

Public and private sanctions: the case of cartels

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Abstract

In this article, we revive an old debate in the law and economics literature: the relative role of public and private (market-based) sanctions in deterring misconduct. We harness recent developments in opinion mining to offer a novel framework, which accounts for public sanctions and a more direct measure of private sanctions. We propose using the intensity and the sentiment of media exposure of misconduct as a measure of reputational effect and thus an approximation of the private sanction. As a demonstration, we combine event study techniques, sentiment analysis, and classic econometrics on a sample of 339 listed companies belonging to 150 cartels prosecuted by the European Commission between 1992 and 2015. Our main finding is that in the context of cartels, public and private sanctions act as complements, but only if the cartel directly affects atomistic customers. In other cartels, we found no consistent relationship between public and our measure of private sanctions.

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Public and Private Sanctions: The Case of Cartels

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Abstract

In this article, we revive an old debate in the law and economics literature: the relative role of public and private (market-based) sanctions in deterring misconduct. We offer a novel framework, which accounts for public sanctions and a more direct measure of private sanctions, harnessing recent developments in opinion mining. We use the intensity and the sentiment of media exposure of misconduct as a measure of reputational effect and thus an approximation of the private sanction. As a demonstration, we combine event study techniques, sentiment analysis, and classic econometrics on a sample of 339 listed cartel member firms, prosecuted by the European Commission between 1992 and 2015. We offer evidence that in the context of cartels, public and private sanctions act as substitutes.

Key words: Private sanctions, public sanctions, cartels, event study, sentiment analysis.

JEL Classification: L4, K4.

1. INTRODUCTION

Most illegal behaviour faces two types of sanction: a public sanction, imposed directly by an administrative body or the court; and a market-based one (private sanction), which materialises indirectly through market mechanisms. The law and economics literature that studies private and public sanctions seems to agree that private sanctions can deter corporate misbehaviour, inasmuch as the offenders internalise the social cost of the offences; and concurs on the point that public sanctions are needed when the harm caused by the offence is not internalised.

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An important upshot of previous literature is that private (reputational) sanctions tend to work in contractual relationships, particularly, in repeated purchase settings.² Klein and Leffler (1981), Shapiro (1983), and Lott Jr (1988) provide theoretical models where customers of a business change their custom in response to a breach in the contractual agreement (related-party offence).³ The credibility of the reputational sanction derives from the change in purchasing patterns that accompanies a change in beliefs about the offence. In this case, some, or all costs of the damages caused by the misbehaviour can be internalised by the offending firm through its repeated contracting with customers, suppliers, employees, and investors.⁴ Private sanctions are sufficient where the only damaged party is a customer of the unlawful business and the total amount of the damages are internalised by the offender. In this setting, public sanctions are only required to the extent the private sanction does not encompass the total social cost of the offence.

Empirically, Peltzman (1981), Karpoff and Lott Jr (1993), Alexander (1999), Karpoff et al. (2008) studied how markets react to fraudulent or misleading behaviour. Jarrell and Peltzman (1985) and Mitchell and Maloney (1989) examined the reputational impact of product recalls (faulty products). Both of these behaviours are related-party conducts. Jones and Rubin (2001) and Karpoff et al. (2005) looked at environmental violations (a third-party offence). Their findings are in line with the theory: private sanctions are effective mostly in related-party offences, but less so in third-party offences, where therefore more reliance on public sanctions is warranted. Armour et al. (2017) provide further empirical evidence to this distinction.

One of the key difficulties in these previous empirical works is that too often private sanctions (and largely their determinants) are difficult to directly observe and measure, and this complicates the empirical evaluation of their effectiveness. To overcome this, previous works have linked private sanctions to the reputational effect of companies, and used an indirect measure of this reputational impact by decomposing the share price effect of various corporate wrongdoings into: the effect of the public sanction, a readjustment effect (without the wrongdoing profits are expected to be lower), and a residual which can be associated to reputational loss.⁵ This is driven by the intuition that reputation is an intangible asset, the value of which is expressed as a component of the share price valuation of the business. In this setting reputational loss is manifested by a stock price drop

²In this paper we use the terms private and reputational sanction interchangeably.

³Literature distinguishes between ‘related-party’ and ‘third-party’ crimes to refer to behaviour that affects contractual parties (for example some types of fraud, as in Karpoff and Lott Jr (1993)) and behaviour that impacts third parties (for example environmental violations, as in Karpoff et al. (2005)).

⁴In third party-offences, the damage caused by the offence is not internalised through a reputational punishment by third-parties.

⁵See for example: Peltzman (1981), Karpoff and Lott Jr (1993), Alexander (1999), Karpoff et al. (2008).

because the share price valuation reflects investors' expectations of loss in future profits at lower levels of reputation. This might entail expectations that future sales will drop, or that firms will have to spend on correcting measures (extra advertising or price drops) to mitigate the reputational damage.

We provide an important methodological contribution by offering a more direct way to measure determinants of the magnitude of the reputational effect. Recent developments in opinion mining and natural language processing allow us to extract the opinion in the media coverage of corporate offences, and to study the relationship between share price valuation and opinion ([Van de Kauter et al. \(2015\)](#)). To the best of our knowledge, no such analysis has been conducted to investigate the effectiveness of private sanctions on firms' behaviour. The context of illegal cartels gives us an ideal ground to test this framework. When the regulator discovers a cartel, this information is not automatically distributed to all related parties (especially not to atomistic consumers). Various information channels are in action to pass the news on the cartel conduct to the public. We offer a way to measure the sentiment and the spread of this information, and because without this information there would be no reputational impact, we posit that the sentiment and the intensity of the information is directly proportional to the reputational effect.

Our proposal offers a workable, and easy-to-implement framework for studying private and public sanctions. The public sanctions are directly obtained from administrative and court decisions and private sanctions are approximated by a reputational effect, which we measure through the intensity and the sentiment of media exposure of the misconduct. We estimate the effect of these measures on the market valuation of offending firms. One of the main advantages of this framework is that data on media exposure is easily available from public sources. To demonstrate this, we use a publicly available dataset on EU cartels assembled by the European Commission (Commission), which we merge with a database on news articles that document and describe the illegal cartel (and cartel members) behaviour. We do a count of news sources per cartel member as indicator of exposure of each cartel member to the news, and then quantify the opinion of each news' item using sentiment analysis. Loss or gain in market valuation is used as a proxy for the deterrence power of these two types of sanctions.

Our empirical strategy gives us an opportunity to look at the relative role of public and private sanctions in deterring misconduct. Based on the premise that businesses are averse to falling market valuation, we assume that sanctions with larger negative effect on valuation act as stronger deterrent. We then estimate the relative effect of public and private sanctions on firms' market

valuation. If the two are substitutes, lower public sanctions will not result in lowered valuation if private sanctions increase at the same time. This follows the same logic as [Karpoff and Lott Jr \(1993\)](#). On the other hand, there is also a possibility that public and private sanctions act as complements. [Iacobucci \(2014\)](#) provides a theoretical framework to demonstrate that the size of the public sanction affects the size of the private sanction and larger fines are associated with larger reputational punishment. The intuition behind this is that as public attitude is likely to be influenced by news on the magnitude of sanction, which is perceived as directly proportional to the seriousness of the offence. In this case increasing public sanctions only drive down market valuation if at the same time private sanctions also increase. Our paper will provide a behaviour specific test to which of the two prevails in the case of cartels.

2. EUROPEAN CARTELS - INSTITUTIONAL SETTING

We use cartels detected by the European Commission as illustration of our proposed framework. To give a brief institutional introduction, in the European Union, the principal body in charge of investigating cartels is the European Commission (at national level the member state competition authorities enforce anti-cartel laws). The investigation can start following: (a) a complaint, (b) the opening of an own-initiative investigation, or (c) a leniency application from one of the participants to a cartel. Following an initial investigative phase, the Commission decides whether to conduct an in-depth investigation - which typically starts with a dawn raid of the suspected cartel members' offices. This is the first point at which the fact of the investigation is publically announced. However, there is some possibility that investors anticipate the investigation even before this date. It is not uncommon that a US cartel investigation is followed by an investigation in the EU. Once the Commission reached its decision, it consults the national competition authorities, and then the final decision is adopted by the full College of Commissioners. The parties to the case are informed directly of the decision, and at the same time the Commission issues a press release on key details of the decision, which includes the amount of the fine imposed on each infringing firm. If the cartel was reported by one of its members (leniency application), the fine can be reduced for this particular firm. Our study focuses on these two main announcements, the start of the investigation, and the final decision, and their effect on firms' share prices. This part of our analysis is similar to [Aguzzoni et al. \(2013\)](#), but has a newer and more extensive dataset. We then study the interaction between the public sanction (EU administrative fine) and private sanctions on the cumulative abnormal rate of returns of shares.

Cartels are related party offences as it is the customer who directly suffers the harm, and therefore, based on previous literature, we would expect private (reputational) sanctions to have a deterrent effect. However, when it comes to cartels, interestingly, the academic discussion on the optimum amount of fines typically circumvents the issue of private (reputational) sanctions. Most discussion is limited to the optimal magnitude of the administrative or criminal fine, or the possibility of custodial sentences. For monetary sanctions the argument is that, they should account for the total social cost of the cartel. [Karpoff and Lott Jr \(1993\)](#) argues that in the case of fraud this would lead to over-deterrence because it ignores the effect of private sanctions. For cartels, there seems to be an understanding that too high sanctions on cartel activity do not chill any legitimate, pro-competitive conduct that could be mistaken for cartel activity; therefore, over-deterrence is not an issue. Whilst we are not convinced that this is true for some vertical agreements, there is another problem with overly stringent fines - that they may cripple the business and force them to exit the market, thereby potentially making it even less competitive.

Moreover, we believe that neither public nor private sanctions should be studied individually on their own. Size and gravity of determinants of private sanctions are driven by the magnitude of public sanctions - in which case the public sanction acts as a signal to the gravity of the offence - i.e. without public sanctions, private sanctions would not be effective [Iacobucci \(2014\)](#). On the other hand, the effectiveness of public sanctions may depend on the presence of private sanctions and on the underlying environment. This would mean that for public sanctions to be effective they would have to be administered as part of a cocktail with private sanctions, and the relative dosage would depend on the context of the case.

The paper proceeds with an introduction of the various types of data sources needed for the study. In Section 4 we present the methodologies. Section 5 discusses the results and looks at whether public and private sanctions are substitutes or complements in deterring misconduct. Section 6 concludes with a discussion.

3. DATA

Our data is based on cartels that were prosecuted by the European Commission. The data consists of information on cartel characteristics and the list of companies that participated in the cartel activities. For the population of listed (public) cartel members we collated information on share price and market performance, along with their capitalisation, prior and post the Commission's detection and decision cartel dates. Finally, to gain insight on the possible reputational damage,

we put together a dataset made of media articles (newspapers, magazines and news agencies). We describe each piece of data source separately and provide a cohesive discussion towards the end of the section.

3.1. Cartel data. We collected information on cartel characteristics and dates of detection and decision for 150 European private cartels convicted by the Commission during the period 1992-2015. The information is retrieved from public documents available on the Commission’s website.⁶ The documentation includes cartels that operated in final or intermediary manufacturing and service industries. The sources that we have accessed are non-confidential versions of decisions adopted by the Commission, including: summary decisions published in the Official Journal of the European Union - EUR-Lex, reports from the Hearing Officer, opinions of the Advisory Committee, Commission’s press releases on adoptions of decisions and, where available, Commission memos on inspections, statements of objections or Court judgements.

TABLE 1. Cartel summary statistics

Variables	N	mean	sd	min	max
<i>cartel characteristics:</i>					
convicted (year)	150	2006	5.71	1992	2015
coverage	68	0.83	0.19	0.11	1
detected (year)	121	2002	6.31	1983	2014
duration (years)	103	7.77	6.29	0	34.8
ring-leader	92	0.27	0.45	0	1
size	103	7.34	8.13	2	76
<i>cartel type (non-exclusive):</i>					
bid rigging	109	0.18	0.39	0	1
market share allotment	109	0.63	0.48	0	1
price fixing	109	0.84	0.36	0	1
quota allotment	109	0.34	0.46	0	1
<i>cartels</i>	150				

A summary of cartel characteristics is offered in Table 1, which reveals a few things about missing observations. In particular, it was not possible to retrieve full information on cartel coverage of the market, and on the existence of a ringleader for a number of cartels. For 29 cartels, we could not find any information on their characteristics. Nonetheless, for the cartels we have information

⁶See <http://ec.europa.eu/competition/elojade/isef/index.cfm> [webpage consulted May 2018].

on, we note that, on average, cartels lasted less than 8 years, were composed of about 7 firms, and covered 83% of the market. Over 80% of cartels involved price fixing, and two thirds of cartels had market share agreements.⁷

3.2. Cartel member (firm-level) data. Along with the cartel characteristics, we gathered details on the firms that participated in the cartel activity. The documentation provides information on the name of the firms that took part in the cartel, the fine they were charged before leniency was applied, the percentage of leniency reduction, and the new fine calculated after the leniency discount. An example of the information that is available is provided in Table 2 for the Air Cargo cartel, labelled in the Commission’s documents as “Airfreight” cartel. Fourteen firms belonged to that cartel, of which Lufthansa (and its subsidiary Swiss Airlines) received full immunity from fines, as it was the first to apply for leniency and help with the cartel investigation.

TABLE 2. Firm fines (in million Euros)

Cartel	Firm	Fine before	% of leniency reduction	Fine after
Airfreight	Air Canada	24.75	15	21.04
Airfreight	Air France	228.65	20	182.92
Airfreight	British Airways	115.60	10	104.04
Airfreight	Cargolux	94.00	15	79.90
Airfreight	Cathay	71.40	20	57.12
Airfreight	Japan Airlines	47.60	25	35.70
Airfreight	KLM	158.95	20	127.16
Airfreight	LAN Chile	10.28	20	8.22
Airfreight	Lufthansa	0	100	0
Airfreight	Martinair	59.00	50	29.50
Airfreight	Qantas	11.10	20	8.88
Airfreight	SAS	82.55	15	70.17
Airfreight	Singapore Airlines	74.80	0	74.80
Airfreight	Swiss International Airlines	0	100	0
Total		978.66		799.45

The full dataset of cartel member accounts for 767 firms –13% of those are recidivist. Some of these firms are publicly listed, and for these we collected information on their share prices around the detection and decision date, as discussed in the next section.

⁷For most of the analysed period, settlement was not an option. Therefore, our sample does not contain settlement cases.

3.3. Stock market data. A third dataset includes cartel members’ share prices, their capitalisation and corresponding market value. We downloaded daily share prices (adjusted for dividends) for all listed firms in our sample from Datastream. We also downloaded daily prices for their respective home market index, as well as their market capitalization in their home market.⁸ Daily prices spanned from one year before the detection and decision dates, to one year after each of these dates. For a small number of companies we could not retrieve share prices prior to the detection date (because they had not become public yet), and for an even smaller number we were unable to find data before the decision date (because the companies had been de-listed or bought out by that time). This selection mechanism produced a final sample of 339 publicly listed firms, which had share prices either around the raid or around the decision (or around both periods).

3.4. Media articles. The last fragment of data consists of news articles on the cartel and cartel member behaviour, downloaded from Nexis® service of the LexisNexis information solution. Nexis® aggregates information from a huge body of international news, business articles, business-relevant websites, blogs and forums.

The Nexis search engine accepts individual words or strings, and then identifies and retrieves thousands of articles that contain the specified word(s). For each cartel, we collated English written news that reported and described cartel behaviour during the time window: one day before and after the cartel decision.⁹ We searched according to the boolean rule: “name firm1” OR “name firm2” OR ... “name firm N” AND “price fix” OR “cartel”. To be more inclusive, when appropriate, we employed both the original name of the company and its abbreviation with the use of the Boolean OR (e.g. “British Airways” OR “BA”). The period of the search was extended from the day before the official EU press release detailing the cartel conviction decision, to the day after. By including the day before the announcement we aimed at capturing media articles that discussed the imminent decision of EU on the day before (if there was any leakage of information). With the inclusion of the day after we aimed to capture print news sources that were late in reporting the European Competition Commission’s decision, either due to time zone differences or the fact that

⁸We used a major, broad, capitalization-weighted index of the local (home) market of the firm (Campbell et al. (2010)). For example, for British firms we used FTSE 100, for US firms we used S&P 500, and so on. For developing countries with no data on such indices, we used the corresponding Datastream calculated index.

⁹We opted for publications in the English language only. This may result in a bias in favour of publications from English speaking countries and firms. However, our decision is based on two premises: Firstly, it would be impractical, if not impossible, to include in our search string the translated terms “cartel” and “price-fix” in all languages. Secondly, not specifying the terms “cartel” and “price-fix” to allow for all languages would generate much noise (i.e. company-related news irrelevant to the cartel conviction decision). Furthermore, these news pieces can be in languages that we do not command, and distinguishing between relevant and irrelevant news releases would be an impossible endeavour. Finally, all the cartels in our sample are of international nature and were likely to have been reported by English language news sources.

European newspapers are normally printed in the morning, hence may miss the EU decision on the day it takes place.

With our search rule, we have gathered 1,534 different news articles. Texts were not included when they were irrelevant or made up a very small part of a longer article. In cases where the cartel has been the primary focus of an article (no matter how short) the text was included. Five cartels have fallen off the articles watch list: 1) Cewal, Cowac and Ukwal, 2) Quantel International, 3) Reinforcing bars (Italy), 4) Sodium Gluconate, 5) Trans-Atlantic Conference Agreement. Texts from the original article have been copied across exactly as they were (with typing/grammatical errors left in place). When the text was too long and irrelevant, only the relevant part was copied.

Articles typically differ in length, number of firms they list, and in the opinion, they deliver to the reader. Take the *Banana cartel* (2009) as an example. 15 news articles covered that cartel (see Table 3), and there is variation in their length (and content), but also in the number of firms (companies) that are cited. Articles may refer to a single company, multiple companies or no companies at all, as it happens when articles do not mention any company name, and talk only about the cartel. For the *Banana cartel* (2009), there is limited variation in the number of firms mentioned in texts, but this is not a common pattern.

TABLE 3. News articles about the “Banana” cartel

Cartel	Source	Words	Title	N firms
Banana	Daily Mail	134	Fyffes is cleared in price-fixing probe	3
Banana	Edmonton Journal	237	Two banana importers skinned by EU for \$82M	3
Banana	European Report	413	Cartels: 60.3 million euro in fines for banana cartel	3
Banana	Irish Independent	388	Fyffes escapes EU fine after major banana price-fixing	4
Banana	The Toronto Star	135	Dole, Del Monte fined for banana price fixing	4
Banana	Agence France-Presse (English)	143	EU squashes banana cartel	3
Banana	Associated Press Financial Wire	244	EU fines banana importers for cartel actions	3
Banana	Associated Press Financial Wire	235	EU fines banana importers for price fixing	3
Banana	Associated Press Financial Wire	95	EU fines banana importers for running cartel	3
Banana	Business World (Digest)	198	Fyffes escapes EU E60m banana fine	3
Banana	Just-food Global News	187	EU: Commission fines banana cartel	3
Banana	RTE News	380	Fyffes escapes EU banana fine	3
Banana	Associated Press International	106	EU fines banana importers for running cartel	3
Banana	Associated Press International	237	EU fines banana importers for cartel actions	3
Banana	Associated Press Online	237	EU fines banana importers for price fixing	3

To give flavour of the content of an article we quote underneath one of the text articles about Banana cartel. The article below mentions all three-cartel members and the amount of the fine for all firms.

Banana importer Fyffes has escaped a €60m fine levied by the EU on its rivals Dole and Weichert for price fixing. The European Commission found that the two had participated in a cartel between 2000 and 2002. Fyffes acquired its 80% interest in

Dole and Weichert on January 1, 2003, but the court found that the price fixing did not continue after the buy-out. Another banana importer, Chiquita, was also found to be involved in the cartel, but was not fined as it provided information to the Commission, allowing officials to open their investigation. California-based Dole was fined €45.6m, with the German Weichert company and its U.S. partner Del Monte jointly accountable for a €14.7m fine. Fyffes has been under investigation since July last year, when the EU Commission charged it with operating a cartel. *Daily Mail*, *October 16, 2008*.

3.5. General overview of the data. Summing up, in this paper we assemble four different datasets. One difficulty we had to face in combining the datasets is that there was no uniform convention on naming the firms. While it was not much of a problem merging the Commission and share price datasets, it was challenging to cope with the news article data, as there, the same firm was named differently in alternative news articles. This complicated the identification of unique firms within the same cartel and the merging of news articles with the other databases. For example “British Airways”, appears shortened as “BA”, or with a dash “British-Airways” or in modified versions, such as “British Airway” or “BritishAirway”. Additional complexity was to deal with non-English firm names, such as “Société des Industries Chimique du Fluor” or “Novácke Chemick Zvody and 1.garantovaná”. We addressed this challenge by constructing a dictionary of synonyms for combinations of firm names. By fixing the firm’s name synonyms, we managed to retrieve 728 observations of firms (a small proportion of which are recidivist firms) out of the original Commission’s database of 767 firms. Of those firms, 339 are publicly listed and have data around either or both raid and decision periods.

4. METHODOLOGIES

In this section, we give an overview of the two main methodologies used in our analysis: event study, and opinion mining (sentiment analysis). Though the efficient market hypothesis literature introduced by [Fama \(1965\)](#) and then extended by [Malkiel and Fama \(1970\)](#) has been criticized by behavioural finance ([Kahneman and Tversky \(1974\)](#) and [Shiller \(1981\)](#)), its core – that information integrates into share prices immediately – still remains a principle widely accepted in the business, economics and finance literature. Recent development of text analysis contributes to this literature with sophisticated tools able to produce richer secondary data to study the relationship between share markets and opinion ([Van de Kauter et al. \(2015\)](#)).

4.1. **Event study.** We calculate the firm and market index return by taking a first difference of the corresponding log share prices. We use the market model (see [Brown and Warner \(1980\)](#) and [Brown and Warner \(1985\)](#)) to obtain a counterfactual return, and then employ a standard event study methodology ([MacKinlay \(1997\)](#)) to compute the daily abnormal returns (AR) for individual firms, and their cumulative version (CAR) over a number of different event windows. Given that part of our data overlaps with that in [Aguzzoni et al. \(2013\)](#), we benchmark our results to theirs (see Table 7 in the Appendix for a throughout comparison).¹⁰ The window for CAR spans from 20 days before the detection or decision dates, to 10 days after (31 days in total). The null hypothesis that the cumulative average abnormal return (CAAR) is zero is tested against the alternative that is greater than zero, this is tested based on the adjusted BMP test (see [Kolari and Pynnönen \(2010\)](#)). This test has the advantage of accounting for cross-sectional correlation, while being robust to serial correlation.

4.2. **Sentiment analysis.** Text mining is the process of extracting useful information from unstructured data, such as text documents, e-mails and HTML files. Various non-exclusive techniques have been developed in the literature to study unstructured texts (see for example, [Hotho et al. \(2005\)](#), [Gupta and Lehal \(2009\)](#), [Gonçalves et al. \(2010\)](#), and [Vijayarani et al. \(2015\)](#)).

We use sentiment analysis (opinion mining) to understand the sentiments (or opinions) being presented in media reports. Sentiment analysis is the computational analysis of the opinion, sentiment, and subjectivity in a text. This is done by speech tagging: breaking down the semantic structure of sentences and determining which emotional words apply to a given keyword. Sentiment is derived using a lexicon, which contains lexical units of a given language, and the sentiment associated to them. We use a simple binary sentiment value, where words or combinations of words are assigned one of the following three polarity values: -1 for negative, 0 for neutral, and 1 for positive sentiment. There is a large number of sentiment lexicons available.¹¹ For the purposes of this article, we rely on two different lexicons. One of them is the word polarity dictionary composed by [Hu and Liu \(2004\)](#), which contains around 6800 positive and negative opinion words or sentiment words for the English language. This dictionary is optimised for customer product reviews, and is a fairly general set of sentiment scores. We use this dictionary as an approximation of how a layperson would interpret a general business related news item (below, we refer to this as 'general' lexicon). On top of this, we also employ an augmented version of the same dictionary, where we use a modified

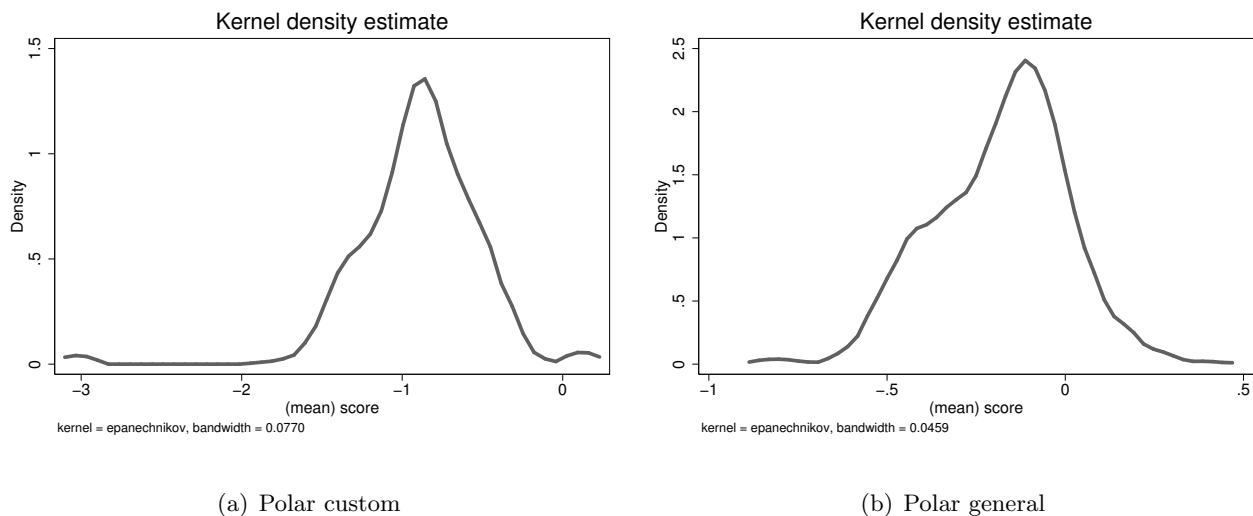
¹⁰There is some misalignment in the results, because [Aguzzoni et al. \(2013\)](#) took the index of the market where the firm had the highest market capitalization, whereas we have chosen the local market.

¹¹We experimented with a number of these, results are available from the authors.

dictionary in order to capture how subjectivity changes in a specific topic such as that of cartels. We did this through induction. Our research team - who are experts in the area of cartels - judged the word-level sentiment in terminology specific to the context and prevalent in our sample of news articles. We then introduced additional terms based on observed frequent co-occurrences. This way we added another 600 words, bi-grams and tri-grams to our dictionary (we refer to this as 'custom' lexicon).¹²

We begin the analysis of article scoring by relying on the most common sense of words. As expected the great majority of the articles produce a negative score. The density of the sentiment per-firm is represented in Figure 1. The density curves confirm that using the custom lexicon gives more negative interpretations of the same article than using the general lexicon.

FIGURE 1. Kernel density sentiment by cartel-firm



We also listed the cartels that were most negatively covered by the press. Table 4 shows the cartel that were reported most negatively by the press, using our own custom cartel-dictionary and the general polarity lexicon. The *Car-glass*, *Airfreight*, and the *Banana* cartels are top of the list for both dictionaries.¹³

4.3. Econometric model. In much the same way to Jarrell and Peltzman (1985) and Karpoff et al. (2008) we regress the cumulative abnormal rate of return (shortened with C in the notation

¹²This cartel-specific dictionary is available at: https://github.com/PeterOrmosi/private_v_public_sanctions.

¹³We have also experimented with the stemming technique. We exert the stemming procedure to both the lexicon and the words from our articles. The stemming methodology brought in new challenges as we had words with the same linguistic root and parts of the speech, but completely different sentiment in the lexicon. For this reason, we found this methodology unsuitable for the purpose of our analysis.

TABLE 4. Most negatively presented cartels (sentiment weighted by exposure)

cartel	score	number_of_articles	weighted
custom cartel-dictionary			
AIRFREIGHT	-1.04	88.00	-4.64
CAR GLASS	-1.24	30.00	-4.22
PRESTRESSING STEEL	-1.19	25.00	-3.82
METHACRYLATE (ACRYLIC GLASS)	-1.02	29.00	-3.44
BANANA	-1.19	18.00	-3.44
RUBBER (CHLOROPRENE)	-1.31	13.00	-3.37
ELEVATORS AND ESCALATORS	-0.86	39.00	-3.16
BELGIAN BEER MARKET	-1.06	17.00	-3.01
CEMENT	-1.06	17.00	-3.00
PROFESSIONAL VIDEOTAPES	-1.03	17.00	-2.92
general polarity lexicon			
CAR GLASS	-0.50	30.00	-1.72
AIRFREIGHT	-0.33	88.00	-1.46
FINE ARTS AUCTION HOUSE	-0.41	23.00	-1.29
RUBBER (CHLOROPRENE)	-0.47	13.00	-1.20
BANANA	-0.41	18.00	-1.17
STEEL BEAM	-0.28	50.00	-1.11
BATHROOM FITTINGS AND FIXTURES	-0.34	20.00	-1.03
MARINE HOSES	-0.42	10.00	-0.97
SODIUM CHLORATE	-0.42	7.00	-0.82
PRESTRESSING STEEL	-0.25	25.00	-0.82

below) at decision, against public and sources of private sanctions and their interaction, among other controls. The fine, net of the leniency reduction, inflicted by the Commission and normalized by market capitalisation seizes public sanctions (F).¹⁴ Private sanctions are proxied by two measures. The first one is media intensity (exposure, E), which is given by the number of articles documenting a cartel member misconduct. The second one is the average (by firm) sentiment of these articles (S). We regress CAAR (C) against a set of control variables (mainly cartel-level variables), and a function of the three key variables. The econometric equation for the firm j is:

$$C_j = g(E_j, F_j, S_j; \phi) + x_j \beta + \varepsilon_j, \quad j = \{1, 2, \dots, J\}. \quad (1)$$

¹⁴This normalisation follows [Aguzzoni et al. \(2013\)](#) and is aimed at indirectly controlling for firm size.

Given the interest in the penalty coefficients, we do not add cartel dummies, but control for cartel characteristics. The row vector x includes the control variables: cartel size, cartel members, cumulative abnormal rate of return at detection (to test for anticipated effects on abnormal returns around the decision date), and a dummy variable for recidivist firms. The notation employed in Equation 1 suggests that the dataset is cross-section, but the presence of recidivist firms would have made a panel notation more appropriate.¹⁵ However, as only 13% of the firms are recidivist, we maintain the light touch cross-sectional notation.

5. RESULTS

In this section, we first discuss the predicted abnormal rate of returns and then address the effect of private and public sanctions on the (cumulative) abnormal rate of returns. Table 5 displays the average abnormal rate of return from 20 days prior to the event, to 10 days after the event, where the event represents either the raid or the decision about the cartel conviction. The table also reports the p-value of one-tailed test J -statistic.¹⁶

The average abnormal rate of return is negative and mildly significant both at the day of the raid, and at the day of the decision. The drop in share prices is more accentuated at the raid, 0.73%, than at decision, 0.33%. There are a couple of mildly significant drops in returns 6 and 9 days prior to the raid. The largest reduction occurs 9 days before the raid. This is not what one would expect as raids are supposed to be secret and therefore unanticipated. [Aguzzoni et al. \(2013\)](#) have investigated this anomaly.¹⁷ A sharp drop in price is not present around the decision date, as highlighted in the third column of Table 5.

Anticipation of the investigation of cartel is confirmed by a graphical inspection of the trend of the cumulative average abnormal rate of return captured by the dotted line in Figure 2, which shows a drop in the CAAR around the raid. Interestingly CAAR for the decision dates has a similar trend, but is smoother than CAAR for detection - with a less pronounced decline around the decision date (i.e. with larger anticipation effect).

The analysis of the cumulative average abnormal returns displayed on the bottom panel of Table 5 shows that share prices significantly (or mildly significantly) drop around the raid. By looking at

¹⁵For example, Atochem and Akzo appear in the original dataset 9 and 7 times, respectively.

¹⁶The abnormal rate of return estimation is conducted using the Stata package `eventstudy2`, written by [Kaspereit \(2016\)](#).

¹⁷They dropped cases that had previously been investigated in the US or where leniency had been applied to the cartel, but found that results were even worse (i.e. more accentuated drop in prices prior to the raid) when these problematic observations were removed.

TABLE 5. Predicted abnormal rate of returns at the raid and at decision (%)

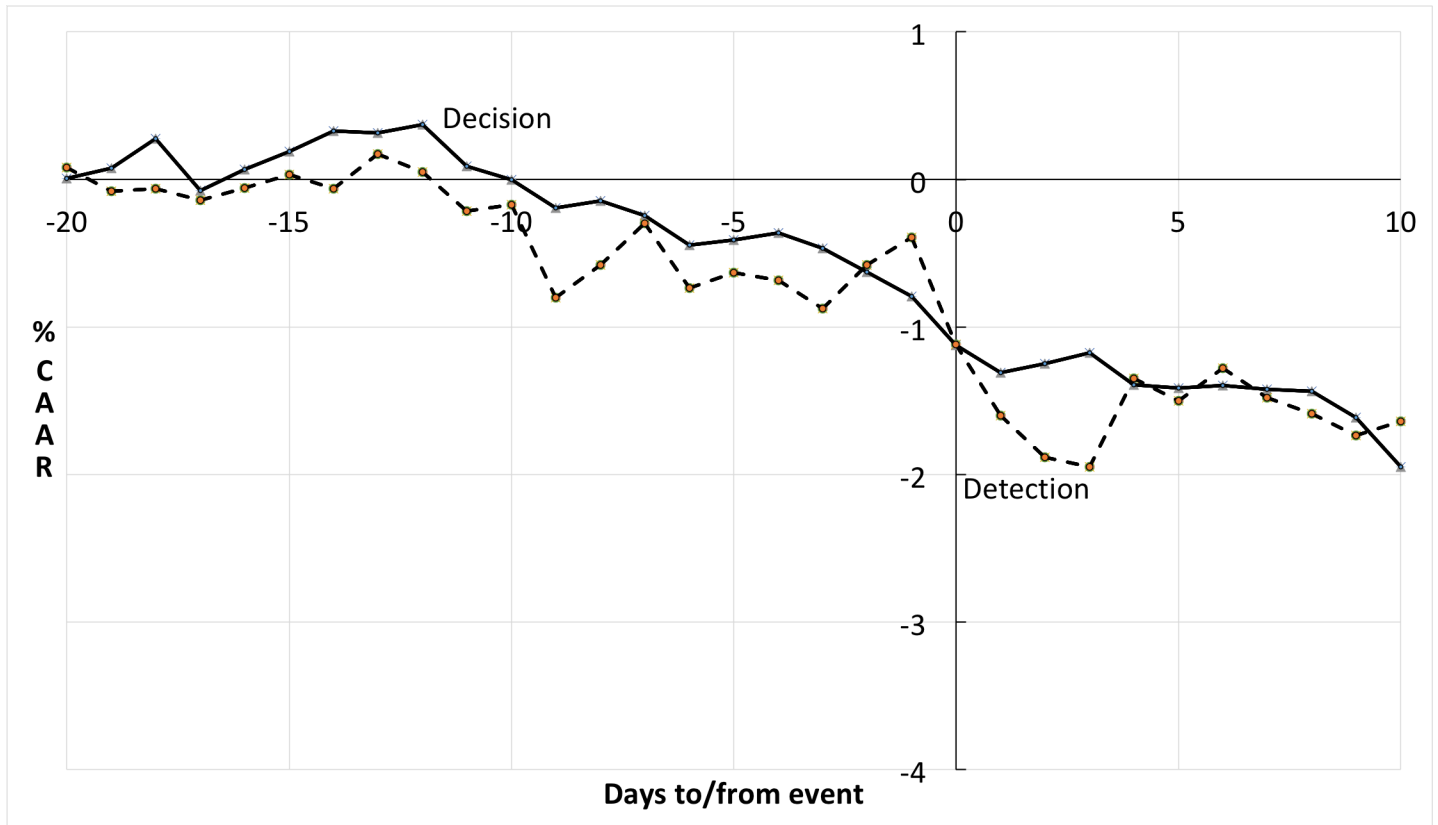
	Raid		Decision	
	Mean	J p-val	Mean	J p-val
	(1)	(2)	(3)	(4)
Days to event			AAR	
-20	0.080	0.169	0.005	0.321
-19	-0.160*	0.078	0.071	0.421
-18	0.015	0.212	0.198	0.198
-17	-0.075	0.246	-0.349	0.066
-16	0.080	0.442	0.143	0.317
-15	0.093	0.297	0.121	0.268
-14	-0.098	0.404	0.138	0.215
-13	0.238	0.448	-0.010	0.415
-12	-0.125	0.348	0.056	0.347
-11	-0.264	0.240	-0.283*	0.076
-10	0.042	0.349	-0.093	0.500
-9	-0.629***	0.002	-0.189	0.184
-8	0.223	0.108	0.045	0.497
-7	0.281	0.171	-0.101	0.184
-6	-0.438**	0.032	-0.197	0.135
-5	0.104	0.281	0.033	0.404
-4	-0.051	0.351	0.046	0.298
-3	-0.188	0.484	-0.101	0.146
-2	0.295	0.133	-0.163	0.118
-1	0.187	0.219	-0.164	0.195
0	-0.728*	0.064	-0.330*	0.095
1	-0.481**	0.011	-0.187	0.343
2	-0.284*	0.075	0.059	0.162
3	-0.065	0.468	0.075	0.420
4	0.599*	0.066	-0.216	0.200
5	-0.153	0.491	-0.025	0.456
6	0.224	0.243	0.018	0.302
7	-0.201	0.356	-0.024	0.420
8	-0.108	0.292	-0.013	0.376
9	-0.149	0.290	-0.179	0.172
10	0.097	0.268	-0.333*	0.082
Event window			CAAR	
[-1, 1]	-1.022*	0.054	-0.681*	0.061
[-5, 5]	-0.765	0.265	-0.972	0.190
[-10, 10]	-1.424*	0.065	-2.036**	0.034
Obs.	194		315	

One-sided test, significance levels: ***1%, **5%, and *10%.

the [-10,10] window, the model predicts that the cartel decision deflates prices by 2.04%, of which negative 0.68% is cumulated in the immediacy of the decision (± 1 day). The CAAR suggests that there is a mild effect on share prices in the immediacy of the decision, but this is an average effect. There are firms whose cumulative share prices ± 1 day of the decision is largely positive (top 1% cumulative abnormal price is +9.62%), and firms where the effect on share prices is substantially negative (bottom 1% cumulative abnormal price is -17.18%). The standard deviation is 4.27%. This heterogeneity is exploited in the final stage of the empirical analysis, which is discussed in the next section.

5.1. The impact of private and public sanctions. We regress the cumulative average abnormal rate of return for each of the three time intervals displayed in the bottom panel of Table 5 against a set of control variables and the four key variables included in the g function in Equation 1. We

FIGURE 2. % CAAR around the raid and the EU decision date [-1,1]

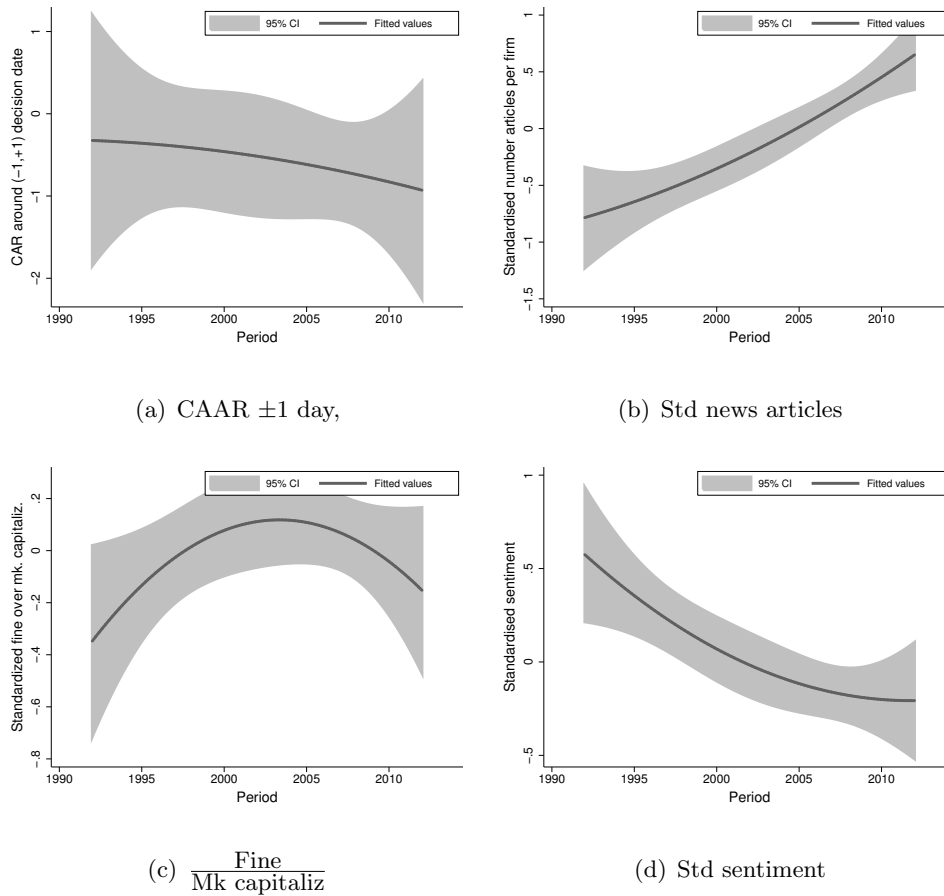


conduct the analysis only at the decision date because very few (in most cases zero) media articles were published around the raid.

The time trend of the four key variables is plotted in Figure 3. It can be seen that CAAR [-1,1], and the number of news articles are characterised by a steady trend: downward the former, and upward the latter. By contrast, standardised fine over market capitalisation and standardised sentiment display an inverse U-shape and U-shape relationships, respectively. There seems to be an inverse relationship between normalised fines and standardised sentiment, but not clear pattern between number of news articles and fine emerges. In the sentiment analysis we did not include the fine in the analysed texts (the amount was excluded from the text), however even with this exclusion, it is normal to expect negative correlation between the fine and the sentiment. It would go against intuition to see positive deviations of fines (large fines) matched with positive deviations of sentiment.

The regression results are reported in Table 6. We have information on the CAAR for 300 publicly listed firms, but 14 observations were not suitable to be included in the analysis, as they presented

FIGURE 3. Key variable trend



a value of fine over market capitalisation in excess of 30%, which we suspect to be a measurement error. We thus dropped those observations. There is no information on cartel duration (and other characteristics) for 35 observations. Instead of dropping these observations, we add a zero to duration and additionally include the dummy variable *missing cartel duration* to account for lack of information. The baseline regression (column 1) does not include the two sources of private sanctions. Columns (2)-(3) account for the two determinants of private sanctions using the custom cartel-dictionary, and columns (4)-(5) repeat the exercise using the general polarity lexicon. The variables used as controls are cartel size, number of cartel members, a dummy for recidivist firms, a dummy indicating whether leniency was applied to that cartel, and a dummy for observations that had no data on cartels.

The fine imposed on cartel members appears to negatively affect share prices when we do not account for a reputational sanction. This would suggest, assuming rationality, that public sanctions are likely to act as a deterrent to corporate misbehaviour. The question is, whether reputational

TABLE 6. Linear regression analysis using windows of percentage CAR as dependent variable

		custom sentiment		general sentiment	
constant	-0.442 (0.879)	-0.039 (0.990)	0.172 (1.042)	-0.418 (0.907)	-0.434 (0.953)
F	-0.994 ^a (0.330)	-0.998 ^a (0.335)	-0.356 (0.796)	-0.993 ^a (0.333)	-0.885 (0.682)
E		-0.023 (0.019)	-0.025 (0.062)	-0.023 (0.020)	-0.023 (0.032)
S		0.522 (0.548)	0.547 (0.641)	0.339 (1.323)	0.140 (1.666)
EF			-0.113 (0.090)		-0.022 (0.069)
ES			0.002 (0.064)		0.016 (0.116)
FS			0.825 (0.958)		0.479 (2.547)
EFS			-0.136 (0.085)		-0.112 (0.201)
trend	-0.020 (0.049)	0.004 (0.052)	-0.001 (0.052)	0.005 (0.053)	0.006 (0.053)
market capitalization	0.009 ^c (0.005)	0.010 ^c (0.005)	0.008 (0.006)	0.011 ^b (0.005)	0.010 (0.006)
Cartel variables:					
- duration	-0.023 (0.051)	-0.037 (0.051)	-0.035 (0.051)	-0.033 (0.050)	-0.032 (0.050)
- members	0.004 (0.015)	0.004 (0.015)	0.002 (0.015)	0.006 (0.015)	0.006 (0.015)
Dummy variables:					
- leniency	0.029 (0.638)	0.006 (0.635)	0.031 (0.641)	0.010 (0.639)	0.017 (0.643)
- missing duration	-0.248 (0.891)	-0.629 (0.904)	-0.649 (0.904)	-0.322 (0.897)	-0.316 (0.899)
- recidivist firm	0.426 (0.464)	0.386 (0.465)	0.351 (0.462)	0.416 (0.462)	0.419 (0.458)
F-statistic	3.489 ^a	2.980 ^a	2.320 ^a	2.810 ^a	2.040 ^c
R-sq	0.069	0.074	0.079	0.072	0.073
Obs	286	286	286	286	286

Significance level: ^a $p < 0.01$, ^b $p < 0.05$, ^c $p < 0.10$. Clustered (by firm) standard error in parenthesis. Since 75 out of 286 observations had no information on cartel duration, the duration variable is zero for these observations and the dummy variable missing duration takes value one.

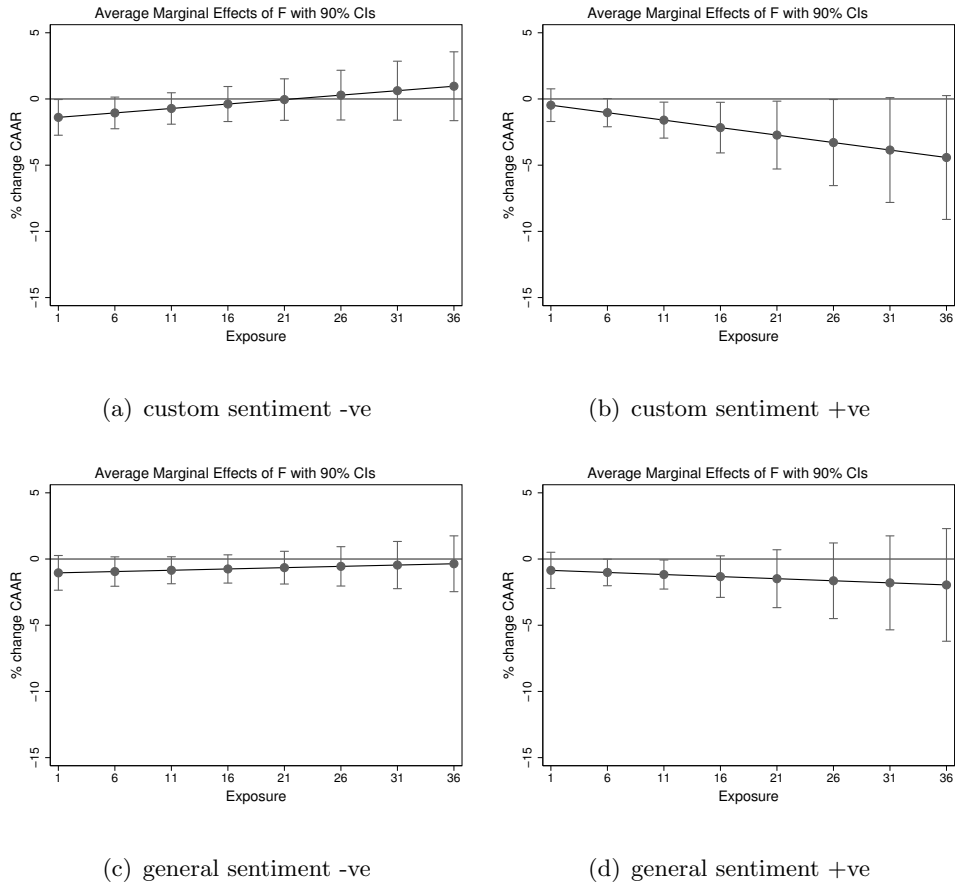
factors have any role to play? To decide, in columns (3) and (5) we included our measure of media exposure and sentiment, together with a number of interaction terms between the public fine and our measure of the private sanction (media exposure and sentiment). To help interpretation of these effects, in Figure 4 we document the marginal effect of the public sanction given various levels of media exposure and sentiment. As fines (over market capitalization) are standardised, a unitary increase in fines is equivalent to one standard deviation increase. We identify negative and positive sentiment based on the 5% and 95% distribution of the sentiment, and different levels of exposure.

A number of interesting findings arise. First of all, if exposure is very low the marginal effect of the fine is negative (larger fine, larger loss in market valuation) irrespective of the sentiment of the news coverage. Put differently, if businesses are not exposed much on the media pillory, then the only thing that affects the market valuation of the misbehaving business is the amount of fine they receive. As soon as there is larger negative exposure, the public fine loses its effectiveness. If the sentiment is negative, then increasing exposure eliminates the negative effect of the fine. If the sentiment is positive, then at low exposure the public sanction does not seem to have a significant effect but as the exposure of positive sentiment increases, the effect of the fine becomes more negative.

A central question in the law and economics literature is whether public and private sanctions are substitutes or complements in their deterrent effect. Karpoff et al. (1993) argue that public and private sanctions are non-perfect substitutes in terms of their deterrent effect. The above discussion provided some evidence that in the case of cartels, the administrative penalty has a more negative effect on the market valuation of the cartel members if there is no reputational damage. On the other hand, the negative effect of administrative penalty disappears if the news exposure is negative (i.e. there is a reputational penalty). Along the conventional breakdown of substitute/complement effects, this would serve as evidence that in this specific case public and private sanctions are substitutes, confirming the findings of studies like Karpoff et al. (1993).

The above findings are stronger for the custom sentiment dictionary, which means that when readers are better informed about the negative consequences of cartels, their evaluation of cartel related news will be more damning. This would suggest that in order to maximise the negative effect of a misbehaviour, society should not only work on sanctioning deviant firms, but on improving public awareness about the seriousness of these offences, as it is a crucial component of effective reputational effects.

FIGURE 4. Marginal effect % change CAAR with respect to 1SD increase in fines (standardised)



6. CONCLUSION AND DISCUSSION

We found some evidence that public fines are only effective if not substituted out by a negative reputational damage. This would suggest that when administering a pecuniary sanction, policy-makers should consider the level and content of media exposure and use of language that lays bare the gravity of the conduct. Media exposure and the disseminated information can be seen as an endogenous factor, which can be influenced (controlled) by the regulator - for example if it wants to intensify the effect of private sanctions (naming and shaming). By ensuring that the public receives wider and more negative information on the discovered cartel, they can increase the reputational penalty.¹⁸

¹⁸Of course, if the regulator were to use the cocktail of private and public sanctions on a more regular basis, then share prices might anticipate that. This would change the results presented in this work, possibly leading to no effect on high exposure, and larger positive effect for limited exposure - as this will be expected to be more of a rare event.

Although this paper is an application to cartel conduct, the evidence provided here has strong general policy implications. Most importantly, if private and public sanctions are indeed substitutes, then the fining bodies might want to account for the reputational damage before imposing a fine to avoid over-enforcement. Moreover, if the policymaker wants to further publicise the misconduct, and alert the public of the damage caused by such conduct, it will have an impact of how the public sanction affects deterrence.

This paper should be seen as a new framework to empirically evaluate the effectiveness of the combination of private and public sanctions using sentiment analysis to retrieve information on how costumers and consumers are informed about the misconduct. However, there are important aspects that this work was not able to cover, but are worth studying in the future. There is much to learn on richer information on the exposure to the news. We have used a straightforward count of news as metric of exposure, simply because we did not manage to capture the readership of the various sources. We did try to gather this information, but variation of readership over time and lack of information on readership for online and offline sources became too much of a challenge to have consistently reliable figures. Another aspect worth researching is the different use of language for domestic companies and international companies. One could study the presence of a bias for domestic companies. A similar distinction can be drawn between industry specialised news, news agencies, and consumer news, as they may use different languages and trigger different sentiments. These are ideas for future research on an area that there is still much to learn. Machine learning and artificial intelligence are fast evolving and their development helps making more of a routine the sentiment analysis conducted in this work.

APPENDIX A. TABLES

Table 7: Cartel characteristics

Cartel	size	year bust	year detection	year conviction	duration (in years)	ring leader	market coverage	quota	market share allocation	price fixing	bid rigging	NACE 2
UK Agric tractors												
Shipowners												
Quantel Internat												
Chemin de fer												H49
Cewal, Cowac and Ukwal	3	2003	1991	1992	2		0.81	1	1	0	0	
Steel Beams	18	1991	1991	1994	3	0		1	1	1	0	C25
Cartonboard	19	1991	1991	1994	3	0		1	1	1	0	C17
PVC	12	1984	1983	1994	3	0		1	1	1	0	C22
Cement	76	1992	1990	1994	9	1		0	1	1	0	C23
Freight confer												
Fenex	4	1991	1991	1996	4	1	0.11	0	0	1	0	H52
Ferry operators												
Extra d'alliage	6	1995	1995	1998	4	0	0.92	0	0	1	0	C24
TACA												
British sugar	4	1990	1990	1998	4	1	0.92	0	0	1	0	C10
Gas switchgear	11	2004	2004	2007	16	1	1.00	1	1	1	1	C27
Greek ferries	7	1992	1992	1998	7	1	1.00	0	0	1	0	H50
FEG & TU												
Steel tubes	8	1994	1994	1999	5	0	1.00	0	1	0	1	C24
FETTSCA	15	1992	1992	2000	23	0	0.73	1	1	1	0	H50
Amino acids	5	1995	1995	2000	5	1	1.00	1	1	1	0	C10
Carb de soude Solvay-CFK												
SAS + Maersk Air	2	1998	1994	2001	2	1	1.00	0	1	0	0	H51
Graphite electrodes	8	1997	1997	2001	6	1	0.85	1	1	1	0	C28
Commissions bancaires												
Vitamins	13	1994	1998	2001	9	1	0.91	1	1	1	0	C21
Interbrew + Alken Maes												C.11
Luxembourg brewing	4	2000	2000	2001	15	0	0.85	0	1	0	0	C11
Citric acid	5	1998	1995	2001	4	1	0.60	1	1	1	1	C20
Zinc phosphate	6	1998	1998	2001	4	0	0.98	1	1	1	0	C20
Commissions bancaires D	5	1999	1999	2001	4	0	0.39	0	0	1	0	K64
Carbonless paper	11	1995	1996	2001	4	1	0.90	1	1	1	0	C17
AU Banken	8	1998	1998	2002	4	0	1.00	0	0	1	0	K64
Methionine	3	1999	1999	2002	13	0	0.60	1	1	1	0	C20
Medical gases	7	1997	1997	2002	4	0	0.87	0	0	1	0	C20
Fine art auctions	2	2000	1997	2002	7	0	0.90	0	0	1	0	R91
Methylglucamine	2	1999	1998	2002	9	0	1.00	0	1	1	0	C20
Plasterboard	4	1998	1998	2002	7	0	0.99	1	1	1	0	C23
Graphite	8	1996	1999	2002	5	1	0.80	0	1	1	0	C20
Food flavour	4	1998	1995	2002	10	0	0.90	0	1	1	0	C20
Ronds bton												
Sodium gluconate	5	1995	1997	2002	8	1	1.00	1	1	1	0	C20
Viandes Bovines												
Sorbates	5	1996	1998	2003	18	1	1.00	1	1	1	0	C20
Carbon and graphite	6	1999	2001	2003	11	0	0.93	0	1	1	1	C28
Organic peroxyde	5	1999	2000	2003	29	0	0.93	1	1	1	0	C20
Tubes industriels	6	2001	2001	2003	13	0		0	1	1	0	C.33
CEWAL, MEWAC ...		1989	1989	2004	2		0.90	0	1	0	0	H50
Copper tubes	8	2001	2001	2004	13	0	0.79	0	1	1	0	C33
FR beer	2	1996	1999	2004	0	0	0.75	1	1	0	0	C11
Raw Tobacco (ES)	4	2001	2001	2004	5	1	0.98	0	0	1	0	C12
Needles	3	1999	2000	2004	5	1	0.95	0	1	0	0	C14
Choline chloride	3	1998	1998	2004	6	0	0.76	1	1	1	0	C20
MCAA	4	1999	1999	2005	15	0	0.96	1	1	1	0	C20
Thread	10	1996	2000	2005	12	1	0.87	0	1	1	1	C13
EMC												
Raw Tobacco IT	4	2002	2002	2005	6	0	0.56	0	1	1	1	G46
Industrial bags	16	2001	2001	2005	21	0	0.75	0	1	1	1	C22
Rubber chemicals	4	2002	2002	2005	6	0	0.58	1	1	1	0	C20
Perborate	9	2000	2000	2006	7	0	0.96	0	1	1	0	C20
Methacrylates	5	2002	2002	2006	6	1	0.87	0	0	1	0	C22
Bitumen NL	14	2002	2002	2006	8	1	1.00	0	0	1	1	C20

Fittings	11	2001	2001	2006	15	0	0.95	0	1	1	1	C33
Butadiene Rubber	6	2002	2003	2006	7			0	1	1	0	C20
Alloy surcharge		1994	1997	2006	1			0	0	1	0	C.24
Elevators	5	2004	2004	2007	9	0	0.86	1	1	0	1	C28
NL beer	4	1999	1999	2007	4	0	0.90	0	1	1	0	C11
Fasteners	6	1999	2001	2007	10	0	0.97	0	1	0	0	C14
Bitumen ES	5	2002	2002	2007	12	1	0.91	1	1	1	1	C19
Videotape	3	2002	2002	2007	3	0	0.89	0	0	1	1	C26
Flat glass	4	2005	2005	2007	1	0	0.80	0	0	1	0	C23
Chloroprene Rubber	6	2000	2002	2007	9	0	0.89	1	1	1	0	C17
Nitrile Rubber	2	2000	2002	2008	9	0	0.89	1	1	1	0	C17
Removal services	11	2003	2003	2008	19	0	0.50	0	1	0	1	H52
Deep-sea transport												
Sodium chlorate	5	2000	2003	2008	5	0	0.93	1	1	1	0	C20
Aluminium fluoride	5	2000	2005	2008	1	0		1	1	1	0	C20
Candle waxes	10	2005	2005	2008	13	1	0.75	0	1	1	0	C20
Bananas	3	2002	2005	2008	3	0	0.43	0	0	1	0	A01
Carglass	4	2003	2005	2008	5	1	0.93	0	1	0	1	C29
Marine hoses	6	2007	2007	2009	21	1	0.92	1	1	1	1	C22
Printers (EFIM complaint)												
E.On - GdF	3	2005	2006	2009	26		1.00	0	1	0	0	D35
Carbide and magnesium	8	2007	2007	2009	3	0	0.80	0	1	1	0	C20
Power transformers	7	2003	2004	2009	4	0		0	1	0	0	C27
Heat stabilisers	11	2000	1999	2009	13	0	0.90	1	1	1	0	C20
DRAMS	10	2002	2002	2010	4	0	0.93	1	0	1	0	C26
Bathroom fittings	17	2004	2004	2010	12			0	0	1	0	C23
Pre-stressing steel	17	2002	2002	2010	18	0	0.84	1	1	1	1	C24
Animal phosphates	6	2003	2003	2010	35	0	0.69	1	1	1	0	C20
Airfreight	14	2006	2006	2010	6		0.22	0	0	1	0	H51
LCD	6	2006	2006	2010	4	0	0.82	0	0	1	0	C26
Consumer detergents	3	2005	2008	2011	2			0	0	1	0	C20
Exotic fruit	2	2005	2005	2011	1	0	0.50	0	0	1	0	A01
CRT glass bulbs	4	2004	2009	2011	4	0		0	0	1	0	C23
Refriger compressors	5	2007	2009	2011	4	0		0	1	1	0	C28
Freight forwarding	15	2007	2007	2012	4			0	0	1	0	H53
Mountings windows	9	2007	2007	2012	7			0	0	1	0	C25
Water management	3	2008	2008	2012	2			0	0	1	0	C25
TV and PC tubes	8	2006	2007	2012	9			0	1	1	0	C26
BR/ESBR recidivism			2003									
Automotive wire	5	2009	2010	2013	9	1		1	0	1	0	C29
Shrimps	4	2009	2009	2013	9	0	0.85	0	1	1	0	G46
Euro rate derivatives	8	2008	2011	2013	3	0		0	0	1	0	K64
Yen rate derivatives	6	2010	2010	2013	4	0		0	0	1	0	K64
Polyurethane foam	4	2010	2010	2014	5	0		0	0	1	0	C31
Power exchanges	2	2012	2012	2014	1	0		0	1	0	0	D35
Automotive bearings	6	2011	2011	2014	7	0		1	0	1	0	C28
Steel abrasives	4	2010	2010	2014	7	0		1	0	1	0	C23
Power cables	26	2009	2006	2014	10	0		0	1	0	0	C27
Mushrooms	3	2012	2012	2014	2	0		0	1	1	0	C10
Smart card chips	4	2005	2008	2014	2	0		0	1	1	0	C26
Swiss Franc rate deriv	4	2007	2011	2014	0	0		0	0	1	0	K66
Envelopes	5	2008	2010	2014	5	0		0	1	1	1	C17
Parking heaters	2	2011	2013	2015	10	0		0	1	1	0	C29
Food packaging	10	2008	2008	2015	8	0		0	1	1	1	C22
Car battery	5		2012	2015	3	0		0	0	1	0	E38
Blocktrains	3	2012	2013	2015	8	0		0	1	1	0	H49
Cement related products			2008	2015								C23
Optical disc drives	8	2008	2009	2015	5	0		0	0	0	1	C26
Gas switchgear	2	2007	2012	2012	16	0		0	1	0	0	C27

Table 8: Comparison with Aguzzoni et al (2013)

firm	cartel	date detection	date decision	% CAR detection	% CAR detection Aguz- zoni et al	% CAR decision	% CAR decision Aguz- zoni et al	fine over mk cap	fine over mk cap Aguz- zoni et al
1	john deere		04/03/92			-0.62			
2	ford		04/03/92			-0.46		0.00	
3	deutz		04/03/92			-2.07		0.00	
4	fiat		04/03/92			0.66		0.00	
5	maureletprom		01/04/92			1.86		0.00	
6	leifhoegh		01/04/92			-3.42		0.03	
7	eastasiatic		01/04/92			0.41		0.01	
8	evergreen		01/04/92			0.67		0.00	
9	british steel	16/01/91	16/02/94	-0.59		-2.10	1.10	1.10	
10	cockerill-sambre	16/01/91	16/02/94	-1.41					
11	krupp hoesch	16/01/91	16/02/94	3.63		1.81	0.00	0.00	
12	norsk jernverk	16/01/91	16/02/94	-0.13		1.43	0.00	0.00	
13	peine-salzgitter	16/01/91	16/02/94	3.54		9.93	0.00	0.00	
14	preussag	16/01/91	16/02/94			0.00			
15	ssab	16/01/91	16/02/94	8.77		-1.66	0.00	0.00	
16	thyssen	16/01/91	16/02/94	-0.21		0.20			
17	cascaades	23/04/91	13/07/94	-2.91		-0.16		3.83	
18	stora	23/04/91	13/07/94	1.81		-1.09		1.68	
19	sca holding	23/04/91	13/07/94	-0.87	2.86	0.70	13.78	0.02	0.27
20	bpb	23/04/91	13/07/94	0.45		-1.39		0.11	
21	mayr melnhof	23/04/91	13/07/94			-3.58		4.07	
22	edison/ausimont	21/11/83	27/07/94			1.52		1.42	
23	ici	21/11/83	27/07/94			-0.27	4.04	0.04	0.03
24	shell	21/11/83	27/07/94			-1.41	-1.86	0.00	0.00
25	norskhydro	21/11/83	27/07/94			-0.32	7.24	0.00	0.03
26	solvay	21/11/83	27/07/94			5.25	2.45	0.11	0.15
27	basf	21/11/83	27/07/94			-0.51	-2.13	0.02	0.02
28	hoechst	21/11/83	27/07/94			-3.35	-4.91	0.02	0.02
29	dsm	21/11/83	27/07/94			-0.95		0.03	
30	enichem	21/11/83	27/07/94			0.59			
31	cementir	01/04/89	30/11/94			2.51	11.67	4.46	4.49
32	dyckerhoff	01/04/89	30/11/94			-3.05	-6.60	2.66	1.45
33	italcementi	01/04/89	30/11/94			2.94	8.83	3.71	2.79
34	holderbank	01/04/89	30/11/94			0.27		0.51	
35	ciments francais	01/04/89	30/11/94			-5.61	-3.71	4.17	4.22
36	cimpor-cimentos pt	01/04/89	30/11/94			-2.08		0.80	
37	heracles cement	01/04/89	30/11/94			-5.61		1.66	
38	fratellibuzzis.p.a.	01/04/89	30/11/94			-0.75		1.53	
39	vicats.a.	01/04/89	30/11/94			2.09		1.32	
40	lafarge	01/04/89	30/11/94			-0.14	-6.57	0.45	0.47
41	bluecircle plc	01/04/89	30/11/94			1.61		0.72	
42	heidelberger	01/04/89	30/11/94			2.29	-6.65	0.71	0.69
43	titan cement company		30/11/94			-2.76	-6.57	2.63	2.26
*	buzzi unicem		30/11/94				-6.77		1.31
44	the rugby group plc	01/04/89	30/11/94			-0.01		0.65	
45	vicats.a.	01/04/89	30/11/94			2.09		1.32	
46	evergreen		21/12/94			-6.09		0.00	
47	p&co nedlloyd		21/12/94			0.54		0.00	
48	mitsui osk lines		21/12/94			2.59	-8.99	0.00	0.00
49	ap moeller-maersk		21/12/94			4.00		0.00	
50	malaysian shipping		21/12/94			-1.79		0.00	
51	neptune orient lines		21/12/94			0.87	0.79	0.00	0.00
52	nippon yusen		21/12/94			-1.18	-5.72	0.00	0.00
53	orient overseas		21/12/94			-1.79	3.49	0.00	0.00
54	hapag lloyd		21/12/94			-1.06		0.00	
55	kawasaki		21/12/94			0.00	-6.73	0.00	0.00
56	p&co nedlloyd	06/04/93	30/10/96	0.78		1.54		0.01	
*	thyssenkrupp		21/01/98				-6.12		0.13
57	acerinoxsa		21/01/98			0.48	-4.02	0.21	0.22
58	hyundai		16/09/98			2.93	-6.37	0.00	8.46
59	nippon yusen		16/09/98			-0.18	3.06	0.00	0.64
60	p&co nedlloyd		16/09/98			-4.57	-31.88	13.41	14.28
61	ap moeller-maersk		16/09/98			3.89	-10.18	0.13	0.50
62	neptune orient lines		16/09/98			-11.12	-11.6	4.79	4.49
63	hanjin		16/09/98			-4.08	-15.44	0.09	65.89
64	orient overseas		16/09/98			0.29	-14.44	1.48	13.08
65	tate and lyle	27/05/94	14/10/98		-10.43	-8.98	-8.95	0.51	0.35
66	minoan	05/07/94	09/12/98			-3.46	-8.24	0.71	0.7
67	dalmine	01/12/94	08/12/99	4.99		-0.32		4.75	
68	kawasaki	01/12/94	08/12/99	-1.25		4.04		0.01	
69	british steel	01/12/94	08/12/99	0.67		3.71		0.32	
*	sumitomo metal	01/12/94	08/12/99		-16.81		4.17		0.42
70	vallourec	01/12/94	08/12/99	-5.53		-3.08	-4.46	2.23	2.23
71	nippon steel	01/12/94	08/12/99	-4.82	-8.47	0.40	-6.66	0.15	0.08
72	yangming		16/05/00			-4.17		0.00	

153	carbone lorraine	carbon and graphite		03/12/03			-12.81	-18.41	12.88	12.91
154	akzo	organic peroxyde		10/12/03			-2.92	6.21	0.00	0.00
155	outokumpu	indust. copper tubes	22/03/03	16/12/03	-19.38		1.72		0.99	
*	kme	indust. copper tubes	22/03/03	16/12/03		14.73		-7.80		8.25
154	boliden	copper plumbing tubes	22/03/01	03/09/04	5.25		-5.69		-5.69	
*	kme	copper plumbing tubes	22/03/01	03/09/04		-5.04		6.49		21.25
155	outokumpu	copper plumbing tubes	22/03/01	03/09/04	-19.38	-20.57	-1.69	-5.09	1.52	1.52
156	mueller	copper plumbing tubes	22/03/01	03/09/04	1.42		3.92		0.00	
157	halcor	copper plumbing tubes	22/03/01	03/09/04	-0.77	-4.15	-2.86	-1.94	5.36	5.28
158	imi	copper plumbing tubes	22/03/01	03/09/04	-2.62		0.21		3.51	
159	heineken	french beer	25/01/00	29/09/04	5.77	18.16	-0.89	0.85	0.01	0.01
*	danone	french beer	25/01/00	29/09/04		-0.10		-6.08		0.01
160	kronenbourg	french beer	25/01/00	29/09/04	-3.16		0.26		0.04	
161	coats	needles	07/11/01	26/10/04	1.10		-4.05		2.81	
162	basf	animal feed		09/12/04			-0.91	5.6	0.12	0.12
163	ucb	animal feed		09/12/04			0.20	8.79	0.17	0.18
164	akzo	animal feed		09/12/04			2.24	1.34	0.23	0.23
165	hoechst	monochloroacetic	14/03/00	19/01/05	4.94		0.33		0.14	
166	akzo	monochloroacetic	14/03/00	19/01/05	7.86		-0.59		0.91	
167	clariant	monochloroacetic	14/03/00	19/01/05	-2.15		0.92		0.00	
168	coats	industrial thread	07/11/01	14/09/05	1.10		6.17		1.02	
169	dimon	raw tobacco italy	18/04/02	20/10/05	-6.86	8.74	-5.16	-23.02	3.40	4.27
170	low & bonar	industrial bags	26/06/02	30/11/05	-1.99	-22.52	11.03	10.55	9.65	6.22
171	british polythene	industrial bags	26/06/02	30/11/05	1.26	13.05	2.98	6.71	0.00	0.00
172	kendrion	industrial bags	26/06/02	30/11/05	-6.63	-12.59	-11.79	-31.57	19.69	21.76
*	trioplast	industrial bags	26/06/02	30/11/05		-21.26		-2.72		1.44
173	nordenia int.	industrial bags	26/06/02	30/11/05	-0.06					
174	upm-kymmene	industrial bags	26/06/02	30/11/05	-6.27	-11.84	0.38	0.11	0.68	0.67
175	sachsa verpackung	industrial bags	26/06/02	30/11/05	-3.29	-8.35	0.41	11.43	10.71	10.92
176	chemtura	rubber chemicals	26/09/02	21/12/05	-1.24					
177	bayer	rubber chemicals	26/09/02	21/12/05	0.26	2.31	2.82	0.43	0.23	0.23
178	akzo	hydrogen peroxide	25/03/03	03/05/06	-2.59	14.03	0.28	2.91	0.61	0.19
179	solway	hydrogen peroxide	25/03/03	03/05/06	-3.28	5.99	0.81	8.25	2.16	2.11
180	fmc corporation	hydrogen peroxide	25/03/03	03/05/06	0.73	7.89	2.51	3.56	1.00	1.25
181	air liquide	hydrogen peroxide	25/03/03	03/05/06	-0.27		-0.33		0.00	
182	kemira	hydrogen peroxide	25/03/03	03/05/06	0.35	7.09	-1.30	-6.39	1.85	1.89
183	edison/ausimont	hydrogen peroxide	25/03/03	03/05/06	0.96		-2.76	1.51	29.04	0.85
184	degussa	hydrogen peroxide	25/03/03	03/05/06	-1.65		-1.15		0.00	
185	degussa	acrylic glass	25/03/03	31/05/06	-1.65		1.28		0.00	
186	ici	methacrylate	25/03/03	31/05/06	-50.46		-2.02		2.13	
187	barlo	methacrylate	25/03/03	31/05/06	7.40					
188	shell	bitumen netherlands	01/10/02	13/09/06	2.63	4.42	-2.52	-12.94	0.22	0.06
189	koninklijke bam	bitumen netherlands	01/10/02	13/09/06	3.56		-4.77		0.81	
190	wintershall	bitumen netherlands	01/10/02	13/09/06			-0.02			
191	heijmans	bitumen netherlands	01/10/02	13/09/06	-2.22	5.54	-1.95	-16.84	1.87	1.89
*	total	bitumen netherlands	01/10/02	13/09/06		-11.17		-19.96		0.78
*	bam	bitumen netherlands	01/10/02	13/09/06		6.59		-8.10		0.02
192	bp	bitumen netherlands	01/10/02	13/09/06	-2.14	-9.69	-0.10	-7.72	0.00	0.00
193	ballast nedam	bitumen netherlands	01/10/02	13/09/06	20.04		-3.38		1.58	
194	aalberts	copper fittings	22/03/01	20/09/06	-6.73	-9.01	-7.11	-14.71	6.87	7.00
195	legris	copper fittings	22/03/01	20/09/06	0.59					
196	tomkins	copper fittings	22/03/01	20/09/06	-6.30		-3.58		0.26	
197	mueller	copper fittings	22/03/01	20/09/06	1.42	13.57	-0.34	-27.92	0.00	0.00
198	imi	copper fittings	22/03/01	20/09/06	-2.62	-11.15	1.31	4.34	2.91	1.94
199	alstom	gas-insulated	11/05/04	24/01/07	-11.74	-41.58	-4.13	-15.21	0.48	0.49
200	areva	gas-insulated	11/05/04	24/01/07	-0.69	-9.68	2.00	12.11	6.17	0.25
201	hitachi	gas-insulated	11/05/04	24/01/07	-1.92	-0.46	5.94	10.94	0.01	0.29
202	schneider	gas-insulated	11/05/04	24/01/07	-1.69	2.75	-0.22	8.5	0.04	0.04
203	abb	gas-insulated	11/05/04	24/01/07	1.34	-8.46	0.82	-4.21	0.00	0.00
204	fuji electric	gas-insulated	11/05/04	24/01/07	-2.51	3.22	-7.57	-19.96	0.00	0.13
205	toshiba	gas-insulated	11/05/04	24/01/07	-1.60	1.6	-0.16	-8.86	0.00	0.55
206	mitsubishi	gas-insulated	11/05/04	24/01/07	12.14	-4.73	5.83	-4.91	0.00	0.79
207	siemens	gas-insulated	11/05/04	24/01/07	0.80	-1.87	6.16	9.09	0.58	0.54
208	hitachi	gas-insulated	11/05/04	24/01/07			5.94		0.01	
209	mitsubishi	elevators/escalators	28/01/04	21/02/07	-1.85		2.38		0.00	
210	thyssen	elevators/escalators	28/01/04	21/02/07	-2.43	-5.22	-0.51	5.45		2.38
211	otis	elevators/escalators	28/01/04	21/02/07	1.64	-6.47	-1.75	1.79	0.33	0.44
212	schindler	elevators/escalators	28/01/04	21/02/07	-5.29	-0.65	5.26	-6.07	2.32	2.27
213	kone	elevators/escalators	28/01/04	21/02/07	-3.01	-5.22	-0.69	5.45	2.80	2.38
214	heineken	netherlands beer	13/07/99	18/04/07	-0.43	14.12	0.74	-1.38	1.16	1.14
215	inBev nv	netherlands beer	13/07/99	18/04/07			-0.18	-6.06	0.00	0.00
216	bavaria nv	netherlands beer	13/07/99	18/04/07	1.78					
217	grolsch nv	netherlands beer	13/07/99	18/04/07	-1.60					
218	coats	fasteners	07/11/01	19/09/07	1.10		-4.33		8.41	
219	repso	spain bitumen	01/10/02	03/10/07	1.26		0.14	-11.28	0.26	0.26
220	bp	spain bitumen	01/10/02	03/10/07	-2.14		-1.24	5.5	0.00	0.00
221	galp energia	spain bitumen	01/10/02	03/10/07			-0.68	-2.53	0.10	0.10
222	cepsa	spain bitumen	01/10/02	03/10/07	-1.50		1.58	-1.16	0.45	0.44
223	fuji electric	professional videotapes	28/05/02	20/11/07	4.11	-4.52	-2.72	5.66	0.00	3.44
224	sony	professional videotapes	28/05/02	20/11/07	-2.50	2.86	0.72	19.07	0.00	0.14
225	maxell	professional videotapes	28/05/02	20/11/07	5.03		-0.69		0.01	
226	asahi	flatglass	22/02/05	28/11/07	-0.86	-3.43	4.93	2.36	0.00	0.58
227	pilkington	flatglass	22/02/05	28/11/07	0.31	0.92	0.22	-21.87	280.50	5.74
228	saint gobain	flatglass	22/02/05	28/11/07	-2.08	-5.17	1.36	-0.97	0.52	0.53
229	bayer	chloroprene	27/03/03	04/12/07	2.34	18.94	2.02	2.80	0.00	0.00

230	denka	chloroprene	27/03/03	04/12/07	0.50	-16.77	-4.06	-26.9	0.13	2.89
231	tosoh	chloroprene	27/03/03	04/12/07	-4.37	-13.2	-5.52	-36.61	0.00	0.25
232	dupont	chloroprene	27/03/03	04/12/07	-0.07	0.44	1.19	-5.88	0.11	0.20
233	dow chemical	chloroprene	27/03/03	04/12/07	1.10	-1.23	-0.59	-2.72	0.01	0.02
234	eni	chloroprene	27/03/03	04/12/07	-0.59		1.52	4.09	0.13	0.13
235	zeon	nitrile butadiene	27/03/03	23/01/08	1.16	17.68	1.91	9.90	0.00	0.56
236	bayer	nitrile butadiene	27/03/03	23/01/08	2.34	18.94	-2.84	-0.30	0.07	0.07
237	exel	removal service	16/09/03	11/03/08	-1.14		-3.68		0.04	
*	uralita	removal service		11/06/08				-3.19		0.86
238	akzo	sodium chlorate		10/06/08			-2.32		0.00	
239	aragonesas	sodium chlorate		10/06/08			1.94		0.37	
240	boliden	aluminium fluoride	25/05/05	25/06/08	1.78		6.88		0.00	
241	exxon mobil	parafin wax	28/04/05	01/10/08	-4.70	-11.18	4.45	3.33	0.02	0.03
242	eni	parafin wax	28/04/05	01/10/08	0.67	1.37	-0.74	-21.12	0.04	0.04
243	rwe	parafin wax	28/04/05	01/10/08	2.66	1.31	1.34	-11.67	0.10	0.10
*	total	parafin wax	28/04/05	01/10/08			-0.68		-13.67	0.13
244	repsol	parafin wax	28/04/05	01/10/08	-1.16	-3.67	-3.99	-10.30	0.08	0.08
245	mol	parafin wax	28/04/05	01/10/08	-1.35	10.11	2.72	9.25	0.00	0.34
246	hansen & rosenthal	parafin wax	28/04/05	01/10/08	-0.82		-8.06		5.36	
247	sasol	parafin wax	28/04/05	01/10/08	0.25	7.09	-5.06	-19.29	0.14	1.77
248	shell	parafin wax	28/04/05	01/10/08	-0.51	1.93	-3.19	1.39	0.00	0.00
249	del monte / weichert	banana	02/06/05	15/10/08		-12.67	-2.11	12.92	1.65	1.99
250	pilkington	car glass	22/02/05	12/11/08	0.31	0.92	1.14	-51.57	803.39	21.22
251	asahi	car glass	22/02/05	12/11/08	-0.86	-3.43	-3.66	-18.74	0.02	2.24
252	saint gobain	car glass	22/02/05	12/11/08	-2.08	-5.17	-3.00	-21.79	8.17	8.33
253	dunlopil & marine	marine hoses	02/05/07	28/01/09	1.81	-0.69	-6.33	-36.66	0.77	0.83
254	trelleborg	marine hoses	02/05/07	28/01/09	0.48	6.44	6.59	-8.06	0.65	6.39
*	parker itr	marine hoses	02/05/07	28/01/09		3.45		8.87		0.53
255	bridgestone	marine hoses	02/05/07	28/01/09	2.03	5.9	1.00	-4.94	0.01	0.7
256	yokohama	marine hoses	02/05/07	28/01/09	0.00	10.82	-2.37	-30.76	0.00	0.00
257	e.on ag	Distribution of gas	16/05/06	08/07/09	-5.53					
258	skwstahl-metallurgie	calcium carbide	16/01/07	22/07/09			-10.30		23.06	
259	akzo	calcium carbide	16/01/07	22/07/09	-0.18		2.27	8.39	0.00	0.00
260	hitachi	power transformers	11/05/04	07/10/09	-1.92	0.03	-2.19	1.62	0.00	2.46
261	fuji electric	power transformers	11/05/04	07/10/09	-2.51	0.18	4.08	-4.43	0.00	1.73
262	toshiba	power transformers	11/05/04	07/10/09	-1.60	0.09	6.05	6.50	0.00	13.20
263	siemens	power transformers	11/05/04	07/10/09	0.80	0	0.76	0.27	0.00	0.00
264	areva	power transformers	11/05/04	07/10/09	-0.69	0.05	-0.99	-10.72	2.47	6.77
265	abb	power transformers	11/05/04	07/10/09	1.34	0.1	2.13	2.69	0.07	33.75
266	alstom	power transformers	11/05/04	07/10/09	-11.74	0.07	1.51	-3.83	0.12	9.38
267	elementis	heat stabilisers	12/02/03	11/11/09	-1.37		-17.47		13.89	
268	gea	heat stabilisers	12/02/03	11/11/09	-0.23		0.82		0.13	
269	akzo	heat stabilisers	12/02/03	11/11/09	-4.93		2.33		0.40	
270	basf	heat stabilisers	12/02/03	11/11/09	-1.45		1.83		0.19	
271	chemtura	heat stabilisers	12/02/03	11/11/09	1.13		-12.32		0.00	
272	infineon	drams		19/05/10			-6.30		1.08	
273	hitachi	drams		19/05/10			-1.52		0.01	
274	elpida	drams		19/05/10			-4.17		0.00	
275	nec	drams		19/05/10			-2.92		0.00	
276	nanya	drams		19/05/10			-3.53		0.00	
277	hynix	drams		19/05/10			-2.39		0.00	
278	samsung	drams		19/05/10			0.21		0.00	
279	toshiba	drams		19/05/10			-1.42		0.00	
280	micron	drams		19/05/10			7.75		0.00	
281	mitsubishi	drams		19/05/10			1.10		0.00	
282	masco	bathroom fittings	09/11/04	23/06/10	-1.01		1.45		0.00	
283	v & b	bathroom fittings	09/11/04	23/06/10	0.93		-17.18		126.58	
284	sanitec	bathroom fittings	09/11/04	23/06/10	-2.08					
285	austria draht	prestressing steel	19/09/02	30/06/10	-4.75		-0.69		0.58	
286	arcelormittal	prestressing steel	19/09/02	30/06/10	-6.62					
287	kemira	feed phosphates	10/02/04	20/07/10	-4.11		-4.31		0.00	
288	ercros	feed phosphates	10/02/04	20/07/10	-1.44		-5.02		19.56	
289	fmc corporation	feed phosphates	10/02/04	20/07/10	4.06		0.11		0.33	
290	tessengerlo chemie	feed phosphates	10/02/04	20/07/10	-1.40		-2.00		13.16	
291	sas	airfreight	14/02/06	09/11/10	-5.62		-6.36		0.80	
292	qantas	airfreight	14/02/06	09/11/10	-0.54		-0.42		0.14	
293	lanchile	airfreight	14/02/06	09/11/10	4.12		-2.46		0.00	
294	lufthansa	airfreight	14/02/06	09/11/10	3.80		-1.84		0.00	
295	aircanada	airfreight	14/02/06	09/11/10			-7.34		2.78	
296	singapore airlines	airfreight	14/02/06	09/11/10	1.08		-0.57		0.38	
297	air france	airfreight	14/02/06	09/11/10	3.05		-1.88		4.42	
298	cathay	airfreight	14/02/06	09/11/10	2.20		1.61		0.07	
299	japanairlines	airfreight	14/02/06	09/11/10	0.12					
300	klm	airfreight	14/02/06	09/11/10	3.05					
301	hann star	lcd		08/12/10			3.75		0.03	
302	chunghwa	lcd		08/12/10			-0.94		0.00	
303	samsung	lcd		08/12/10			1.48		0.00	
304	lg display	lcd		08/12/10			-1.84		0.00	
305	au optronics	lcd		08/12/10			-1.29		0.04	
306	henkel	consumer detergents		13/04/11			-2.80		0.00	
307	unilever	consumer detergents		13/04/11			3.17		0.29	
308	p & g	consumer detergents		13/04/11			2.25		0.11	
309	chiquita	exotic fruit	28/11/07	12/10/11			2.59		0.00	
310	asahi	carglass		19/10/11			-4.07		0.01	
311	samsung	carglass		19/10/11			4.99		0.00	

312	nippon electric	carglass		19/10/11			-5.28	0.01
313	embraco/whirlpool	refrigeration		07/12/11			1.23	1.45
314	panasonic	refrigeration		07/12/11			-0.80	0.00
315	tecumseh	refrigeration		07/12/11			-3.94	0.00
316	uti worldwide	freight forwarding	10/10/07	28/03/12	-1.95		1.74	0.18
317	toll global	freight forwarding	10/10/07	28/03/12	-1.86		-0.57	0.07
318	exel	freight forwarding	10/10/07	28/03/12	2.84		0.36	0.00
319	agility logistics limited	freight forwarding	10/10/07	28/03/12	-0.36		0.31	1.19
320	panalpina	freight forwarding	10/10/07	28/03/12	-5.59		0.25	1.92
321	ups	freight forwarding	10/10/07	28/03/12	-0.10		-0.26	0.02
322	beijing kintetsu	freight forwarding	10/10/07	28/03/12	-2.90		1.45	0.00
323	nippon express	freight forwarding	10/10/07	28/03/12	-4.21		0.02	0.00
324	dsv	freight forwarding	10/10/07	28/03/12	-6.12		0.90	0.00
325	expeditors	freight forwarding	10/10/07	28/03/12	-0.89		0.32	0.04
326	kuehne	freight forwarding	10/10/07	28/03/12	-1.60		0.10	0.37
327	pneumatex	water management		27/06/12			-5.59	0.00
328	sumitomo electric	auto. wire harnesses		10/07/13			-1.43	
329	furukawa electric	auto. wire harnesses		10/07/13			-2.91	
330	recticel nv/sa	polyurethane foam	27/07/10	29/01/14	5.10			
331	safransa	power cables	28/01/09	02/04/14	-1.38			
332	goldman sachs	power cables	28/01/09	02/04/14	10.32			
333	nexanssa	power cables	28/01/09	02/04/14	3.07			
334	sumitomo electric	power cables	28/01/09	02/04/14	5.63			
335	pirelli & c.s.p.a.	power cables	28/01/09	02/04/14	-0.74			
336	bonduelle sas	mushrooms	28/02/12	25/06/14	1.33			
337	jpmorgan chase & co	yen interest rate deriv.	04/12/13	21/10/14			-0.61	0.04
338	ub sag	yen interest rate deriv.	04/12/13	21/10/14			0.20	0.00
339	bank of scotland	yen interest rate deriv.	04/12/13	21/10/14			2.34	1.27

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