The Reputational Penalties to Firms in Antitrust Investigations

Stijn van den Broek[*],
Ron Kemp[*],
Willem F.C. Verschoor,[**]
Anne-Claire de Vries[*]

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Abstract

We examines the legal penalties imposed on Dutch listed firms targeted by competition authorities from 1998-2008. By using event study techniques we estimate the impact of the main events in an antitrust investigation on a firm's stock market value and analyse the causes of the value impacts. The first announcement of an antitrust investigation has a statistically significant effect on the firm's share price, with a cumulative abnormal return being approximately -2.3%. This corresponds to a total value loss of €4.3 billion. Overall, the fines imposed by the legal system attribute only 12% of this total value loss. Another 40% of the total value loss is explained by the lost conspiracy-generated profits. We find that the residual 48% of the total value loss is explained by reputation loss. Thus, cartel offenders are disciplined largely through market-induced reputational penalties, not through legal penalties.

Keywords: Firm value, legal penalties, reputational loss, antitrust investigations.

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[*] The Netherlands Competition Authority
[**] Erasmus School of Economics, Erasmus University Rotterdam

Corresponding address: Erasmus School of Economics, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR Rotterdam The Netherlands. E: verschoor@ese.eur.nl (W.F.C. Verschoor) T: +31 10 408 2248 F: +31 10 408 9165.

Introduction

Effective market competition and its accompanying antitrust laws imposed by competition regulators are fundamental in market economies, as they prevents firms from distorting competition in a way that is detrimental to economic efficiency. To deter firms from engaging in cartels and other anti-competitive behaviour, the competition authorities can impose legal and regulatory penalties on firms which are caught infringing on competition law. The existence and size of any kind of penalty is important for public policy. Optimal penalty policy requires that the fines, or more general the costs that firms incur when found guilty of antitrust infringement, are large enough to make the infringement unprofitable. Many experts therefore recommend the financial sanction should even exceed the expected benefit from the illegal activity to compensate for imperfect detection and prosecution (OECD, 2002). Sanctions also have the related purpose of providing an incentive to cartel participants to deviate from the cartel and provide information to competition authorities to benefit from leniency.

In an optimal framework, the total penalty consists of explicit legal sanctions imposed through regulatory, civil, and criminal proceedings, plus market-imposed sanctions or "reputational penalties". It is however argued that the current maximum on fines[1] might not be sufficient to accommodate fines that are high enough for deterrence and co-operation incentives. Available data from an OECD survey indicates that sanctions have not yet reached the optimal level; larger sanctions are required to make infringements unprofitable and thus to achieve effective deterrence. However, when examining this optimal level, previous studies solely take the legal and regulatory penalties into account instead of looking at the total losses borne by the firm and its shareholders. Firms might not only incur sanctions imposed by the regulator, but also sanctions imposed by the market since customers, suppliers and stakeholders will change the terms of trade on which they do business with the firm when the illegal activity is exposed. Thus reputational sanctions should also be taken into account when deterrence is examined. For instance, Karpoff et al., 2008 show that the reputation loss for firms guilty of financial misrepresentation in the US exceeds the penalties imposed through the legal and regulatory system by over 7.5 times.

[1] In the European Union, competition law violators are not subject to criminal penalties but firms can in principle be given fines up to 10% of the firm's total yearly turnover.

The existence of reputation damage for firms caught infringing on competition law, has implications for business as well as for public policy. First of all, it will impact the decision making of firms considering a cartel or other abusive practises. Following the economic theory of Nobel price winner Gary Becker, the decision to form or join a cartel is primarily a financial one. If criminals are rational, the way to prevent crime is to make the crime unprofitable. Friedman (1995), following the theory of Becker, states "If the benefits of a profession decrease or its costs increase, fewer people will enter it - whether the profession is plumbing or burglary. If it becomes sufficiently unprofitable, nobody will do it." Hence, showing the existence of reputation damage contributes to deterrence since it raises the height of the expected costs of an indictment and thus contributes in making the infringement unprofitable. Furthermore, the existence of reputation damage has policy implications for competition authorities, since it lowers the optimal height of the fines, because firms are partially disciplined by the market.

There is, however, little evidence on the reputational penalties meted out for price-fixing in the EU. Studies that ventured to address this field suggest that value impacts are all attributable to fines and lost monopoly profits. However, this has never been examined empirically and the outcomes have never been conclusive. This paper seeks to fill this gap by measuring the losses borne by shareholders of firms which have infringed European competition law. To the best of our knowledge, this paper provides the first large-sample estimates of the share value impact on firms for price-fixing violations. We extend the analysis of Karpoff et al., (2008) to measure reputation loss into the field of antitrust investigations. Our research approach is twofold. First, we estimate the impact of the main events in an antitrust investigation on a firm's stock market value using the market model. Then, more importantly, we use these results to investigate the attribution of the reputation damage to the possible total value losses and analyse the causes of observed value impacts. We unveil a dataset of penalties imposed on Dutch listed firms that were subject to an investigation of the NMa or the European Commission because of anticompetitive behaviour in the Dutch market.

Using data from 66 antitrust investigations by publicly and non-publicly traded companies for 1998-2008, we find that the largest penalties are not imposed by the competition authority but rather by the market. On average, firms lose 2.3% of their market values when an antitrust investigation is exposed. This amounts to a total value

loss of 4.3 billion euro. We estimate that 12 % of these losses reflect the expectation of fines imposed by the NMa or the European Commission. Another 40% reflects the market adjusting to the value the firms would have obtained had it not been cartelising its products. We find that the residual 48% of the total value loss is explained by reputation loss. Thus, reputational penalties and not legal penalties are the primary deterrents to antitrust investigations.

This paper is organized as follows. Section 1 reviews previous research investigating the effect imposed on firms that violate antitrust laws. Section 2 presents some theoretical background on Competition Law and fining policy. Section 3 addresses theoretical considerations on *why* and *how* the announcement of an antitrust investigation triggers stock price reactions and thus impacts firm value. Section 4 expounds the methodology used for our empirical research. Section 5 present the empirical results and section 6 concludes.

1. Empirical evidence on selected studies

The last two decades have seen the emergence of a number of studies attempted to measure the effect of an illegal activity on a firm's share price. Interestingly, only a few studies have examined the market value losses imposed on companies that violate antitrust laws. Table 1 provides a brief overview of relevant studies that examine the impact of the main events in an antitrust investigation on a firm's stock price.

Insert Table 1

Table 1 indicates that misbehaviour of firms cause negative value impacts on the stock price of these firms, whether the misbehaviour is in the field of antitrust or financial misrepresentation. However, differences are found in the magnitude of the abnormal returns. From Table 1 it is clear that financial misrepresentation, examined by Karpoff et al. (2008), impacts stock value negatively with a mean cumulative abnormal return of

38,06%, while anticompetitive behaviour only gives negative cumulative abnormal returns between 1.08 % and 3.41%. An other difference is found in the causes of the share value impacts. In Table 1, only financial misrepresentation is reported to cause reputation damages. Karpoff et al. (2008) imply that the largest monetary penalties are imposed by the market. Their estimate of the reputational penalty - which they define as the expected loss in present value of future cash flows due to lower sales and higher contracting and financing costs- is over 7.5 times the sum of all penalties imposed through the legal and regulatory system. This suggests that reputation losses constitute substantial penalties for cooking the books. Obviously, the period under investigation in which a wave of scandals like Enron erupted, has a huge effect on the magnitude of the market movements as a result of a loss in trust in the companies involved.

In contrast, the value loss of firms guilty of anticompetitive behaviour is said to be caused solely by legal costs and lost monopoly profits. Bosch & Eckard (1991) suggest that the major part of the residual is expected loss of conspiracy-generated profits, rather than reputation damage. They point out that price fixing is a profitable deal because the profits from price fixing exceed expected fines, implying that the deterrence effect of antitrust enforcement actions is small. However, these results have no empirical ground and are non conclusive. Langus & Motta (2007) and Detre et al., (2005) do not further analyse possible causes of the implied negative value impact, although the former suggests that the residual loss results predominantly from lost monopoly profits.

Inevitably, the examination of different events and different samples leads to significant discrepancies in empirical results. It could very well be the case that the event 'anticompetitive behaviour' is perceived as less serious in scope, or that it leaves investors less uncertain about future repercussions. Shareholders do not expect that the market, in contrast to financial misrepresentation, will punish and/or change the terms of trade with firms when an anticompetitive infringement is exposed. Moreover, Bosch & Eckard (1991) use a data sample from 1962-80. During this time period competition policy was not yet that familiar. Throughout the years the attention paid to antitrust infringements has grown enormously and competition law has gone through a lot of developments. One of them is that now not only firms can get fined, but also individuals (natural persons). If managers can be held personally liable, then

indictments might affect market expectations regarding firm operating efficiency. It could lead to the removal of managers and could affect employee morale. In addition, we find the conclusion that major part of the residual is expected to be lost monopoly profits from the conspiracy remarkable. According to a calculation we made based on the data of this survey[2] it seems that, if the residual is all attributable to lost conspiracy profits, fines are not nearly in proportion to the extra profits won by the firms. We calculate, making some assumptions on the way, that the market had expected the total annual gross profits of the cartelists to decrease by 270 mln dollar. If this decrease is completely attributable to the lost conspiracy profits, then the cartelists had been making that 270 mln extra profit per year until they were exposed. Studies into cartels estimate that the average length of a cartel's operation is 6 years. Then on average the total extra conspiracy profits would be 1.62 bln dollar, 5.6 times the total of the fines. If this calculation is correct, the fines imposed by competition authorities have little deterrence effect. While according to the NMa fining-code, a fine must be of a deterring nature. So either the fines were to low, or the residual loss is not just attributable to lost monopoly profits of the conspiracy.

This latter point is also supported by the following observation. Detre et al. (2005) noticed that in many price fixing cases from the research of Bosch & Eckard (1991) the conspiracies had been dissolved a long time before the first announcement of the investigation or an indictment had been issued. If a conspiracy was dissolved a long time prior to the announcement and this is made explicit in the announcement, than there should be no value losses due to the expected lost monopoly profits.

2. Competition law in the Netherlands

Until the late nineties the Netherlands had a reputation of being a 'cartel paradise', caused by a lack of a national cartel office to investigate and prosecute the creation of cartels. In January 1998, the Dutch Competition Act came into force and the

[2] Figures from Bosch & Eckard: Total value loss: $ 2.18 bln. Total PV fines: $287.4 mln (13%). Residual loss: $1.89 bln. Assumption: Price/Earnings-ratio =10. Formula: NPV= PE * annual net profit. The NPV has decreased with 1.89 bln dollar. Thus the expected decrease in annual net profits is 1.89 bln/10 = 189 mln dollar. This will be approximately an annual decrease of (189 mln/0.7) 270 mln in gross profits. If the assumption is correct, that this annual decrease in gross profits is totally attributable to lost conspiracy profits, then the cartelists have earned in total extra conspiracy profits of 270 mln dollar per year. Studies into cartels estimate that the average length of a cartel's operation is 6 years. This means that on average the cartelists have earned 1.62 bln dollar in total. (This will probably be even more, because not all cartels have been caught.) The total fines for these cartelists, however, were 287.4 mln dollar in total.

Netherlands Competition Authority (NMa) started its operations. The Dutch Competition Act provides a legislative basis for competition policy. The main objectives are i) to enforce fair competition in all sectors of the Dutch economy, ii) to take action against parties who participate in a cartel or who abuse a dominant position and iii) to assess mergers and acquisitions. The act is based on and is essentially the same legislation as European Competition Law.

The most familiar and harmful form of anticompetitive behaviour are cartels. The purpose of a cartel is to increase the individual member's profits by removing or reducing competition. This is done by agreeing on, among others things, price-fixing, market shares, total industry output, allocation of territories and bid rigging. Cartels directly affect consumers, the purchasers of the goods and services, because cartels cause consumers to purchase less or pay more for the cartelised product. It is not just consumers who are offended by cartels. Cartels bring damage to the economy as a whole. By removing competition, they also remove the incentives for firms to operate efficiently and to innovate. This diminishes the quality of products and services and slows down economic growth. It is undisputed that the harm from cartels is large. Detecting and taking enforcement action against the firms involved in cartels should therefore be one of the main enforcement priorities of a competition authority. Any firm found to have engaged in cartel activity should face a substantial high financial penalty. Before fines can be imposed, there must be a thoroughly investigation into the possible cartel and its members.

2.1. The investigation procedure

The NMa as well as the Commission begins its investigation either on basis of a complaint from a third party or at its own initiative. There is (generally) no announcement that an investigation had started. During the investigation information is gathered. If there are serious suspicions that there has been an antitrust infringement the NMa/Commission can carry out a surprise inspection, also called a dawn raid, to gather documentary evidence. Listed firms have the legal obligation by security law to release a press statement about the raid, since this information is liable to considerable price fluctuations. If after the investigation period there still are reasonable suspicions that competition law has been violated, the NMa/ Commission makes a report or Statement

of Objections. The report is sent to the firms under investigation and they get the opportunity to react. After that the NMa/Commission will make a decision. Three main events in the investigation procedure are identified above: i) the Dawn raid, ii) the Statement of Objections and iii) the Decision. These events are analysed to investigate the effect of the antitrust investigation on the firm's share price.

However our sample consists of many infringements coming from a widespread fraud in the construction sector, also known as 'The Construction Case'. The main events in these cases are different from the ones mentioned above. Therefore we will also quickly expound the main events in the construction case. In November 2001 a Dutch television news programme 'Zembla' revealed the existence of secret financial accounts at a major construction company. The focus of the television documentary was the testimonial of a whistleblower which highlighted illicit practices in the Dutch Construction Industry and stirred up a series of formal investigations. In the following year, the proceedings of the Parliamentary Committee of Inquiry into the Construction Industry and resulting Report established the wide ranging impact of the affair. In search of evidence, the NMa undertook a series of dawn raids on company premises. While sanction procedures were still being finalised in the course of 2003, the NMa started investigations into new cartel offences. A second round of cartel cases soon followed, implicating various sectors within the Construction Industry. The difference with 'normal' cases is that instead of the dawn raid, the Zembla broadcast is the first main event for investors. Also in contrast with 'normal' cartel cases is that a lot of information about the cartels and the firms is already exposed to the market before the NMa had even started its investigation. In our research we therefore treat the cases coming from the construction case differently.

2.2. Fining code

The Competition Act empowers the NMa to impose fines for infringements of this Act. According to the NMa Fining Code 2007:

"The objective of a fine is both special and general prevention. To this end, a fine must be set at such a level that it is likely to deter the offender from committing another infringement (special prevention) besides deterring other potential offenders (general prevention)."

Concerning the height of the fines the fining code declares the following:
"For infringements of sections 6 and 24 of the Competition Act and Articles 81 and 82 EC Treaty, the starting point of the fine is derived from the relevant turnover. In general, the higher the relevant turnover, the greater the economic impact of the infringement can be, including the potential gains to be made by the offending party or offending parties. The starting point will therefore be adjusted for the duration and size of the economic activities involved in the infringement, as well as the intended (potential) economic impact of the infringement."
Since October 2007, the NMa cannot only impose fines on undertakings but also on natural persons for giving instructions or exercising de facto leadership with regard to an infringement of the Competition Act.

Sanctions have another related purpose, that of providing an incentive to cartel participants to deviate from the cartel and provide information to the NMa to benefit from leniency (OECD). The undertaking or natural person, which, on its own initiative, informs the NMa of the existence of a cartel in which it is involved, and delivers the necessary evidence before the NMa begins its investigation, can apply for leniency (Leniency code).

3. Stock price reaction to an antitrust investigation

In this paper, we use the event study methodology to investigate the effect of the antitrust investigation on a firm's share price. Although the efficient market hypothesis (EMH) is often disputed, it is still used as central concept in the event study methodology. Under the EMH, if an exact time in which news becomes available to the market as well as the stock prices that would have occurred in the absence of this news is known, we could compute the value that that news brings along. The announcement that a firm is subject to an antitrust investigation reveals new (negative) information to the market. The market will form expectations of the probability of a case being fined and of the likely profit loss firms might incur. This change of information has, under the EMH, an immediate negative effect on the value of the stock of the firm that is target of the investigation. The magnitude of this negative effect on the stock value of a firm depends on the magnitude of the unexpected component of the event.

We analyze the effect of three main events in the investigation procedure identified above. Every event in our sample has an exact date on which they occur. The dawn raid, or surprise inspection, is the first signal to the market that an antitrust investigation has started, given that our sample only consists of listed firms whom are obliged to release a press statement about the raid. Because this event is very unexpected, the dawn raid-event is therefore expected to have the most impact on the stock value. When there is no dawn raid during the investigation process, or the dawn raid keeps investors to much in uncertainty whether there will be an indictment or not, then the release of the 'Report' will be the first or better signal to the market that there is a serious suspicion of an antitrust infringement. Consequently, that will be the moment that the market will adjust its expectations of future profit streams, resulting in a negative effect on stock prices.

The 'Decision' is the final peace of information for the capital market. However, decisions will probably not cause a significant decline in stock prices. Prior to the decision the market has already set some expectations concerning the decision and its outcome. So, under the EMH, the investors have already incorporated the expected set back in the profit stream at the moment of the fist announcement of a serious suspicion and have it already (partially) reflected in the price of the relevant stocks. The only case under which there will be a negative effect on the value of the stock is when the market has a too positive expectation of the outcome of the decision. However, prior to the decision, leaks about and speculations on the content of the decision and the level of the fines are common.

In the Construction Case, the broadcast was the first, and very unexpected, piece of information of antitrust infringements in the construction industry. This is the first moment investors adjust there expectations on future profit streams. During the year of 2002, it became clear how widespread the price fixing infringements were. The first dawn raids gave a signal how serious the fraud had been taken and that there were serious suspicions of antitrust infringements by the NMa. Thus the dawn raid gave additional information to the investors and is the second moment at which the capital market have adjusted expectations. But both event dates only revealed information of fraud in the construction industry in general. Very specific information on particular cartel cases and companies, however, had not yet been given. The issue date of the

Statements of Objections was the first moment that specific information concerning the cartels, firms, heights of fines etc. were revealed. This is the moment the capital market could form actual expectations on the outcome of the decision and on the decrease of future profit streams.

For the cartels in the construction case three moments are investigated as event dates of first announcement: (i) the Zembla broadcast, ii) the first dawn raids, and iii) the issue of the Statement of Objection. Next the Decisions are investigated. As explained above the market had already been aware that massive investigations had been going on since the dawn raid or at least since the issue of the Statement of Objections. Under the EMH this information should already have been incorporated in the share price so we do not expect a large systematic decrease in the value of the firm at the publication of the Decision.

The above explains *why* an antitrust investigation can impact stock prices, namely because it reveals negative information to the capital market about future profit stream of the targeted firm. The next question is: *how* do antitrust infringements impact firm value. A negative market reaction to the announcement of an indictment can have several sources. In the case of financial misrepresentation, Karpoff et al. (2008) identify three effects that attribute to the total loss in share value when an indictment is exposed: i) the Fine effect, ii) the Readjustment effect and iii) Reputational losses. Below we discuss whether these components are also relevant for our analyses on antitrust infringements.

The first effect identified is the Fine-effect. According to Karpoff *et al*. (2008) share values can decrease as investors anticipate that a targeted firm will receive certain sanctions like; fines, damage suits, class settlements, litigation costs etc. Announcements of antitrust investigations are only issued when there is a serious suspicion. A dawn raid or a Statement of Objection is usually followed by a fine. Thus when the market gets acquainted of a serious suspicion of an antitrust infringement, it will anticipate that the targeted firm will receive sanctions. The expectation of these sanctions decrease the present value of future profit streams and should thus have a negative effect on the value of a firm.

A second possible component is the Readjustment effect. Karpoff et al. (2008) describe this as: "*the portion of the observed loss in share values that reflects an*

adjustment to the value the firm would have had if its financial statements had never been cooked." We can also apply this effect in case of antitrust infringements. Of course a cartel is not known by the market[3]. The discovery of an antitrust infringement informs investors that the profit stream of the involved firm was inflated with cartel profits. Since an investigation has started, the probability is high that the cartel will be shut down and thus will no longer receive the extra cartel-margin on their revenues. Hence, the announcement of an infringement reveals that a portion of the firm's expected profit stream is lost. The market then makes an estimate of the present value of this lost (illegal) profit stream (Bosch & Eckard, 1991) and this will reflect in a negative effect on firm value. Even in absence of legal penalties, the share values should decrease as this cartel mark-up is corrected for. Following Bosch & Eckard (1991), we will define the readjustment effect as 'the loss of conspiracy-generated profits'. It requires comparison of the actual market situation under the cartel to that which would exist in a hypothetical competitive market.

In addition to the legal penalties and the readjustment effect, there are more sources of the negative stock price reaction. These additional effects can be captured in reputation damages and is what Karpoff et al. (2008) define as: "*the decrease in present value of the firm's cash flows as investors, customers, and suppliers are expected to change the terms of trade with which they do business with the firm.*" Reputation loss is imposed by counterparties that stop doing business or change their way of doing business with the targeted firm. Why would the market expect counterparties to change the way they do business with a firm that is under target of the NMa or Commission?

First of all, it could signal the market that the firm has a tendency for dishonesty (Bosch and Eckard, 1991). As a result, suppliers might become mistrustful. They might adjust their risk profile, thereby increasing future transaction costs and perhaps causing marginal customers and suppliers to take their business elsewhere. Also, financing costs imposed by banks or other moneylenders could rise in expectation of a higher risk profile because of the expectation of a lower solvability due to huge fines they could incur in the future and because of a lower profitability.

[3] This is a very clear assumption. If the market was informed about the cartel, it would immediately be shut down and prosecuted, since a cartel is illegal.

Another source of negative stock price reaction, is that investors might think that future revenues will decrease because of a drop in brand value. Usually, the victims of price-fixing conspiracies are the customers. During the active period of the cartel they paid too much money for their purchases and/or received too poor quality. The possibility that the customers feel duped and will switch to a competitor whom they do still trust is quite big. This will cause a decline in future revenues and profits. For example, in the construction case the government applied a 'black list' for firms that infringed on the law. These firms were shut out (once or for a determined period) of bidding on government projects. These projects are a great part of revenue for most construction companies. Being shut out from bidding could be very costly.

Further, Bosch & Eckard (1991) sum up a few more negative market signal effects as reaction on the announcement of an antitrust indictment. One negative market signal is that the indicted firm might be engaging in other as yet unknown illegal activity (including non-antitrust related activity) which could lead to future prosecution and associated costs. Also, Bosch & Eckard (1991) argue that the discovery of antitrust infringements might effect market perceptions regarding firm operating efficiency. Natural persons can be held liable for the indictment which could lead to removal of key management. Further, employees might no longer want to work for a fraudulent firm or adversely affected employee morale could reduce firm efficiency.

In a nutshell, an antitrust infringement may be interpreted as a sign that the firm might be engaged in other illegal activities, or might affect market expectations regarding suppliers increasing future transaction costs or taking business elsewhere, higher financing costs, drop in brand value, lower future revenues and a decrease in operating efficiency. These signs should result in investors adjusting their expectations on future profit streams and should therefore lead to negative changes in the value of the firm. It follows, just as for financial misrepresentation, that a third component of the negative stock price reaction to an antitrust investigation is the present value of these reputation damages.

4. Empirical methodology

Our research approach is twofold. First the impact of the main events in an antitrust investigation on the firm's stock market value is estimated, using standard event study

methodology. Secondly, these results will be used to analyse the causes of observed value impacts.

4.1. Sample description

Our sample consists of all decisions of the NMa concerning cartels and abuse of dominant positions (either article 6 Mw or 24 Mw) resulting in a fine during the 10 year period from 1998 to 2008. We also include all decisions of the Commission concerning Dutch cartels resulting in a fine during the same time period. Table A1 in the Appendix lists the firms in our sample, the sector the firms are active in, the height of the fines as well as the dates of the relevant events. Construction firms comprise 75% of the sample. An additional 14% are in the financial industry, the remaining are in wholesale, telecommunication and beverages. The reason to include Commission decisions is that we are doing research on how the Dutch market disciplines Dutch cartels. Thus to complete the dataset we include all cartels concerning the Dutch market. The reason for taking the time period 1998 until 2008 is that the NMa is established in 1998, so we include all the decisions of the NMa. From all the decisions gathered we will retain only those involving firms that are publicity traded or are a subsidiary of a publicity traded firm. The data is provided by the NMa or derived from Commission Decisions, published on the official website of the Commission.

Our final sample refers to 26 decisions of the NMa involving 11 listed firms and 2 Commission decisions involving 5 listed Dutch firms. A lot of firms were involved in more than one infringement. We have exact event dates of decisions and data on the share prices at the time of the decision for 30 infringements and we have 33 exact event dates of first announcements of the antitrust investigation. This provides us a total sample of 63 event dates. We have to point out that most of the cases of the NMa involve firms that are small and not listed. The firms in our sample are all quoted on the Euronext of Amsterdam, either on the AEX, the AMX or AScX[4]. The historical data of all share prices as well as all other stock-, index- and firm information are derived from DataStream and Bloomberg. For the statistical computations we made use of the software package SPSS and Excel.

[4] The Amsterdam Exchange Index, the Amsterdam Midcap Index and the Amsterdam Small cap index respectively.

4.1.1. Event study methodology

To measure stock market reactions to the main events identified above, we follow the methodology proposed by Bosch & Eckard (1991) as well as the methodology proposed by Langus & Motta (2007), who use Campbell et al. (1997) and MacKinlay (1997) as main references for the event study methodology.

The effects of an event on stock prices can be captured by Abnormal Returns (AR) and Cumulative Abnormal Returns (CAR). The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window. The normal return is defined as the return that would have prevailed if the event did not take place, so we strive to eliminate influences on the stock value that are not related to the event from the gross change in stock price. The most important influences on the value of the stock are those which affect the entire market. To eliminate the effect of simultaneous movements of the market as a whole, the market model is used. The market model is a statistical model which relates the return of any given security to the return of the market portfolio:

$$ARit = Rit - (\alpha + \beta * Rmt) \tag{1}$$

where $ARit, Rit$ and Rmt are the Abnormal-, Actual- and Market- Return for security i for event day t respectively. We use the AEX, AMX and AScX returns as proxies for the market return. The coefficients α and β are the Ordinary Least Square (OLS) estimates of the intercept and the slope of the market model regression[5]. The returns are computed as:

$$R = LN(\frac{Pt}{Pt-1}) \tag{2}$$

where Pt is the price of the share or index on trading day t. The time line of the event is described in figure 1.

[5] In order to evaluate the statistical properties of the abnormal returns we make some assumptions about the distribution of the returns. The standard assumption made here is that the returns are serially independent and normally distributed.

Insert Figure 1

The event date is set as the day that the information reaches the capital market. This is the day of the press release of the Dawn raid, Statement of Objections or the Decision rather than the day that the Dawn raid was actually carried out or that the Decision was taken. The event occurs at date t_0. The parameters α and β of the predicative model are estimated in the estimation period. Following Bosch & Eckard (1991) we set the estimation window from To (t = -171) to T1 (t = -22) relative to the announcement date t = 0, taking 150 trading days. Once the parameters are estimated, the abnormal returns are calculated during the event window. The period from T2 to T3 form the event window which is defined as: "*the entire length of time over which one may look for a stock price reaction to what the analyst has identified as news"*. It is typical for the estimation window and the event window not to overlap. This design provides estimators for the parameters of the normal return model which are not influenced by the returns around the event (Mackinlay, 1997). To measure the economic impact of a specific event we should observe security prices over a relatively short period around the day that the information about the event gets out in the market, but it is usual to set the event window length to be larger than one day in order to capture possible effects of insider knowledge or a lagging market reaction. Following Langus and Motta (2007) as well as Bosch and Eckard (1991) we take an event window of 11 trading days, 5 days prior to the event and 5 days after the event date.

To calculate the Abnormal Returns we use the statistical software package SPSS. It provides a programme by which the whole event estimation can be run in one step by doing regression (1) over the combined sample of the estimation window and event window. Following the methodology proposed by Pynnönen (2005), we implement dummy variables into the regression, one for each day within the event window. The regression model becomes:

$$Rit = \alpha + \beta * Rmt + \sum_{a=1}^{A} \gamma aDa \tag{3}$$

where Da represents one or more dummy variables for each event day in the event window and the γ estimates represent the abnormal return earned during the specific event period. The results are exactly the same as when first running the regression over the estimation period to find the parameters and then using these to find abnormal returns in the event period.

The null hypothesis to be tested in the event study is that the mean abnormal return is equal to zero, or no-event-effect. It concerns the average effect of an event to shareholders. To draw general inferences about the event effects the abnormal returns should be aggregated. This can be done along two dimensions – through time and across securities. We first aggregate abnormal returns across securities. This means aggregation of the daily abnormal returns from all securities in the sample on day t, to obtain daily average excess returns:

$$\overline{ARt} = \frac{1}{N} \sum_{i=1}^{N} ARit \tag{4}$$

where $ARit$ is the abnormal return on day t for firm i and N is the number of observations in the sample. Under the null hypothesis of no event effect, the mean is equal to zero. Following Brown & Warner (1985) the t-statistic used to determine the statistical significance of the average abnormal return on day t is the ratio of the average abnormal return on day t to its estimated standard deviation. The standard deviation is estimated from the time-series of average excess returns. The test statistic for any event day t is:

$$t, statistic = \overline{ARt} / \hat{S}(\overline{ARt}) \tag{5}$$

where:

$$\hat{S}(\overline{ARt}) = \sqrt{\sum_{t=d1}^{d2} (\overline{ERt} - \overline{\overline{ER}})^2 \Big/ (d2 - d1)} \tag{6}$$

$$\overline{\overline{ER}} = \sum_{t=d1}^{d2} \overline{ERt} \Big/ (d2 - d1 + 1) \tag{7}$$

where $\overline{ERt}$ are the excess returns on the days within the estimation period. The variables $d1$ and $d2$ are the beginning and end days of the estimation period, thus -22 and -171.

Next we aggregate over time. This means aggregation of the average abnormal returns over the days of the event window. Cumulating over time is necessary to construct an event window. Since news about the investigation of the NMa or the Commission may leak to the market outside the specific event dates, one could suggest cumulating over the entire period, from the announcement day to the decision. However, the entire period from announcement till decision usually covers a few years. Focusing on identifiable event dates improves the signal-to-noise ratio of the measured abnormal returns. The Cumulative Abnormal Return for the interval $(\tau 1, \tau 2)$ is defined as:

$$CARi(\tau 1, \tau 2) = \sum_{\tau=\tau 1}^{\tau 2} ARi\,\tau \tag{8}$$

Under the null hypothesis of no event effect, this Cumulative Abnormal Return is equal to zero. The test statistic for the interval $(\tau 1, \tau 2)$ is:

$$t, statistic = CARi(\tau 1, \tau 2) \Big/ (\hat{S} * \sqrt{n}) \tag{9}$$

Where n is the number of days over which the average abnormal returns are cumulated.

4.1.2. Robustness check

Following Detre et al. (2005), we use the non-parametric sign test to check whether our results are robust. Under the null hypothesis of no announcement effect, the fraction

of positive abnormal returns is assumed to 50%. This test does not require the assumption of normality of abnormal returns. The test statistic of the binomial distribution is calculated using the following formula:

$$ZQ = (N - np) \Big/ \sqrt{[\mathrm{np}(1 - \mathrm{p})]} \qquad (10)$$

where N represents the number of firms with negative abnormal returns on day t, n is the number of observations in the sample and $p = 0.5$

4.1.3. Sources of bias

One possible source of bias is that the Abnormal Returns solely are corrected for coinciding movements of the market as a whole. It could be possible that on the event dates in our sample multiple announcements were made. The abnormal return we then observe is not linked one-on-one to the announcement of the antitrust investigation. This could impact Abnormal Returns in two directions, depending on whether the other announcement brings positive or negative news about future profit streams. We tried to overcome this bias by searching news paper archives on the event days in our sample. In one case we found that when one antitrust investigation was announced at the same time a merger blow-off was announced too. This case is removed from our sample. Further we could not find any important announcements overlapping the announcements in our sample.

An other bias is that we measure rather conservatively. Since returns are measured solely on specific dates during the enforcement period and those event dates are not always good proxies for the moment the information reaches the market, the estimates will almost certainly understate the total valuation loss for an average firm in the sample, especially in our sample where there are a lot of infringements originating from the Construction Case. This might lead to rejecting the null hypothesis of no effect less often than it should.

For the aggregation of the abnormal returns across securities it is assumed that there is no overlap in the event windows of the included securities, so abnormal returns and the cumulative abnormal returns will be independent across securities. In our sample, however, simultaneous indictments of all firms in a conspiracy occur. This

results in announcement clustering. To overcome these biases we use a Brown and Warner (1985) procedure. Under their approach, the standard deviation of the mean and cumulative mean daily excess returns for the sample are estimated from the time-series of the sample's mean excess returns. This way the test statistic ignores any time-series dependence in abnormal returns.

4.2. Causes of value impacts

The second part of the research investigates the reasons for the shareholders to adjust their expectations on the present value of the future profit streams, with the aim to find and to quantify reputational damages. This part is based on the methodology proposed by Karpoff et al. (2008). As argued earlier on, a negative market reaction to the announcement of the indictment can be attributed to several components: (i) the penalty imposed by the regulator (legal costs), (ii) the loss of expected conspiracy-generated profit stream, and (iii) possible reputation losses. This can be written as:

$$\Delta MV = Fine\ effect + Readjustment\ effect + Reputation\ loss \qquad (11)$$

where ΔMV is the change in total market value of all firms. To quantify this change in total market value, the negative cumulative abnormal returns are converted into Euro losses. This is done by multiplying each individual cumulative abnormal return by the firm's market capitalization two days before the event. Subsequently, the individual euro losses are aggregated over all firms to get a total Euro loss. This can be written as:

$$\Delta MV = \sum_{i=1}^{N} (CARi * MVit - 2) \qquad (12)$$

where N is the number of observations in the sample, $MVi\ t-2$ is firm i's market capitalization on day t-2. Market capitalization is calculated as the product of share price and the number of outstanding shares. Next we split this total loss into the three different components: the fine effect, the readjustment effect and the reputation loss.

4.2.1. The fine effect

Investors can make expectations on fines by following the fining-code of the NMa. Following the rationality assumption, on average the market makes good estimates of fines. Therefore the fine effect can be easily approximated by aggregating all the fines imposed by the NMa and the Commission on the sample firms.

4.2.2. The readjustment effect

The readjustment effect is more difficult to quantify. It is determined as the change in expected future profit streams due to the loss in conspiracy generated-profits. It requires comparison of the actual market situation under the cartel to that which would exist in a hypothetical competitive market. This can be done with help of the relevant cartel revenues and their additional mark-ups:

*Annual Conspiracy-generated Profits = Mark-up * Relevant Annual Turnover* (13)

The relevant cartel revenues of all individual firms in our sample are derived from (confidential) reports and decisions of the NMa and the Commission. Because they are often confidential, they are solely presented on aggregate level. The relevant mark-ups per cartel are usually not known by the NMa or by the Commission. However, a lot of studies have been done to estimate the height of the mark-ups and there are a lot of speculations on how high mark-ups probably have been. For example, in the Construction Case the report of the parliamentary inquiry gave an approximation of the overall mark-up. Although later studies imply that the mark-up probably had been higher, for our study the only figure that counts, is the figure that analysts have used for their calculations on cartel profits. The parliamentary inquiry was executed in the year that all the construction cartels were uncovered. That will be the time that analysts have adjusted their expectations. Therefore we will use this figure (8.8%) to calculate the conspiracy profits. For the Heineken case there have been speculations about a mark-up of 10%. An OECD Cartel report estimates that on average, cartels produce overcharges amounting to 10% of the affected commerce. We will take this 10% to estimate the readjustment effects. After having corrected the annual conspiracy-

generated profits for corporate taxes[6], the price-earnings ratio (P/E) is used to estimate the impact on the market value of the individual firms.

$$P/E = Market\ Value\ per\ Share / Net\ Annual\ Earnings\ per\ Share \quad (14)$$

Most of the time, the P/E is calculated using the Earnings per Share from the last four quarters. By multiplying the Market Value per Share and the Net Earnings per Share with the amount of outstanding shares, one gets:

$$P/E = Market\ Capitalization\ (MV) / Annual\ Net\ Profits\ (ANP) \quad (15)$$

Rewriting this equation gives:

$$\Delta MVit = (P/Eit - 2) * \Delta ANPi \quad (16)$$

where $\Delta MVit$ is the change in the market value of firm i on day t and $P/Eit-2$ is the Price Earnings ratio of firm i two days before the event. $\Delta ANPi$ is the change in annual net profit of firm i due to the lost conspiracy generated profits. For all infringements the readjustment effect is first calculated individually, expect for the Construction Case. Since the P/E is usually based on earnings over the last four quarters, there will only be a readjustment effect if the cartel was still active in the year before the first announcement of the investigation. Otherwise the expectations of the future profits are not bases on cartel generated profits and will not have to be readjusted. The individual cartels within the construction sector where announced a few years after the overall investigation in the construction industry was started. The cartels were assumed to be stopped by then, consequently the profit level of the individual firms should already have been readjusted to the level without cartel generated profits. Thus at the moment that the individual cartels were announced, there should have not been a readjustment effect. However, at the start of the investigation in the construction

[6] In our calculations the Net annual profits should be used. A corporate tax rate of 30 % is assumed.

sector, analysts new that the whole construction industry was under investigation, thus at the moment of announcement they will probably have taken into account that all revenues in sub-sectors of the construction industry would have cartel inflated profits. We will assume that in the period from first announcement in November 2001, until the end of 2002 when the parliamentary inquiry was released, the capital market will have readjusted expectations by decreasing the profit streams with 8.8 % (outcome of parliamentary inquiry). Therefore, all of the concerned revenue from all firms and infringements within the construction case is aggregated and multiplied by the median price earnings ratio over the period November 2001 until December 2002. Subsequently, the readjustment effect from the Construction case is aggregated with the readjustment effects of all other infringements to get a total readjustment effect due to the announcement of an antitrust investigation.

4.2.3. Reputation effect

The reputation effect of an antitrust infringement reflects the investors' expectations of the loss in future profit streams as investors, customers and suppliers are expected to change the terms of trade with which they do business with the firm as reaction to an antitrust infringement. As explained earlier, this effect shows, among others, in higher financing costs, higher transaction costs, lower revenue, drop in brand value and decrease in operating efficiency. The size of this reputation effect is hard to quantify, since the loss is not directly measurable. However, we can approximate the reputation effect by subtracting the amounts that are attributable to the fine effect and the readjustment effect from our estimation of the total loss in market value:

$$Reputation\ Loss = \Delta MVt - (Fine\ effect + Readjustment\ effect) \quad (17)$$

Reputation is a very valuable asset to a firm. It takes time to build up a strong reputation, but can be threatened by one single event. Loss in reputation can be very costly and should therefore be taken into account as well as by firms considering cartels as by policy makers setting penalties.

5. Empirical Results

The abnormal returns occurring on the ten days surrounding the First Announcement and the Decision of the antitrust investigation and on the event date intself, are presented in the tables A.2. and A.3. in the appendix respectively. Also cumulative abnormal returns in an eleven-, a three- and a six- days window are reported. Table 2 summarizes the results when the First Announcement is taken as event. The average abnormal returns, cumulative abnormal returns and test statistics in the [-5,5] day window are presented. Also reported are average cumulative abnormal returns and the corresponding test statistics.

Insert Table 2

For the calculations of these results, KPN is dropped from our sample. As can be seen in Table 2, there was a huge negative market reaction of 36,2% (cumulating the abnormal returns over the [0,2] window) by reaction on the announcement of a dawn raid that had been executed on the premises of KPN. However, this reaction can not be attributed totally to the announcement of the antitrust investigation, because on the exact same time, KPN made an announcement that an expected merger was blown off. It is quite likely that this merger blow-off had more impact on the stock price than the announcement of the dawn raid. Since we cannot separate the reactions of these two announcements we have dropped this case from our sample.

The average abnormal returns on the day of the announcement and the day after are negative and highly statistically significant, suggesting an on average drop in the firm's share price of 0.82% and 0.99% respectively. Similarly, the average negative return of about 0.5% on day $t = 2$ is significant at a 10% level. Aggregating over the entire event window we find a negative cumulative abnormal return of 2%, significant at a 10% level. To maximise the power of the test we take a shorter window of three days [0,2]. For this window, the cumulative abnormal return is -2.3% with a t-statistic of -3.71, which gives a statistical significance at 1%. We also report other sizes of event windows, all have negative abnormal returns and are statistically significance. This

shows that the negative abnormal return is robust to variations in the size of the event window. The results are supported by sign test statistics, implying that the majority of observations are negative. All other individual event days are insignificant.

Hence, empirical evidence shows that on average the market views the first announcement of a firm being subject to an antitrust investigation as a significant and negative piece of information. Our results are similar to those obtained by Bosch & Eckard (1991), by Langus & Motta (2006) and by Detre et al. (2005). Our results are also similar to those of Karpoff et al.(2008) in the sense that significant negative abnormal returns are found. However, the magnitude of the abnormal returns is much smaller than what Karpoff et al. (2008) found. The difference in magnitude is probably explained by the different kind of events: a penalty for an antitrust infringement is seldomly seriously threatening for the existence of a company, while a number of recent bookkeeping scandals ended in bankruptcies, which obviously made the stock market extremely nervous and over-reactive to such news.

Table 3 presents the average abnormal returns, the cumulative abnormal returns and the test statistics for the five business days preceding the first announcement (t = -5 to t = -1), the day of the announcement itself (t = 0) and the five subsequent business days (t = 1 to t = 5), when the Decision is taken as event.

Insert Table 3

The Decisions result in insignificant (cumulative) average abnormal returns. This is not surprising since we expect the market to incorporate expectations about it in the share price. In our further calculations to analyse the value loss we therefore will use only the abnormal returns by reaction on the first announcement of the antitrust investigation.

5.1. Value loss

Table 4 shows the individual value loss of all sample firms by announcement of the antitrust investigation in euro terms.

Insert Table 4

Aggregated over all firms the induced total value loss amounts € 4.3 billion. The mean euro loss is €148 million. The component of this value loss attributable to the fine effect is approximated by aggregating all fines imposed by the NMa and the Commission on all sample firms. Table 5 presents the fines of all individual firms.

Insert Table 5

Aggregating over all firms (KPN being an exception) the total value of all fines is €500.627.715, explaining only 12% of the € 4.3 billion aggregate total euro loss. The mean fine is €17.263.025. Procedures concerning damages by clients of the firms involved because of antitrust infringements are in the Netherlands and in Europe not common. In most of the cases in our sample we can assume that there were no damages paid. Solely in the Construction Case there have been made some damage payments. However there is not sufficient data on these damages to take this along into our calculations. But we can assume that these amounts are not large enough to significantly impact our outcomes.[7] Our result on the fine effect is in the same order of

[7] For example, the total amount of damages paid by all the 1300 firm which were involved in the Construction Case was €100 million. The total amount of fines imposed on all these firms was €306 million. Thus, approximately an amount of one-third of the total fines was paid as damage settlements. In our sample the total amount of fines imposed on firms from the Construction Case is €107.893.715. When we make an approximation of the damage settlements, we take one-third, which amounts in €35.928.607. If we add this amount to the total amount of fines in our sample we find an amount of €536.556.322, explaining 12.5% of the total euro loss. This is only 0,5% more than when we ignore the damage payments. It seems clear that we can assume that possible damage payments are negligible.

magnitude as the results of Karpoff et al. (2008) (8.8%), Langus & Motta (2007) (19%) and Bosch & Eckard (1991) (13%).

To quantify the readjustment effect we multiply each firm's cartel-relevant revenue with the estimated mark-up as well as with the specific price earnings ratio two days before the event. Table 6 presents the calculations of the readjustment value.

Insert Table 6

Since most of the relevant revenues are confidential we only present these results on an aggregate level. The total readjustment effect is € 1.7 billion, explaining 40% of the €4.3 billion aggregate total euro loss. The mean value of the readjustment effect is €58.978.406.

Under the rationality assumption, the size of the fine effect and the cartel-generated profits are estimates of markets' expectations of these amounts when news of the antitrust infringement becomes public. By the same assumption, the remaining unexplained portion of the overall share value loss reflects markets' expectations of additional losses in firm value from reputation losses. Table 7 shows our estimate of the reputation loss.

Insert Table 7

Overall, 12 % of the aggregate share value loss for the firms in our sample can be attributed to markets' expectations of legal penalties. The readjustment effect equals €1.7 billion, or 40% of the share value loss. Combining this 12% with the 40% we see that half of the aggregate loss is attributable to legal penalties and the loss of

conspiracy-generated profits. This leaves the other half, or €2.1 billion, of the aggregate share value loss as our estimate of the reputation loss.

5.2. Robustness check

The estimation of the reputation loss is sensitive to the readjustment effect. To estimate the readjustment effect we had to make assumptions about the height of the mark-up. This means that if we made wrong assumptions our readjustment value could differ from the real lost conspiracy-generated profits. Our outcome for the reputation loss is however so large that even large variations of the readjustment effect do not eliminate it. To strengthen this argument, we arbitrarily inflate the readjustment effect to check whether this could significantly influence our outcome. We assume the mark-up to be 50% larger. The value of the readjustment effect is then € 2.56 billion, explaining 60% of the total valuation effect. This means that although the reputation loss drops to €1.22 billion, it still explains 29% of the total valuation effect and its contribution to the total value loss is still prominent and almost 2.5 times bigger than the legal penalty.

Further, despite the high proportion of these reputation loss estimates, they most likely underestimate the true magnitude of these losses. Since we measure abnormal returns only on specific dates during the investigation period, the estimated returns almost certainly understate the total valuation losses for an average firm in the sample. However we did subtract the entire value of fines and the entire loss in conspiracy-generated profits. This is a conservative measurement bias that serves to bolster our overall conclusion that the reputation loss is very large.

Also, prior research consolidates our results, since it indicates that reputation losses are important for other types of corporate misconduct, including among others financial misrepresentation (Karpoff et al., 2008), false advertising (Peltzman, 1981), product recalls (Jarrell & Peltzman, 1985) and frauds of private parties (Karpoff & Lott, 1993).

6. Conclusions

This paper examines the penalties imposed on Dutch listed firms targeted by the NMa or the European Commission from 1998-2008. We estimate the impact of various

events in an antitrust investigation on a firm's valuation and analyse the causes of the value impacts. We find that the first announcement that a firm is target of an antitrust investigation has a statistically significant effect on the firm's share price. On average the cumulative abnormal return over the day of the event and the two following days is -2.3%. This corresponds to a total loss of €4.3 billion in equity market value. Consistent with previous research, the expected fines appear to explain only a fraction of this loss, namely 12% of the total loss. However, we find that fines are not the only penalty for firms caught infringing on competition law. Rather, reputation loss is what hurts companies most. We find that reputational penalties imposed by the capital market attributes for almost 50% to the total value loss. The remaining 40% is attributable to lost conspiracy-generated profits. The empirical findings indicate that the market views news on anticompetitive behaviour as negative and expects the market to change the terms of trade with whey do business with the targeted firm. Thus, cartel offenders are disciplined largely through market-induced reputational penalties, not through legal penalties.

Our findings provide an empirical measure of the expected costs of a cartel and contributes to the debate over the height of the optimal fine for anticompetitive behaviour. In the absence of solid information about the probability of getting caught we however cannot make strong statements on how high this optimal fine should be. Nevertheless, when making business decisions or setting public policy one should not solely take legal penalties into account but also the reputational penalties, since the latter hurt companies most.

We should stress that market-imposed penalties will only contribute to general deterrence if firms are aware of this reputation effect. Therefore one recommendation towards competition authorities would be to actively alert firms to the existence and magnitude of the market imposed reputational penalties. Competition authorities should also alert shareholders to the negative impact of antitrust infringements on firm value. If shareholders are aware of the damage antitrust infringements cause to shareholder wealth, they have an incentive to devote resources to preventing firms from engaging in any kind of anticompetitive behaviour.

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Table 1: Summaries of empirical studies regarding valuation effects and the causes of the share value impacts of certain illegal activities. Valuation effects are expressed in Cumulative Abnormal Returns (CAR). An abnormal return is the difference between the expected return of a security and the actual return. CAR is the sum of abnormal returns over a specific event window.

Authors	Events analysed	Sample + Period	Primary Findings	
			Valuation effects	Cause of share value impact
Karpoff, J.M., Scott Lee, D. & Martin, G.S. (2008)	Examination of penalties imposed on firms targeted by SEC enforcement actions for Financial Misrepresentation	585 enforcement actions, involving 384 Firms (1978-2002)	Mean CAR of enforcement actions: -38,06% Total Dollar Loss: $152,54 billion.	8.8% = Fine effect 24.5% = Readjustment Effect 66.6% = Reputation Loss
Langus, G. & Motta, M. (2007)	Examination of the impact of the main events in an Antitrust Investigation on a firm's stock market value.	55 European Commission Decisions, involving 88 Firms (1969-2005)	Dawn Raid: CAR -2% Decision: CAR -3.3%	19% = Fine effect. Residual is not further investigated.
Detre, J., Golub, A., Connor, J.M. (2005)	Examination of stock price reaction to the announcement of an indictment in a price fixing case in the US	24 price-fixing cases, involving 31 Firms (1981-2001)	WSJ indictment announcement: CAR -3,41 %	Not investigated.
Bosch, J.C. & Eckard, E.W. (1991)	Examination of stock price reaction to federal indictments in the US	57 conspiracy cases, involving 127 Firms (1962-1980)	WSJ indictment announcement: CAR -1.08% Total Value Loss: $2.18 billion	13% = Fine effect. Residual is expected to be lost monopoly profits (not conclusive)

Table 2: Summary of Average Abnormal Returns and Test Statistics for the days surrounding the First Announcement of the antitrust investigation (day t=0) and on the day itself.

Time-Series of Daily Returns:

Event day	Average Abnormal Return (%)	t-statistic for Average Abnormal Return (t)	Cumulative Average Abnormal Return (%)	Percentage Negative	Sign Test Statistic (ZQ)
-5	0,31	0,85	0,31	39%	-1,22
-4	-0,19	-0,54	0,11	48%	-0,17
-3	0,34	0,94	0,45	52%	0,17
-2	-0,08	-0,22	0,37	55%	0,52
-1	0,03	0,08	0,4	55%	0,52
0	-0,82	-2,29**	-0,42	67%	1,91**
1	-0,99	-2,76***	-1,41	73%	2,61***
2	-0,5	-1,39*	-1,91	61%	1,22*
3	0,34	0,96	-1,56	55%	0,52
4	-0,24	-0,68	-1,81	58%	0,87
5	-0,21	-0,58	-2,02	64%	1,57*

Cumulative Abnormal Returns:

Period	CAR	t-statistic	Percentage Negative	Sign Test Statistic (ZQ)
[-1,0]	-0,79	-1,56*	61%	1,72*
[0,1]	-1,81	-3,56***	70%	3,20***
[0,2]	-2,30	-3,71***	67%	3,32***
[0,5]	-2,41	-2,75***	63%	3,27***
[-5,5]	-2,02	-1,70*	57%	2,57**

*** significant at 1% level, ** significant at 5% level, and * significant at 10 % level.

Table 3: Summary of Average Abnormal Returns and Test-statistics for the days surrounding the announcement of the Decision of the antitrust investigation (t=0) and on the day itself.

Time-Series of Daily Returns:

Event day	Average Abnormal Return (%)	t-statistic for Average Abnormal Return (t)	Cumulative Average Abnormal Return (%)	Percentage Negative	Sign Test Statistic (ZQ)
-5	0,09	0,28	0,09	57%	0,73
-4	-0,13	-0,38	-0,03	37%	-1,46
-3	-0,43	-1,30	-0,47	60%	1,10
-2	0,26	0,77	-0,21	50%	0,00
-1	-0,32	-0,95	-0,53	53%	0,37
0	0,31	0,94	-0,21	50%	0,00
1	0,41	1,23*	0,20	37%	-1,46*
2	-0,21	-0,65	-0,02	53%	0,37
3	0,15	0,45	0,13	37%	-1,46
4	-0,03	-0,10	0,10	40%	-1,10
5	-0,59	-1,78	-0,49	70%	2,19

Cumulative Abnormal Returns:

Period	CAR	t-statistic	Percentage Negative	Sign Test Statistic (ZQ)
[-1,0]	0,00	-0,01	52%	0,26
[0,1]	0,72	1,53*	43%	-1,03
[-5,0]	-0,21	-0,26	49%	-0,22
[0,5]	0,03	0,04	48%	-0,60
[-5,5]	-0,49	-0,45	51%	0,30

*** significant at 1% level, ** significant at 5% level, and * significant at 10 % level.

Table 4: Loss in market value of individual sample firms. The value loss is calculated by multiplying the cumulative abnormal returns over the [0,2]-day event window by the market capitalization of the firms, two days before the event.

Fist Announcement	Abnormal return [0,2]	Market cap [-2]	Value loss
KPN*	-0,362	€ 5.083.007.300	-€ 1.840.089.103
Ballast (zembla)	-0,071	€ 97.290.000	-€ 6.896.962
Arcadis (zembla)	0,012	€ 182.480.000	€ 2.200.458
BAM (zembla)	-0,060	€ 206.460.000	-€ 12.402.406
Heijmans (zembla)	-0,085	€ 459.700.000	-€ 39.214.690
Imtech (zembla)	-0,013	€ 543.190.000	-€ 6.807.129
BAM (Dawn raid)	-0,027	€ 172.180.000	-€ 4.600.028
Heijmans (Dawn raid)	-0,041	€ 311.280.000	-€ 12.690.680
Imtech (Dawn raid)	-0,013	€ 613.840.000	-€ 7.720.685
Ballast (Dawn raid)	0,005	€ 26.800.000	€ 136.291
Arcadis (Dawn raid)	-0,013	€ 202.640.000	-€ 2.714.997
Accell (Dawn Raid)	-0,017	€ 25.740.000	-€ 429.453
Accell (St. of Obj.)	-0,015	€ 40.210.000	-€ 618.339
ING	-0,020	€ 29.073.080.000	-€ 584.314.986
van Lanschot	0,042	€ 315.530.000	€ 13.260.425
ABN	-0,006	€ 25.686.720.700	-€ 160.365.214
Fortis	-0,015	€ 20.751.980.500	-€ 312.954.871
Heijmans (14-10-2004)	-0,006	€ 489.150.000	-€ 2.885.342
BAM (14-10-2004)	-0,016	€ 480.000.000	-€ 7.802.678
Ballast (14-10-2004)	-0,124	€ 116.000.000	-€ 14.434.059
Arcadis (14-10-2004)	0,016	€ 240.870.000	€ 3.784.864
BAM (26-4-2005)	-0,060	€ 895.140.000	-€ 54.090.007
Imtech (26-4-2005)	0,011	€ 672.160.000	€ 7.646.494
Heijmans (30-11-2005)	-0,016	€ 875.040.000	-€ 13.793.420
Ballast (30-11-2005)	-0,036	€ 356.700.000	-€ 12.782.680
BAM (30-11-2005)	-0,081	€ 1.851.380.000	-€ 149.170.414
Imtech (30-11-2005)	-0,011	€ 740.720.000	-€ 7.810.638
Arcadis (30-11-2005)	-0,005	€ 531.620.000	-€ 2.809.651
BAM (7-9-2005)	-0,053	€ 1.301.010.000	-€ 68.609.471
BAM (Bitumen)	0,005	€ 162.440.000	€ 859.944
Ballast (Bitumen)	0,017	€ 53.500.000	€ 885.445
shell (Bitumen)	-0,030	€ 86.637.440.000	-€ 2.617.558.179
Heijmans (Bitumen)	-0,023	€ 354.010.000	-€ 8.199.960
Heineken	-0,011	€ 18.046.750.000	-€ 207.252.738
Total (without KPN)			-€ 4.290.155.755
Mean (without KPN)			-€ 147.936.405

* *Dropped from our sample*

Table 5: Overview of all listed firms targeted by an investigation of the NMa or the Commission resulting in a fine during the ten year period of 1998-2008. Given are the exact event dates, case numbers, sectors and fines. In single cases there were more than one events during the same investigation which fall under the label first announcement. That is the reason why it seems not all cases resulted in a decision or in a fine.

Nr	Art	Decision	Press Decision	First announcement (Dawn.raid / Statement of Objections)	Case nr.	Sector	Firm	Fine
1	6	30-12-2002	30-12-2002	31-8-2001	2658	Telecommunication	KPN Mobile N.V.	€ 31.300.000
2				12-11-2001(Zembla)		Construction	Ballast	
3				12-11-2001(Zembla)		Construction	BAM	
4				12-11-2001(Zembla)		Construction	Heijmans	
5				12-11-2001(Zembla)		Construction	Arcadis	
6				12-11-2001(Zembla)		Construction	Imtech N.V.	
7	6	25-4-2003	25-4-2003		3055	Construction	Ballast Nedam	€ 308.000
8				20-3-2002		Construction	Imtech N.V.	
9	6	18-12-2003	19-12-2003	20-3-2002	2873/3064	Construction	Ballast Nedam	€ 14.788.000
10	6	18-12-2003	19-12-2003	20-3-2002	2873/2906/3054/ 3064	Construction	Heijmans	€ 14.823.000
11	6	18-12-2003	19-12-2003	20-3-2002	2873/3064	Construction	BAM	€ 15.261.000
12	6	18-12-2003	19-12-2003	20-3-2002	3054	Construction	Arcadis	€ 369.000
13	6	21-4-2004	22-4-2004	28-11-2002 + 12-9-2000	1615	Wholesale	Accell	€ 12.809.000
14	6	28-4-2004	29-4-2004	17-4-2003	2910	Financial industry	ING Bank N.V.	€ 3.900.000
15	6	28-4-2004	29-4-2004	17-4-2003	2910	Financial industry	ABN AMRO Bank N.V.	€ 3.900.000
16	6	28-4-2004	29-4-2004	17-4-2003	2910	Financial industry	Fortis Bank (Nederland)	€ 1.900.000
17	6	28-4-2004	29-4-2004	17-4-2003	2910	Financial industry	F. van Lanschot Bankiers	€ 500.000
18	6	29-3-2005	4-4-2005	14-10-2004	4610+4307	Construction	Heijmans (van Lee B.V.)	€ 14.369.279
19	6	29-3-2005	4-4-2005	14-10-2004	4602+4601	Construction	BAM Group	€ 18.842.290
20	6	29-3-2005	4-4-2005	14-10-2004	4592	Construction	Arcadis	€ 222.787
21	6	29-3-2005	4-4-2005	14-10-2004	4572/4570	Construction	Ballast Nedam	€ 4.105.404
22	6	20-10-2005	21-10-2005	26-4-2005	4886	Construction	BAM	€ 2.338.590
23	6	20-10-2005	21-10-2005	26-4-2005	4880	Construction	Imtech N.V.	€ 5.620.407
24	6	30-5-2006	31-5-2006	30-11-2005	5391	Construction	Arcadis	€ 129.276
25	6	30-5-2006	31-5-2006	30-11-2005	5408/5330	Construction	Heijmans (van Lee)	€ 1.883.163
26	6	30-5-2006	31-5-2006	30-11-2005	5222	Construction	Ballast Nedam	€ 55.227
27	6	30-5-2006	31-5-2006	30-11-2005	5336	Construction	Imtech N.V.	€ 679.000
28	6	30-5-2006	31-5-2006	30-11-2005	5333	Construction	BAM	€ 2.628.697
29	6	29-6-2006	3-7-2006	7-9-2005	3938-520	Construction	BAM	€ 11.102.455
30	6	17-7-2006	17-7-2006		5291	Construction	Ballast Nedam	€ 56.288
31	6	9-11-2006	9-11-2006		5242	Construction	Ballast Nedam	€ 311.852
32	81	13-9-2006	13-9-2006	10-10-2002	38.456	Construction	Royal Dutch Shell	€ 108.000.000
33	81	13-9-2006	13-9-2006	10-10-2002	38.456	Construction	Ballast	€ 4.650.000
34	81	13-9-2006	13-9-2006	10-10-2002	38.456	Construction	BAM	€ 20.700.000
35	81	13-9-2006	13-9-2006	10-10-2002	38.456	Construction	Heijmans	€ 17.100.000
36	81	18-4-2007	18-4-2007	24-3-2000	766	Beverages	Heineken	€ 219.275.000

Table 6: Calculation of the readjustment value (or loss in conspiracy-generated profits). P/E ratio = Price Earnings Ratio. To get from gross profits to net profits, a corporate tax level of 30% is used. For the firms involved in the Construction Case all the relevant revenues per infringement are first aggregated before further calculations are made. For these firms the median P/E-ratio over the first year that the Construction case was uncovered is used. For all the other cases, the P/E-ratio two days before the announcement day is used. For the Construction Case a mark up of 8.8% is used (derived from the parliamentary inquiry) and 10% for the remaining firms.

Companies Construction Fraud	Median PE-ratio (12.11.2001/12.12.2002)	Total annual relevant revenue of all infringement from the firms within the Construction Case.	Mark-up	Net profit	Readjustment value
Ballast	6,61	x (confidential)	8,8%	70%	x
Heijmans	6,98	x (confidential)	8,8%	70%	x
Bam	5,60	x (confidential)	8,8%	70%	x
Arcadis	7,81	x (confidential)	8,8%	70%	x
Imtech	4,40	x (confidential)	8,8%	70%	x
Total Construction fraud					€ 499.959.031

Company	P/E-ratio [-2]	Total annual relevant revenue	mark-up	Net profit	Readjustment value
Accell	6,8	x (confidential)	10%	70%	x
ING	6,3	x (confidential)	10%	70%	x
van Lanschot	9,8	x (confidential)	10%	70%	x
ABN	10,3	x (confidential)	10%	70%	x
Fortis	9,0	x (confidential)	10%	70%	x
BAM (Bitumen)	3,8	x (confidential)	10%	70%	x
Ballast (Bitumen)	6,6	x (confidential)	10%	70%	x
shell (Bitumen)	14,4	x (confidential)	10%	70%	x
Heijmans (Bitumen)	4,9	x (confidential)	10%	70%	x
Heineken	28,0	x (confidential)	10%	70%	x
Subtotal:					€ 1.210.414.735
Total:					€ 1.710.373.766
Mean					€ 58.978.406

Table 7: Calculation of the reputation loss. (Reputation Loss = ΔMVt - Fine effect - Readjustment effect)

	Total	Average	Percentage
Total value loss	€ 4.290.155.755	€ 147.936.405	100%
Total fine	€ 500.627.715	€ 17.263.025	12%
Total Readjustment effect	€ 1.710.373.766	€ 58.978.406	40%
Total Reputation loss	€ 2.079.154.274	€ 71.694.975	48%

Figure 1: Timeline of the event study