each of the events, we compute CAARs on the event day itself and over an event window from five trading days before to five trading days after the event date. These two event windows are standard windows used by many papers (e.g., Aktas et al., 2007). We also examine different event windows from three trading days before to 20 trading days after the event date for the dawn raid and the issuance of the SOO and from 25 trading days before to three trading days after the event date for the final decision and for the appeals. The choice for the longer windows is motivated by the fact that dawn raids are not always immediately reported in the press. For the official decision, some leakage of information motivates the choice of a longer pre-event window. We use graphs of the development of the CAARs over a period from 25 trading days before to 20 trading days after the event date to evaluate the stock market response over a longer period and to check whether our choice of event windows is plausible.

Gelbach et al. (2013) pointed out an important concern about standard inference in single-firm, single-event studies. In particular, standard statistical tests are only appropriate when abnormal stock returns stem from a normal distribution, but it is well-known that the normal distribution is a less than perfect description of stock returns. This concern is especially pressing when the number of events is small, and may thus also apply to our paper—since most firms appear in the analysis only once and since the number of events per firm is small. To address this concern, the authors propose an alternative, non-parametric "SQ" test that is based on

the sample quantiles of the estimated abnormal return distribution to estimate the critical value for the event effect (as opposed to the normal distribution). The approach is straightforward to implement: the estimated abnormal event-window return is compared to the quantiles of a set of pre-event returns measured over the same horizon. To evaluate the robustness of our statistical inferences to this non-parametric approach, we also report *p*-values of the SQ test that are based on the same pre-event window of 220 trading days that we used to estimate Eq. (1). For event windows longer than one day, we determine the quantiles of the distribution of returns measured over equally long horizons within this pre-event period.

5. Empirical results

5.1. Summary statistics

Table 1 shows summary statistics for the sample of observations we use for the event study around the decision date (the “decision sample”). The dawn raid, SOO, and appeal samples are subsamples of this sample. Most of the cases in our decision sample (75%) involve horizontal conduct, better known as cartels. Vertical conduct (13%) and abuse of dominance (10%) cases form a significant part of our sample, while we have only few joint venture and licensing cases. Carree et al. (2010) showed a similar distribution for economic conducts. Hence, we conclude that that we have a representative sample for our event study. There is a considerable amount of variation in the final fine given. For 54 of the 253 observations (21%), there was no fine. The maximum fine in our sample was €497 million for Microsoft in 2004. On average, the Commission investigation lasted for over two years, while the average duration of the infringement was approximately six years (which is close to the estimates reported by Bryant and Eckard, 1991; Combe et al., 2008; Levenstein and Suslow, 2006). Out of all infringements decision in our decision sample, 59% of the cases resulted in an appeal; 29% were reported under the 1996 Leniency Notice.

The decision sample shows a great variation in the market capitalization of the firms involved. The smallest firm in our sample (Carbide Graphite Group) had a market cap of €8.41 million at the time of the decision, while the largest firm (Microsoft) had a market cap of over €215 billion. On average, the fraction of sales (as a percentage of total sales) that the involved companies derived from the particular product market under investigation was around 6%. A considerable number of companies in our sample were involved in more than one cartel; 36% of the observations involve repeat offenders.¹⁰ Within our sample, one company (BASF) appears in eight different cases, one company (Nedlloyd) in seven cases, two companies in six cases, three in five cases, four in four cases, seven in three cases, and 26 in two cases. BASF is also the repeat offender with the highest count of infringements (Carree et al., 2010). The large number of repeat offenders suggests that even though on average the product market under investigation accounted for 6% of firm sales, many firms may have been simultaneously active in anticompetitive conduct on other markets. The deterrent effect of

the infringement decision thus has the potential to have a bearing on a considerably larger part of these firms.

About three quarters of the companies in the decision sample are from the manufacturing industry. Around 10–15% of the companies are incorporated in each of the following countries: France, Germany, Japan, the UK, and the US. The remaining companies are primarily from other European countries. On average, 19 newspaper articles discuss the infringement decision in the fifty days around the decision date. The Microsoft case was the most often reported decision with 152 newspaper citations around the decision date.

5.2. Event study results

Table 2 presents the results of the event study of the dawn raid, the SOO, the decision, and the appeal. Fig. 1 shows the development of the cumulative abnormal return around each of the events. Since the stock market response around the announcement of the appeal decision by the European Court of Justice is likely to depend on the nature of the judgment, we distinguish between appeal cases that were upheld, appeal cases that were partially annulled, and those that were fully annulled.

We observe an economically large and statistically significant decline in the market value of the firm around the dawn raid. On the event date itself, the market value drops by around 1%. Since there is no public announcement of the dawn raid, it is not surprising that the stock market response is stronger in the longer event windows. In the 11-day window around the event date, the 82 firms in our sample that experienced a dawn raid show an average abnormal return of over –2.5%. Over the window from three days before to 20 days after the day of the dawn raid, the CAAR is –4.7%. For all three event windows, the CAAR is highly statistically significant according to the standard statistical inference based on the normal distribution. The *p*-values of the non-parametric SQ test of Gelbach et al. (2013) are slightly larger than the normal *p*-values, but still significant at conventional significance levels.

Panel A of Fig. 1 shows the development of the CAAR from 25 days before to 20 days after the dawn raid. The graph shows that the market response to the raid is strongly negative, with the steepest decline in market prices observed in the days around the raid. The graph suggests that there is some information leakage before the event. Also, the development of the CAAR is suggestive of the stock market taking a few weeks to process all the information related to the dawn raid. We note that the use of the event study results over the period ($t-3$, $t+20$) in our analyses leads to a conservative estimate of the stock market response to European antitrust enforcement. Over the extended window ($t-25$, $t+20$), the CAAR is close to –6.5%.

An interesting finding is that several companies involved in leniency cases experience a negative abnormal return in the period before the raid. In fact, of all firms that show a significantly negative abnormal return in the period before the raid, only four firms do not stem from leniency cases. And these four firms were either involved in cases prior to the 1996 Leniency Notice (PVC, Cement, Cartonboard) or in cases that fall under Article 82 (Opel).¹¹ This finding may indicate a possible leakage effect and/or insider trading by applicants in leniency cases. Of course, our evidence is indirect, but several event returns before the raid suggest a possible leakage effect in leniency cases: Compañía Española de Tabaco en Rama and Tabacos Españoles (–3% and –16%), Ajinomoto Company (–2%),

¹⁰ Examples of cases that explicitly mention the involvement of repeat offenders are: PO/Organic peroxides Commission decision of 10 December 2003, published on DG Comp website, Case COMP/E-2/37.857; Matieres colorantes, Dyestuffs Commission decision 69/243/EEC [1969] OJ L 145/11, Case IV/26.267; Polypropylene Commission decision 86/398/EEC [1986] OJ L 230/1, Case IV/31149; PVC Commission decision 89/190/EEC [1989] OJ L 74/1, Case IV/31.865; PVC (II) Commission decision 94/599/EEC [1994] OJ L 239/14, Case IV/31.865; Vitamins Commission decision 2003/2/EC [2003] OJ L 6/1, Case COMP/E-1/37.512; Choline chloride Commission decision of 9 December 2004, published on DG Comp website, Case COMP/E-2/37.533.

¹¹ PVC Commission decision 94/599/EEC [1994] OJ L 239/14, Case IV/31.865, Cement Commission decision 94/815/EEC [1994] OJ L 343/1, 33.126, Cartonboard Commission decision 94/601/EEC [1994] OJ L 243/1, Case IV/33.833, Opel Commission decision 2001/146/EC [2001] OJ L 59/1, Case COMP/36.653

Table 1

Summary statistics of country and firm characteristics. This table provides summary statistics for the decision sample. A description of the variables is provided in [table* A1](#) in the Appendix.

	Mean	Median	Minimum	Maximum	Standard deviation	N
Horizontal	0.75	1.00	0.00	1.00	0.42	253
Vertical	0.13	0.00	0.00	1.00	0.34	253
Dominance	0.10	0.00	0.00	1.00	0.27	253
Joint venture	0.01	0.00	0.00	1.00	0.09	253
Licensing	0.01	0.00	0.00	1.00	0.10	253
Market capitalization	9292.05	3128.69	8.41	215,760.79	22,939.49	222
Fine	16.50	2.50	0.00	497.20	51.52	253
Relative sales	6.09	2.28	0.01	80.48	11.06	125
Newspaper count	19.45	11.00	0.00	152.00	25.99	253
Duration of infringement	75.16	59.00	0.00	348.00	68.78	253
Appeal	0.59	1.00	0.00	1.00	0.49	253
Leniency	0.29	0.00	0.00	1.00	0.45	253
Repeat offender	0.36	0.00	0.00	1.00	0.48	253
Manufacturing industry	0.76	1.00	0.00	1.00	0.42	253
France	0.09	0.00	0.00	1.00	0.29	253
Germany	0.14	0.00	0.00	1.00	0.35	253
Japan	0.16	0.00	0.00	1.00	0.37	253
UK	0.11	0.00	0.00	1.00	0.31	253
US	0.08	0.00	0.00	1.00	0.27	253
Europe (other)	0.36	0.00	0.00	1.00	0.48	253

Table 2

The stock price reaction to European antitrust policy This table shows the event study results for the dawn raid, the statement of objections, the decision, and the appeal decision (conditional on the appeal decision).

Event (number of observations)	Event window	Cumulative average abnormal return (CAAR) (%)	p-Value standard normal	p-Value SQ test	% Positive cumulative abnormal returns (CARs)
<i>Dawn raid</i> (82)	$t=0$	-0.97	<0.001***	<0.001***	35.37
	$t=-5$ to $+5$	-2.66	<0.001***	0.023**	30.49
	$t=-3$ to $+20$	-4.74	<0.001***	0.004***	21.95
<i>Statement of objections</i> (240)	$t=0$	0.13	0.418	0.814	48.33
	$t=-5$ to $+5$	0.56	0.305	0.841	52.50
	$t=-3$ to $+20$	-0.24	0.768	0.353	50.42
<i>Decision</i> (253)	$t=0$	-0.13	0.395	0.197	46.64
	$t=-5$ to $+5$	-0.36	0.479	0.308	48.22
	$t=-25$ to $+3$	-1.85	0.024*	0.029**	44.27
<i>Appeal-upheld</i> (37)	$t=0$	-0.29	0.343	0.144	47.22
	$t=-5$ to $+5$	-0.31	0.759	0.401	33.33
	$t=-25$ to $+3$	-2.26	0.169	0.141	44.44
<i>Appeal-partial annulment and/or fine reduction</i> (65)	$t=0$	0.51	0.140	0.082*	69.81
	$t=-5$ to $+5$	1.68	0.146	0.155	75.47
	$t=-25$ to $+3$	4.28	0.022**	0.034**	83.02
<i>Appeal-annulment</i> (22)	$t=0$	0.64	0.082*	0.027**	94.12
	$t=-5$ to $+5$	0.44	0.720	0.360	70.59
	$t=-25$ to $+3$	2.24	0.261	0.092*	76.47

We determine significance using standard event study methodology (Brown and Warner, 1985) based on the standard normal distribution as well as on the non-parametric SQ-test of Gelbach et al. (2013).

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

BPB (-6%), Showa Denko K.K. (-3%), which all cooperated with the Commission before the raid. We find supporting evidence for an additionally potential leakage effect for cases in which the Commission had sent letters requesting information prior to the raid: Boliden AB and IMI (-21% and -5%) and Erste Bank der Oesterreichischen Sparkassen AG (-3%).¹²

¹² Raw tobacco Spain Commission decision of 20 October 2004 published on DG Comp website, Case COMP/C.38.238/B2, Copper plumbing tubes Commission decision 2006/485/EC [2006] OJ L 192/21, Case C.38.069, SAS Maersk Air and Sun-Air Commission decision 2001/716/EC [2001] OJ L 265/15, Case COMP/D 37.444, Case IV/33.322, Plasterboard Commission decision 2005/471/EC [2005] OJ L 166/8, Case COMP/E-1/37.152, Graphite Electrodes Commission decision 2002/271/EC [2002] OJ L 100/1, COMP/E-1/36.490, Carbonless Paper Commission decision 2004/337/EC [2004] OJ L 115/1, Case COMP/E-1/36.212, Amino Acids Commission decision 2001/418/EC [2001] OJ L 152/24, Case COMP/36.545/F3

The dawn raid is a visible and often publicly recognized event in which the Commission – jointly with national officials and the national police – enters firm premises to receive documentation of the illegal practice. This is reflected by the fact that newspaper coverage is high. For example, in the Amino Acid cartel no fewer than 40 different newspapers referred to the raid around the date of the raid.¹³ The average number of different newspaper articles around the dawn raid is equal to seven (not tabulated). In contrast, the SOO is hardly discussed in the press. It is therefore not surprising that we find no evidence of a significant stock market reaction around the SOO. For all three event windows, the CAARs are close to zero and not statistically significant. Panel B of Fig. 1 shows no clear pattern

¹³ Amino Acids Commission decision 2001/418/EC [2001] OJ L 152/24, Case COMP/36.545/F3.

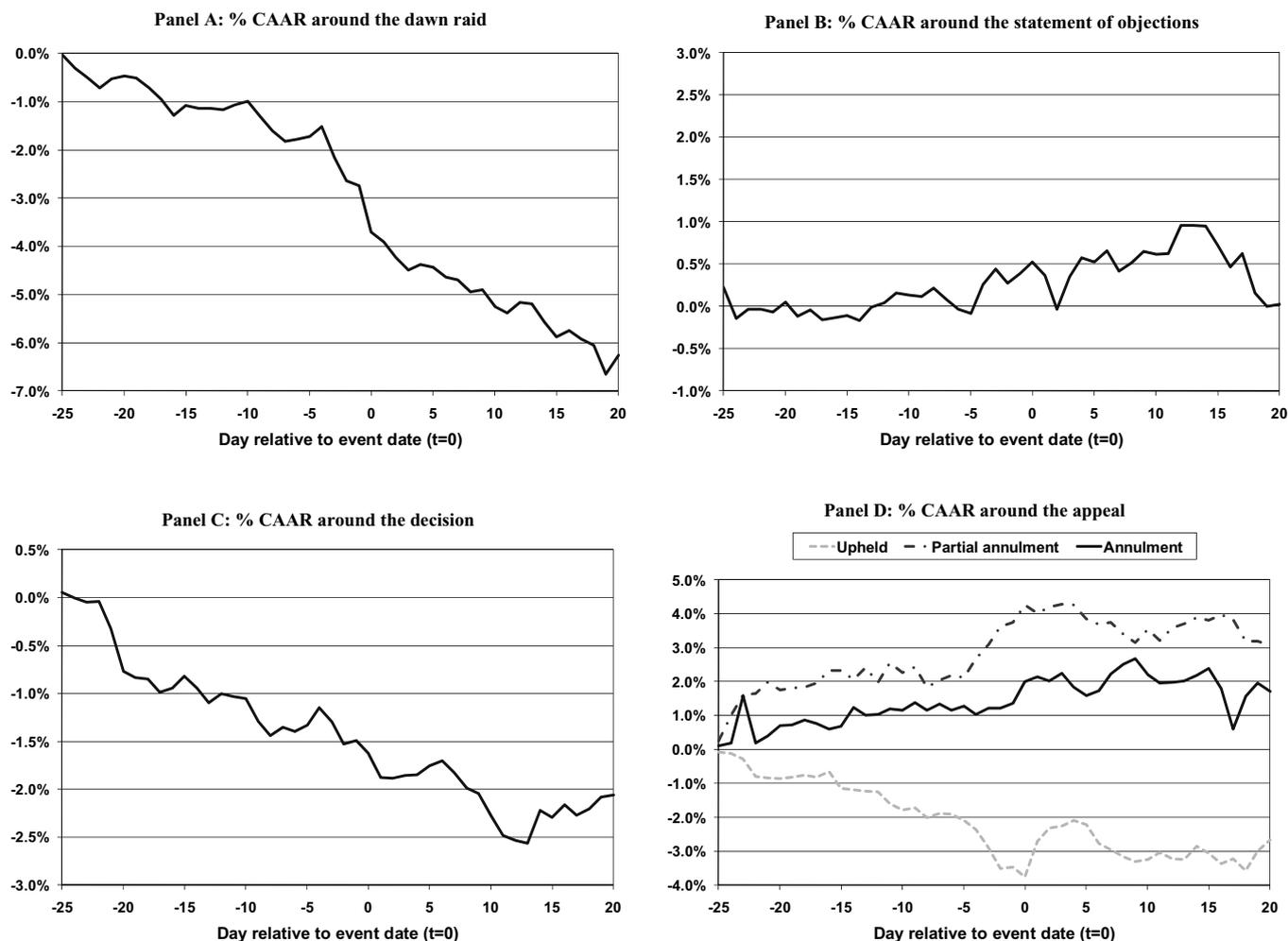


Fig. 1. The stock price reaction to European antitrust policy. This figure shows the development of the cumulative average abnormal return (CAAR) over the period from 25 days before to 20 days after the event date for the dawn raid (Panel A), the statement of objections (Panel B), the decision (Panel C), and the appeal (Panel D). Panel A: % CAAR around the dawn raid. Panel B: % CAAR around the statement of objections

in the development of the CAAR around the event date; abnormal returns are close to zero.

There is a negative stock market reaction around the announcement of the Commission final decision. This reaction is small and not statistically significant for the shorter event windows, but close to -2% and significant at the 5% level (based on both the standard test and the SQ test) for the event window ($t-25, t+3$). Panel C of Fig. 1 shows the development of the CAAR from 25 days before to 20 days after the Commission decision. We see a clear negative trend in the development of the CAAR that starts around 22 trading days before the event date and continues to around 13 days after the event date. This pattern suggests that information leakage and/or expectation formation are non-trivial issues around the announcement of the infringement decision, and that the market takes a while to absorb and analyze the information released before it stabilizes at a new level. Again, we take a conservative approach by using the results for the event window ($t-25, t+3$) in our analyses. For longer windows, the CAAR is more negative. In comparison to Bosch and Eckard (1991), we find larger and more statistically significant negative abnormal returns over longer windows. They find the strongest drop in the stock price on the day of the indictment at a statistically significant level and report a statistically insignificant negative reaction for their longest window ($t+1, t+10$).

Why is the effect on CAAR around the dawn raid stronger than around the decision date? There are several plausible explanations

for this finding. First, at the time of the decision it is likely that the market has already received a substantial amount of information about the antitrust investigation. A large part of the (bad) news has thus already been incorporated in the stock prices of the companies involved. Almost one third of the decision date events involved a dawn raid. Many cases appeared in the press before the decision date (sometimes through a press release by the Commission). Second, the decision may be less adverse for some firms than the market already expected, which implies that the stock market response is likely to be positive for these firms. These positive abnormal returns dampen the average negative stock market reaction. Still, the drop in the aggregate market value of the 253 firms in our sample around the decision date of close to -2% indicates that the stock market assesses the information released around that date to indicate a considerable detrimental effect on the value of the companies involved.

The appeal decision by the European Court of Justice also tends to have a considerable effect on the market value of the companies involved. In the 37 cases where the original EC decision is upheld by the Court, there is a negative effect on the stock price in all three event windows. The effect is more than -2% over the window ($t-25, t+3$). These effects suggest that the market generally assigned a positive probability to a (partial) annulment of the original decision and thus reacted negatively to the news that the decision was upheld in the appeal. The abnormal return over

neither of the event windows is statistically significant, however. We note that the number of observations in the appeal subsamples is limited, which makes it harder to draw statistically reliable inferences.

When the decision is partially or completely annulled, the stock market appreciates this as good news about the value of the companies and the CAAR is positive. In the 65 cases of partial annulment and/or fine reduction, we observe a positive CAAR of 0.51% on the event day, of 1.68% over the window ($t-5, t+5$), and of 4.28% over the window ($t-25, t+3$). The CAAR over the window ($t-25, t+3$) is statistically significant at the 5% level based on both the standard and the SQ test, while the event day CAAR is significant at 10% according to the SQ test. In the 22 cases where the decision was fully annulled, the CAAR is equal to 0.64% on the event day, to 0.44% over the window ($t-5, t+5$), and to 2.24% over the window ($t-25, t+3$). Despite the very small number of observations, the event day abnormal return is statistically significant according to both the standard and the SQ test. The SQ test also indicates statistical significance (at the 10% level) for the longest event window. Panel D of Fig. 1 shows the development of the CAAR from 25 days before to 20 days after the decision for the upheld, partially annulled, and fully annulled cases separately. Consistent with our expectations, we observe a clear upward trend for the annulment and partial annulment cases and a clear downward trend for the upheld cases. Each of the three trend lines is particularly pronounced just before and on the date of the appeal decision. A possible explanation for the smaller CAAR for the full annulment cases relative to the partial annulment cases is that the former may be more clear-cut and the market may thus have better anticipated the outcome of the appeal, while the latter involved more uncertainty.

Table 3 presents the event study results around the final decision announcement for several subsample splits carried out on the basis of case and firm characteristics. The table also shows differences in the CAARs over the window ($t-25, t+3$) between subsamples and indicates whether these differences are statistically significant. The stock market response to EC antitrust decisions is of similar magnitude for horizontal conduct, vertical conduct, and abuse of dominance cases. Only the CAAR for the horizontal conduct cases is statistically significant, but this is likely driven by the much large number of observations for this subsample. Surprisingly, the stock market response is more negative for firms that did not receive a fine. However, the number of observations is limited and the difference between the CAARs for firms with no fine and firms with a positive fine is not statistically significant. Another explanation for the counterintuitive impact of the fine might be that the fining policy of the Commission may be rather arbitrary. Combe and Monier (2009) found that there is hardly any correlation among fines and profits generated on the market on which the anticompetitive conduct took place.

We would expect the stock market response to be more negative for firms for which the size of the product market investigated in the case is larger relative to the total activities of the firm, as measured by the relative sales variable. In line with our expectations, the stock market reaction is more negative for firms for which the relevant product market constituted more than 10% of total sales (CAAR of -1.27%) than for firms with a relative sales variable smaller than 10% (CAAR of -0.58%). The difference is not statistically significant from zero, though.

Small firms suffer a substantially greater drop in their value around the Commission decision announcement than large firms. For the smallest firms in our sample (those with a market capitalization below the sample median), the CAAR is close to -3% , versus less than -1% for the largest firms. The difference is significant at the 10% level. Repeat offenders experience less negative CAARs than first time offenders. This result could suggest that stock prices incorporate the likelihood of further infringements of European

antitrust law at the time of the first conviction. Or, alternatively, the reputational damage is greatest at the time of the first conviction. The difference in CAARs is economically large, though not statistically significant.

As expected, there appears to be a stronger stock price reaction in cases where there was no dawn raid. It is likely that less information came out before the event window around the decision date in these cases. However, the difference is insignificant. We find some indication that the stock market might anticipate the outcome of a subsequent appeal at the time of the Commission decision. For the firms in our sample for which the decision was upheld, partially, and fully annulled by the European Court of Justice, the CAAR is equal to -2.77% , -1.80% , and -0.69% , respectively. Differences between these CAARs are not significant, however.

Aktas et al. (2007) reported evidence of protectionist motivations in the Commission decisions to evaluate merger proposals. We find no evidence that the stock market assesses antitrust decisions by the Commission to be less detrimental for European firms. In fact, European firms experience a much more adverse stock price reaction than US firms (-1.94% vs. 0.74%). This result may be driven by the fact that for US firms the Commission antitrust decisions are less likely to have an important impact on the home market. Also, there may just be less attention for European antitrust decisions in the US. Japanese firms appear to experience a more negative stock market reaction (-2.90%) than European firms. The difference between the CAARs for US and Japanese firms is significant at the 10% level. In the US, private litigation suits usually follow public cases. In private litigation cases, the damages awarded are based on the idea of treble damages and therefore, legal costs in forms of penalties are significantly higher than in the EU.

Carree et al. (2010) distinguished three different periods in the history of European antitrust policy: 1964–1977, 1978–1990, and 1991–2004. They document that the fines become larger over time and that the last period is characterized by a more economic approach to antitrust policy by the Commission with the introduction of the leniency program and the installment of two specialized anti-cartel units inside the European Commission. When we contrast the last period with the first two, we find a substantially more pronounced stock market response. Over 1991–2004 the CAAR is -2.28% , while over 1974–1990 the CAAR is only -0.78% . This result suggests that the impact of and the attention paid to European antitrust policy has increased over time, although the difference is not statistically significant.

Overall, the differences in CAARs between various subsamples are economically large, but the substantial variation within subsamples does not allow for strong conclusions. In addition, the variables on the basis of which the subsamples are formed are likely to be correlated, which calls for a multivariate analysis. In the next section, we present a systematic analysis of the effect of various case and firm characteristics in cross-sectional regressions to explain the variation in event returns across firms.

5.3. Cross-sectional regression results

Table 4 shows the estimation results of cross-sectional regressions of the event returns on a number of case and firm characteristics. Panels A, B, and C of Table 4 report the result for the dawn raid, the decision, and the appeal, respectively. As we do not observe any stock market response to the SOO, we do not attempt to explain cross-sectional variation in the SOO event returns. The dependent variable is the CAAR over the windows ($-3, 20$), ($-25, 3$) and ($-25, 3$) for the raid, decision and appeal event, respectively, in Table 2. In reporting our findings for the cross-sectional analysis, we use similar regression model specifications for the three different events. Each panel presents four models, all of which include the logarithm of the market capitalization and the logarithm of

Table 3
The stock price reaction to the final decision announcement for subsamples This table shows the event study results for the period of 25 days before to three days after the announcement of the formal decision for different subsamples of firms as well as the difference in event returns between the different subsamples (defined as the difference between the subsamples in columns and rows).

Subsamples	Cumulative average abnormal return (CAAR) (%)	Number of observations	Differences in cumulative average abnormal return (CAAR) across subsamples (%)		
<i>Nature of conduct</i>			Vertical	Dominance	
Horizontal	−1.83***	184	0.37	0.29	
Vertical	−2.20	33		−0.08	
Dominance	−2.12	18			
<i>Fine</i>			Fine > 0		
Fine = 0	−2.91**	54	−1.34		
Fine > 0	−1.57**	199			
<i>Relative sales</i>			Relative sales > 10%		
Relative sales ≤ 10%	−0.58	105	1.21		
Relative sales > 10%	−1.27	21			
<i>Size</i>			Market cap > median		
Market cap ≤ median	−2.87***	111	−2.13*		
Market cap > median	−0.74	111			
<i>Repeat offender</i>			No		
Yes	−1.10	90	1.17		
No	−2.27***	163			
<i>Dawn raid</i>			No		
Yes	−1.58	80	0.39		
No	−1.98***	173			
<i>Appeal</i>			Upheld	Partial annulment	Annulment
No appeal	−1.59*	118	1.17	0.20	−0.90
Upheld	−2.77**	57		−0.97	−2.08
Partial annulment	−1.80	63			−1.11
Annulment	−0.69	15			
<i>Origin of the firm</i>			US	Japan	
Europe	−1.94***	171	−2.68	0.95	
US	0.74	28		3.64*	
Japan	−2.90**	54			
<i>Time period</i>			1991–2004		
1974–1990	−0.78	72	1.50		
1991–2004	−2.28***	181			

We determine significance using cross-sectional regressions of the cumulative average abnormal return (CAAR) on dummy variables indicating the different subsamples and using Wald tests on the equality of the coefficients of different subsamples

* Significance at the 10% level.

** Significance at the 5% level.

*** Significance at the 1% level.

newspaper citations around the event. In Panels A and B of [Table 4](#), all models also include dummy variables for the country of incorporation. We use standard errors that are robust to heteroskedasticity ([White, 1980](#)).

We expect firms from countries with a long antitrust enforcement history to have a more pronounced stock price reaction. In the US, antitrust enforcement dates back to the Sherman Act in 1890 (for an evaluation of its impact, see [Binder, 1988](#)). During the US occupation after World War II, the US government installed antitrust enforcement systems that resemble the American system in Germany and Japan. France installed its own, quite rigorous enforcement system after 1945. We hypothesize that the reaction might be more pronounced for firms from these countries. The UK used to have a less rigorous system at the beginning of antitrust enforcement in the European Union. Other reasons why the country of incorporation may be able to explain part of the cross-sectional variation in event returns are the size of the economy and the development and liquidity of national stock markets.

To test the hypothesis whether the stock market response is related to the magnitude of the economic gains of anticompetitive conduct, Model (2) incorporates the relative size of the market where the antitrust allegation refers to (“relative sales”—measured as the fraction of the total sales of a company derived from the market on which the anticompetitive practice took place). This variable

is only available for a limited number of cases, which reduces the sample sizes by 28%, 49% and 48% for the raid, decision, and appeal samples, respectively. These reduced samples essentially consist of cartel cases with firms being located in the EC and operating in the manufacturing industry. Therefore, we drop the industry controls in this model. A potential advantage of this model is that the observations in this sample are more homogeneous. Model (3) includes a number of additional variables, the choice of which depends on the event. We discuss these variables in more detail below. Model (4) adds the relative sales variable to Model (3).

The estimation results of Models (1) and (3) for the raid sample (Panel A of [Table 4](#)) indicate that smaller firms have a significantly more negative stock price reaction. The stock market thus assesses the costs of antitrust action to be larger for smaller firms. [Bos and Schinkel \(2006\)](#) showed that according to the EC fining guidelines, smaller firms operating on fewer markets are punished heavier by the height of the fine imposed. Since the fine is not known by investors at the time of the dawn raid, this either suggests that the stock market anticipates the relatively high fine for small firms or that it punishes smaller firms on top of the effect of the fine. The economic magnitude of this effect is considerable. A one standard deviation (1SD) increase in the natural logarithm of a firm’s market capitalization is associated with an abnormal event return that is up to 1.72% more positive, an effect that corresponds to 0.28 of

Table 4

Cross-sectional regressions to explain the stock price reaction to different events. This table shows the estimation results of regressions to explain cross-sectional variation in the event returns around the dawn raid (Panel A), the decision (Panel B), and the appeal decision (Panel C). Event returns are measured over the longest window listed in Table 2 and are expressed in % terms. A description of the variables is provided in Table A1 in the Appendix.

Panel A: Dawn raid				
Variable	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	-6.00*	-5.36	-6.82*	-3.59
Ln(Market capitalization)	0.96**	0.19	1.07**	0.25
Ln(Newspaper count)	-1.28*	-1.90**	-1.26*	-2.16**
Repeat offender			-1.08	-4.42***
Relative sales		-0.01		-0.05
Manufacturing industry	-4.64*		-4.14*	
France	-5.06***	-4.34***	-5.34***	3.96***
Germany	0.51	3.96*	0.55	3.29**
Japan	1.39	3.29	0.97	0.38
UK	-2.33	0.38	-2.25	4.66
US	2.94	4.66	2.58	-0.01
Number of observations	76	55	76	55
R ²	0.19	0.19	0.20	0.27
Adj. R ²	0.09	0.05	0.09	0.13
Panel B: Decision				
Variable	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	-6.22*	-5.91	-6.36*	-2.65
Ln(Market capitalization)	0.99***	1.93***	1.17***	1.62***
Ln(Newspaper count)	-0.17	-1.56**	-0.58	-1.24**
Ln(Fine/market capitalization)			0.14*	-0.29**
Duration infringement			-0.01	-0.02*
Relative sales		0.16**		0.17***
Manufacturing industry	1.45	-2.19	1.21	-1.78
Other European countries	-2.52	-3.80	-3.02	-2.32
France	-4.80**	-5.46	-5.17*	-3.29
Germany	-6.92*	-13.04***	-7.43**	-11.70***
Japan	-4.92*	-2.35	-4.93	-1.08
UK	-4.32	-7.53**	-4.34	-6.04
US	-5.63*	-4.80	-5.97*	-4.05
Number of observations	222	114	222	114
R ²	0.06	0.22	0.08	0.24
Adj. R ²	0.02	0.15	0.03	0.15
Panel C: Appeal				
Variable	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	-6.59	9.48	-6.59	9.61
Annulment (Partial or full)	20.74**	3.33	22.43*	7.76
Ln(Market capitalization)	1.00	-0.14	1.00	-0.15
Ln(Market capitalization) × Annulment (Partial or full)	-2.54**	-1.46	-2.55**	-1.49
Ln(Newspaper count)	-1.93**	-5.93*	-1.93**	-5.94*
Ln(Newspaper count) × Annulment (Partial or full)	2.92**	8.29**	2.35*	6.51*
Fine revision			0.28*	0.33*
Relative sales		-0.03		-0.04
Number of observations	114	59	114	59
R ²	0.17	0.15	0.18	0.16
Adj. R ²	0.13	0.05	0.13	0.04

Standard errors are robust to heteroskedasticity.

* Significance at the 10% level (one-sided test).

** Significance at the 5% level (one-sided test).

*** Significance at the 1% level (one-sided test).

the cross-sectional SD of the event returns. The magnitude of this effect becomes somewhat weaker—and the statistical significance disappears—once we account for relative sales in the regressions. We note that in Models (2) and (4) the sample size is reduced to

55 and the inclusion of up to 10 independent variables may be a stretch.

Newspaper coverage has a negative impact that is both statistically and economically significant in all models. A 1SD increase in the natural logarithm of the newspaper count is associated with an event return that is up to -2.42% (or 0.40 SD) more negative. Consequently, the more media attention the dawn raid receives, the greater the loss in stock market value; an effect that we interpret as an indication of the importance of reputational damage in antitrust cases. Model (4) shows that repeat offenders experience a more negative stock price response around the raid. In unreported tests, we find no significant effect of a dummy variable indicating leniency program cases or cases initiated by any other type of report route. French firms and firms from the manufacturing industry have a significantly more negative stock price reaction than other firms. Both effects show up consistently in the models in Panel A of Table 4. For the subsample based on relative sales, German firms show a significantly more positive reaction. The R² of the models in Panel A of Table 4 varies between 0.19 and 0.27, suggesting that our explanatory variables capture a considerable part of the variation in event returns across firms.

Panel B of Table 4 shows the results of the cross-sectional regressions to explain the event return around the decision date. In these estimations, we include an additional country dummy indicating other European firms. We do not include this variable in the raid estimations since all firms are located inside the EC. The strongest result in Panel B is that smaller firms experience significantly more negative stock price reactions to antitrust decisions. This effect shows up in all four model specifications, is always significant at the 1% level, and is again economically substantial. A 1SD increase in the ln(market capitalization) is associated with an abnormal event return that is up to 2.49% (or 0.27 of the cross-sectional SD of the event returns) more positive, depending on the specification. The effect of firm size survives the inclusion of the relative sales variable in Models (2) and (4) of Panel B.

Remarkably, the coefficient on relative sales is positive and significant at the 5% level in Models (2) and (4). One potential explanation may be that the Commission's estimate of the sales generated on the market on which the infringement took place also becomes public knowledge at the publication of the decisions. Prior studies find that the fines imposed by the Commission are lower than could be justified by the profitability on the market of infringement, and that this discrepancy is greater when this market is larger (Combe and Monier, 2009; Connor and Miller, 2010). Therefore, the market's ex post estimate of the realized net gain of the anticompetitive conduct may increase for larger values of relative sales. This explanation finds additional support in the positive coefficient of the fine when not accounting for relative sales (Model (3)).

Models (2) and (4) indicate that the greater the number of newspapers discussing the case in the window around the event date, the larger the stock price drop. A 1 SD increase in the newspaper count is associated with an event return that is up to -1.70% (or 0.18 SD) lower. We interpret this effect as an indication of the greater reputational damage that firms with high visibility face. The effect has the same sign in Models (1) and (3), but is smaller and not statistically significant.

In Model (4), we find that the larger the fine is relative to the size of the firm, the greater the stock price decrease. A 1SD increase in the relative fine is associated with an effect of -1.21% (or 0.13 SD) in the CAAR. A greater duration of the infringement is also associated with a more negative event return. A potential explanation for this effect is that the stock market anticipated a greater probability of continuation of past profitability for firms that had been part of a cartel for a longer period of time (perhaps due to the stability of such cartels), so that an antitrust conviction is perceived as more

costly for these firms. The results for the fine and the duration of the infringements are only statistically significant in Model (4) for the subsample of firms for which relative sales are available. This could in part be due to the greater homogeneity of this sample. Unreported tests again show no significantly different event returns for leniency cases, repeat offenders, raided firms and firms involved in multiple investigations simultaneously. The R^2 of the four models in Panel B varies between 0.06 and 0.24.

Model (1) in Panel B suggests that French, German, Japanese, and US firms have significantly more negative stock price reactions around the event date than firms located in Asia and the rest of Europe. The effect of the dummies for France, Japan, and the US disappear in Models (2) and (4). Antitrust enforcement systems in Germany and Japan have existed since 1945 and follow the US enforcement philosophy. It is possible that the long antitrust enforcement history in France, Germany, Japan and the US makes the stock market more responsive to European antitrust action. The coefficient on the German dummy is always significant at the 1% level and is economically large.

Panel C of Table 4 reports the regression results for the appeal sample. When analyzing the stock price reaction around the appeal date, we have to distinguish between two outcomes. The ECJ, or its first instance the CFI after 1989, can either uphold, partially or fully annul a Commission decision. If the decision is upheld, there should be no reaction or a slightly negative reaction, since the Court confirms the decision and thereby orders the firm to refrain from the specific business practice. Furthermore, if the Court upholds the decision, there is no fine reduction. If the Court partially or fully annuls a Commission decision, the firm might at least to some extent continue its previous business practice and often receives a fine reduction. This should be good news for the stockholders—to the extent that the appeal decision was not anticipated. To disentangle these effects, we include a dummy variable that indicates whether an individual appeal was partially or fully annulled. We include this variable by itself and interact it with several of the independent variables. We also separately include a variable measuring the revision in the fine. Since the number of observations in the appeal sample is small – only 59 in Models (2) and (4) – and because for meaningful inferences all independent variables should be included by itself as well as in the interaction with the annulment dummy, we drop the country and industry dummies to conserve degrees of freedom. Also, the dummy does not distinguish between partial and full appeals.

Consistent with the results of Table 2, we find a large and positive coefficient on the annulment dummy. The stock market experiences partial and full annulment as positive news for the firms involved. However, including relative sales or fine revision removes the statistical significance of this effect. Models (1) and (3) indicate that large firms profit more from annulments than small firms. We find again evidence that is consistent with the importance of reputation which all models suggest; firms which received relatively more media attention around an annulment experience more positive abnormal returns. Conversely, greater newspaper coverage around upheld appeals is associated with more negative event returns. In line with expectations, the greater the reduction in the fine, the more positive the stock price response. The R^2 of the models varies between 0.15 and 0.18.

Overall, the key results of Table 4 are that small firms suffer more from European antitrust decisions than large firms, that greater media attention intensifies the stock market response, and that the event returns tend to be more pronounced in more mature markets with a longer history of antitrust enforcement. In contrast to most prior (US) studies, we are the first to proxy for a reputational effect. Since antitrust enforcement has a longer history, receives more public attention, and involves higher damages, fines and legal costs in the US, we expect that newspaper coverage would have a

more pronounced effect for US based cases. The event studies we cite in Section 2 do mostly not control for market value, sectors and country of incorporation, which might be of importance given the impact of these variables. The impact of our proxies for profitability (affected sales) and legal costs (fines/MV) do not always show the same influence in the EU; especially fines only affect the stock price negatively once controlling for affected sales in contrast to US studies showing legal costs to have a negative effect. Part of our finding might be explained by studies showing that fines levied by the European Commission do not reap off the profits generated from the illegal activity. In analogy, generated profits in the European Union enter positive into our specification, suggesting the appreciation of the stock market for those firms having generated abnormal profits.

5.4. *Decomposing the market value lost due to European antitrust decisions*

The event study results in Table 2 (discussed in Section 5.2) show that the impact of European antitrust policy on the firms involved is substantial. We uncover significant abnormal stock returns of -4.7% around the time of the dawn raid and -1.9% around the final decision date. Bosch and Eckard (1991) argued that the market value loss due to antitrust policy can be attributed to three factors: legal costs, foregone potential future profits due to the termination of the anticompetitive conduct, and loss of reputation. The regression results in Table 4 (discussed in Section 5.3) provide some evidence that each of these factors influences the stock market response to European antitrust action. We find significant effects of legal costs (as proxied by the magnitude of the fine or the fine revision), foregone profits as a result of the end of the anticompetitive conduct (as proxied by relative sales and the duration of infringement—although the results of the former are weak and sometimes counterintuitive), and loss of reputation (as proxied by newspaper coverage).

In this subsection, we provide estimates of the total market value lost for all companies in our sample as a result of the raid and the decision. The total market value of the 76 firms in the raid sample with data on the market capitalization at the time of the raid amounted to €375.8 billion, or €4.9 billion per firm. For each firm, we compute the market value lost around the raid as the market capitalization multiplied by the abnormal stock return over the window from 3 days before to 20 days after the raid date. We note that Fig. 1 suggests that estimates based on this window are conservative. The total stock market loss due to the raid event is equal to €11.1 billion for these 76 firms, or €146.0 million per firm.

The total market value of the 222 firms in the decision sample with data on the market capitalization at the time of the decision was €2.1 trillion, or €9.3 billion per firm. In the window from 25 days before to three days after the date, €13.3 billion in market value was lost for these 222 firms, or €60.1 million per firm. The total market value loss attributable to European antitrust policy in the raid and decision samples is thus €24.4 billion. Assuming independence of the stock price reactions around the raid and decision events, the average firm that was raided and subsequently convicted thus experienced a decline in its stock market value of €206.1 million. Even if these reactions are not independent (Table 3 suggests that firms that were raided subsequently experience a less extreme stock price reaction around the decision), this market value loss is substantial, also from the perspective of an individual firm.

What explains the loss in market value? The first component suggested by Bosch and Eckard (1991) consists of direct legal costs and fines imposed by the Commission. Like Bosch and Eckard (1991), we argue that direct legal costs are unlikely to be able to explain a significant fraction of the total market value loss for the average firm. Bosch and Eckard's (1991) assumption that lawyer

costs are negligible may not hold for the larger cases in our sample, but even if we use lawyer cost estimates of €5 or €10 million on average per firm, we are left with a large unexplained value loss. For the 222 firms in our decision sample for which we are able to compute the lost market value, the total fines imposed in the decision amount to €3.9 billion, or €17.7 million per company. Out of a total value loss of €24.4 billion, the fine can thus explain only 16% of the stock market response. This finding is in line with [Bosch and Eckard \(1991\)](#), who find that 13% of the average value loss of 127 firms involved in 57 US federal price fixing indictments can be attributed to legal costs.

If we use estimated average legal costs of €10 million per firm, this leaves around 75% of the lost market value unexplained. The stock market thus anticipates that the antitrust conviction results in a significant loss of future profitability for the firms involved. [Bosch and Eckard \(1991\)](#) argue that this loss in expected profitability can be due to two reasons: the loss of profits due to the termination of the profitable anticompetitive conduct and the loss of profits due to reputational damages. The results of our cross-sectional analysis of the abnormal returns around the decision date (see Panel B of [Table 4](#)) provide some evidence that the relative size of the market on which the anticompetitive conduct took place and the duration of the infringement (proxies for the importance of the profits generated by the anticompetitive conduct) and media coverage (a proxy for reputation effects) matter. Unfortunately, we are not able to quantify the fraction of the value loss that can be attributed to each of these components Eckhardt.

6. Conclusions and policy implications

We show that European antitrust policy has a significant impact on the market value of the prosecuted firms, which is in line with the prior literature that almost exclusively analyzes the US system. We perform an event study for a sample of 253 companies involved in 118 European antitrust cases over the period 1974–2004. Average abnormal stock returns are close to –5% around the dawn raid and –2% around the final decision. Around a successful appeal, we observe average abnormal returns of 2–4%. The combined stock price reaction around the raid and the decision represents a €24 billion decrease in the aggregate market value of the companies involved. Our estimates of the impact of European antitrust policy are conservative, as the effects are stronger over longer event windows and as the sample also includes firms that derived only a small fraction of their total sales from the market on which the misconduct took place.

Part of the total stock market value lost as a result of European antitrust action can be attributed to legal costs. The fines imposed by the European Commission represent 16% of the total value lost. Hence, the majority of the stock price reaction is the result of reputational damage and, probably most importantly, anticipated decreases in future profitability due to the termination of the collusion. The stock market thus assesses the anticompetitive conduct identified by the Commission to be profitable for the average firm. The assessment that anticompetitive conduct is profitable is consistent with the considerable number of firms involved in anticompetitive conduct as well as the large fraction of repeat offenders. For cartel cases, these findings could be interpreted as indirect evidence that the stock market expects product prices to decrease after the Commission infringement decision.

Our results suggest that the magnitude of the fine is small relative to the assessed value of the misconduct and thus the direct deterrence effect of European antitrust penalties may be limited. That might be different from the US situation, where public sanctions are usually accompanied private litigation damages constituting three times the amount of economic harm. However, our

findings also indicate that the stock market expects the antitrust action to reduce future profitability. Consequently, consumer welfare is likely to be enhanced by the Commission's actions to break up profitable collusion. In addition, the stock market response to antitrust decisions may be an important indirect deterrent to anticompetitive conduct

Controlling for country and industry effects, the magnitude of the fine, and the relative size of the market on which the anticompetitive conduct took place, the strongest predictors of the severity of the stock price reaction are the size of the firm and the newspaper coverage. [Bos and Schinkel \(2006\)](#) argued that the fining guidelines in the EC result in relatively greater punishments for smaller firms. We find that, independent of the fine, smaller firms also suffer larger market value losses as a result of the antitrust investigation by the European Commission. As the impact of small firms on societal welfare is likely to be limited, it seems worthwhile to reconsider the rationale for this “double punishment” of small firms. Besides a size effect, we show that firms with greater newspaper coverage of the case, and firms with a greater duration of the infringement experience more negative stock price reactions. We find no evidence that European antitrust policy favors European firms. In fact, firms from France (around the dawn raid) and Germany (around the decision) exhibit significantly more negative stock price reactions than other firms. Both countries have a long history of systematic antitrust enforcement. In general, firms from countries with a long antitrust enforcement history seem to suffer more from European antitrust decisions.

Our analysis also has policy implications for the 1996 Leniency Notice. Some scholars argue that the leniency program only attracts cartels that are near to death (e.g., [Stephan, 2008](#)). We find no significant difference in the event returns for cases under the leniency program compared to the other cases. The leniency program thus seems to attract cartels which are perceived to be profitable, since we observe a similarly negative stock price reaction for the companies involved in cases based on leniency application. It would be interesting to test whether the same effect concerning leniency cases in the US as well.

We provide some tentative evidence that suggests that in several cases information about a potential investigation by the Commission was incorporated into stock prices before the raid, especially when a leniency application was filed or a Statement of Objections or request for information was sent in advance informing the firms about an investigation before the raid. This anecdotal evidence hints at the possibility of making trading profits based on the advance knowledge of a raid. Possible policy implications include monitoring insider trading by companies under investigation.

Comparing our findings to prior US studies, we introduce more explanatory as well as control variables and do not limit our analysis to one specific type of anticompetitive conduct. When analyzing the dawn raid, we encounter some evidence that might be considered with insider trading. This issue has not been discussed in the (US) literature so far, but seems worthy of further investigation. We would also be interested in more work on the impact of reputation, in particular in US studies.

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Table A1
Variable definitions and data sources.

Variable	Description	Source
Horizontal/Vertical/Dominance	Indicator variable that assumes the value one for companies involved in, respectively, a horizontal conduct case (Article 81), a vertical conduct case (Article 81), or an abuse of dominance case (Article 82) and zero otherwise. If a company was involved in a case that involved not only horizontal conduct, vertical conduct or abuse of dominance, but also one or more other conducts, this variable assumes a value of one over the total number of types of conduct involved.	Carree et al. (2010)
Joint venture	Indicator variable that assumes the value one for companies involved in a joint venture case (Article 81) and zero otherwise.	Carree et al. (2010)
Licensing	Indicator variable that assumes the value one for companies involved in a licensing case (Article 81) and zero otherwise.	Carree et al. (2010)
Market capitalization	Stock market capitalization of the firm on the decision date (expressed in €m.).	Datastream
Fine Fine revision	Final fine given to the company by the European Commission (expressed in €m.). Fine revision is the difference between the original fine and the fine established at the appeal (as a fraction of the original fine; a greater number means a larger fine reduction).	Official EC decision documents
Relative sales	The fraction of the total sales of a company that was derived from the market on which the anticompetitive practice allegedly took place (expressed in %). We note that this variable is only available for a subset of the total sample mainly comprising cartel cases from the manufacturing sector.	Official EC decision documents
Duration of infringement	Number of months from the start of the anticompetitive practice to the end date, as established in the official EC decision documents.	Carree et al. (2010)
Appeal	Indicator variable that assumes the value one for companies that filed an appeal with the European Court of Justice and zero otherwise.	Carree et al. (2010)
Leniency	Indicator variable that assumes the value one for companies that applied for leniency through the 1996 Leniency Notice and zero otherwise.	Carree et al. (2010)
Repeat offender	Indicator variable that assumes the value one for companies that were involved in more than one case and zero otherwise in the entire EU antitrust history.	Carree et al. (2010)
Newspaper count	Number of newspaper cites of the antitrust case for each involved firm in over 100 international newspapers in the window (−25, +25) around the raid, decision, and appeal dates.	Factiva

Appendix A. APPENDIX

Table A1

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