



CCRED
CENTRE FOR COMPETITION,
REGULATION AND
ECONOMIC DEVELOPMENT

MCom Working Paper¹

**AN ASSESSMENT OF THE RESPONSIVENESS OF SHARE PRICES TO CARTEL
INTERVENTIONS BY SOUTH AFRICAN COMPETITION AUTHORITIES**

Maletuma Malie

Abstract

The South African competition regime is in line with global standards that prohibit direct and indirect price fixing, dividing markets, and collusive tendering. Provided that the penalties are large enough to reduce the gains made from collusion, companies will have lower incentives to engage in collusion. Findings of cartel conduct could lead to revenue loss due to legal and administrative costs, as well as reduced profitability due to the lower than collusive prices. Companies may also suffer reputational damage, which could be a disincentive to investors. This study uses event study methodologies to examine cartel conduct in South Africa between 2009 and 2019 and assesses the impact of announcements of investigation and the imposition of penalties. This is done by analysing the returns on the share prices of 15 companies listed on the Johannesburg Stock Exchange. The study finds that on average, the announcement of investigations and imposition of penalties on the listed companies under study did not lead to statistically significant negative returns, despite negative returns being observed in most cases. The result may be due to relatively low penalties imposed on colluding companies, delays in processing cases from investigation to penalisation and information leakages among cartel members and within industries.

Key Words: abnormal returns, announcements, cartel, estimation window, event date, event study, event window, Johannesburg Stock Exchange, listed company, market model, penalties.

¹ This working paper was completed as part of the requirements for the MCom Competition and Economic Regulation.

Contents

1: Introduction.....	1
2: Literature Review.....	2
2.1: Theoretical Background.....	2
2.2 Cartel Legislation in South Africa.....	3
2.3 Brief Literature Review on the Foundation of Event Studies	3
2.3 Review of Recent Event Studies in Competition Infringement Cases.....	4
3: Event Study Methodology.....	8
3.1 Background	8
3.2 The Building Blocks of an Event Study	9
3.2.1 Event Definition	9
3.2.2 Selection Criteria	10
3.2.3 Estimating Normal and Abnormal Returns	10
3.2.4 Estimation procedure.....	11
3.2.5 Testing Procedure	13
3.2.6 Presentation of Empirical Results, Interpretation and Conclusions	13
3.3 Econometric Approach	13
3.3.1 Market Model.....	13
3.3.2 The Nonparametric Theil's Approach.....	15
4: Effectiveness of Cartel Enforcement in South Africa.....	16
5: Conclusion.....	31
References.....	33

1. Introduction

Cartel conduct is widely viewed by competition authorities as the most deplorable of competition infringements. This is because cartels reduce the levels of competition and create the opportunity for members to collectively wield market power, which allows them to raise prices, and constrain supply (Maphwanya, 2017). The goal of cartels is to achieve prices above (or output levels below) those that would prevail under competitive conditions in order to increase their joint profits. In other words, companies collude to achieve and sustain supra-competitive profits. These cartels seek to enjoy collective profits that are similar to those that would be enjoyed by a monopoly in the same industry. In this way, a cartel can be viewed as a simulation of a temporary merger among rival companies, with the ultimate goal of generating monopoly profits (Connor, 2008).

When a cartel is detected and penalised, it can be expected that the implicated company's share price may be impacted negatively. This would not necessarily be for altruistic reasons but may be due to three key factors: firstly, the litigation that results from the suspected cartel activity could lead to legal costs and penalties, which would then negatively affect the company's profits. Secondly, post-cartel, the company may not produce the large profits that motivated the cartel in the first place. Thirdly, the reputational damage resulting from cartel activity may have an impact on customer relations (Bianconi et al., 2015).

The effective implementation of anti-cartel laws is an imperative for most competition authorities worldwide. This stems from the fact that when competitors form a cartel, the pressure of competing is overtaken by coordinative efforts that allow them to achieve collective market power. Such market power then allows these cartel members to raise prices and restrict supply. The harmful effects of cartel conduct therefore become a burden to consumers who will face higher prices, limited product choices and diminished quality of products or services. The effective implementation of competition law creates an environment where all participants in the market are reluctant to engage in cartel activity as they expect significant negative consequences. This requires that competition authorities have means to detect and prosecute cartels and to deter new or recurring cartel conduct (Maphwanya, 2017).

Administrative penalties are a critical tool used by competition authorities to penalise cartel conduct. In the South African context, companies which are found guilty of collusion can face penalties of up to 10% of their turnover for the preceding financial year (Competition Act No. 89 of 1998). However, the penalties will effectively deter cartel conduct only if they are sufficiently high as this could significantly impact the finances of the implicated companies (Aguzzoni, Langus & Motta, 2013).

To gain perspective on the effectiveness of the enforcement measures in South Africa, it is important to assess the cost of the penalties that are incurred by companies when found guilty of cartel activity. By examining the relationship between interventions, in the form of initiation of investigations and penalisation of companies, on company share prices, the study examines the direct impact of such actions on the owners of companies involved in the collusion. The results provide a means for assessing the potential of such enforcement actions to achieve deterrence from participation in current and future cartels. The purpose of this study is therefore to determine the impact of interventions in the form of investigation and penalisation on individual company share prices when a cartel is uncovered. This is done by quantitatively

examining 15 Johannesburg Stock Exchange (JSE) listed companies to analyse the changes in company share prices after a cartel enforcement announcement is made public using event study analysis². Such an announcement may be done via the Stock Exchange News Service (SENS) of the JSE, a media release by the Competition Commission (the Commission) or a settlement agreement issued by the Competition Tribunal (the Tribunal). The outcome of this research provides insight into the extent to which investors view cartel activity as detrimental to the valuation of a company and as such, the extent to which termination of collusion, when exposed, can result in the loss of profitability for the companies involved.

This study finds that investigation and penalty announcements do not consistently result in negative and significant returns for the implicated cartel members. This can be attributed to three key factors. Firstly, the penalties are often low in relation to the company's financial standing, particularly in the case of group companies. Secondly, the time that it takes from inception of the case to its conclusion and penalty announcement can be extensive. This creates the opportunity for investors to adjust their expectations and as such reduces the impact of the intervention on the company valuation. Finally, information leakages make it possible for news to spread among companies and within industries such that when a formal notice of an investigation or penalty is sent out to the market, such news is already known to investors and this reduces the impact of the news on the company's share price.

2. Literature Review

2.1. Theoretical Background

The sustainability of cartels depends on three key characteristics. Firstly, cartels should be able to coordinate so that prices and quantities are agreed upon by member companies. Secondly, cartels are able to thrive where there are significant barriers to entry, as new entrants into the market create a challenge for coordinating conduct with new participants. Thirdly, they should have means to detect and punish cheating, so that no member can increase its own profitability by undercutting its co-conspirators (Levenstein & Suslow, 2006).

The ability to detect cheating among colluding firms largely depends on transparency of prices and quantities, and the ability of companies to exchange information (Motta, 2004). Pricing practices that are easily observable and unambiguous make it possible to observe deviations and can therefore enhance the stability of cartels. Similarly, sharing of information, for example through industry associations, can facilitate the tracking of prices, quantities, customer demands and cost information which can enable detection of deviants.

The actions of a successful cartel will inevitably create a welfare loss to consumers due to higher prices, decreased product choice and quality, and slower rates of technological development (Levenstein & Suslow, 2003). This necessitates a robust law enforcement framework that seeks to maintain competition and deter collusion among competing companies.

² An event study examines the returns on a company's share price in response to a specific event that may induce investors to re-evaluate the company (Cichello & Lamdin, 2006)

2.2. Cartel Legislation in South Africa

Competition legislation can be described as the policies and rules that seek to ensure that competition in the economy is not restricted to the detriment of society (Motta, 2004). The widespread and global implementation of competition legislation was in part initiated due to cartel activity being identified as one of the reasons for inflation, trade restrictions, and stunted economic growth in the post-World War II period (Connor, 2008). By the early 2000s, more than 100 countries globally, including South Africa, had adopted some form of competition law.

The South African competition regime is in line with international best practices in that it encourages free trade, while closely monitoring the actions of companies for anticompetitive behaviour. The Competition Commission is a statutory body whose key mandate is to investigate, control and evaluate anticompetitive practices, and the abuse of dominant positions and large mergers, in order to achieve equity and efficiency in the SA economy (Competition Commission website).³ It also makes recommendations to the Tribunal. The Tribunal has jurisdiction throughout the country to adjudicate competition matters in order to uphold the Competition Act (Competition Tribunal website)⁴. The third institution is the Competition Appeal Court, which hears appeals relating to Tribunal decisions. Through its three bodies, the Act seeks to, among other objectives, promote and maintain competition to efficiently to support economic development, enable consumers to access products at competitive prices, promote social and economic welfare, enhance integration to international markets and to offer fair opportunities to small and medium sized enterprises (Hartzenberg, 2006).

This study is primarily concerned with cartel conduct, which is prohibited on a 'per se' basis under Section 4 (1)(b) of the Act, regardless of it being in the form of price fixing, market division, or collusive tendering. Under the Act, the Tribunal may impose administrative penalties on those parties found to have engaged in cartel activity. The penalty liability depends on, inter alia, the extent of the cartel conduct, the duration of the cartel conduct, and the amount of damage as a result of the conduct. The penalty is, however, capped at 10% of the company's annual turnover in the preceding financial year. Companies found guilty of recidivism can face penalties of up to 25% (Competition Amendment Act No 18 of 2018). The objective is to deter companies from engaging in cartel conduct. This can be achieved if enforcement action has significant financial impact on the companies involved through reduced current and future profitability or impact on the valuation of the companies involved.

2.3. Brief Literature Review on the Foundation of Event Studies

According to the efficient market hypothesis (EMH), a market is described as efficient if it fully reflects all relevant and available information (Fama, 1970). If this is the case, share prices are a true reflection of the fundamentals of a company, and therefore managers are equipped to make decisions on when to expand production vs when to invest. Investors are also able to make comparisons between companies and make investment decisions. Therefore, in an efficient market, it is not possible to make profits solely based on information because all

³ <http://www.compcom.co.za/>

⁴ <https://www.comptrib.co.za/>

participants are assumed to have such information (Campbell, Lo & MacKinlay, 1997). The EMH therefore presupposes that in an efficient market, share prices react immediately to unanticipated but relevant news by increasing (positive impact) or decreasing (negative impact). Prior to that information, share prices are assumed to be stable and are expected to exhibit stable performance after the immediate price adjustment (Gopane & Mmotla, 2019). Given that the EMH assumes that share prices respond to the emergence of new information about companies, it is possible to examine the impact of this information on company valuation. This analysis can be done using event study techniques.

An event study analyses the impact of specific events on the value of a company using that company's financial information at specified timeframes. The main premise of such a study is that the impact of an event is reflected immediately in the share price, given that investors are expected to act rationally (MacKinlay, 1997). A central theme in the event study literature is the assumption of the EMH which, as mentioned, states that when an event occurs that is material to the fundamentals of a company, the company's share price should adjust immediately to reflect all available information and as such, reflect the new expected cash flows. This implies that the updated share price would have no systematic bias and as such would be the single best estimate of the company's valuation (Kavanagh, 2008).

Event study analysis dates back to the early 1930s, with some of the early work being attributed to Dolley (1933), cited in Campbell, Lo and MacKinlay (1997) as a study on the impact of stock splits on prices, using a sample of 95 splits. In the decades that followed, more advanced event studies were published. Notably, the seminal works of Ball and Brown (1968) and Fama et al. (1969), which were instrumental in developing the event study methodology still used today. Ball and Brown (1968) review the content of accounting information to determine which measures can be used in analysing earnings. Fama et al. (1969), analyse the impact of stock splits when confounding effects are excluded. The use of event study methodology has since expanded beyond finance and economics with growing research in other disciplines such as environmental, corporate, and governance studies (Klassen & McLaughlin, 1996; Lundgren & Olsson, 2010; Cheung, 2011; Tamechika, 2020).

From the perspective of companies, event studies provide some insight into the extent of abnormal profits (or losses) to shareholders following an event of interest. In capital markets research, these studies offer a test of market efficiency where persistent non-zero abnormal returns that follow an event are an indicator of market inefficiency. In competition law and economics, this approach has been used to determine the effectiveness of regulation and to assess damages in liability cases (Kothari & Warner, 2004; Aguzzoni, Langus & Motta, 2013). These studies therefore make it possible to observe the impact of company-specific as well as industry-specific events. These include mergers and acquisitions, changes in legislative frameworks, and enforcement of regulatory policies. Such regulatory policies include implementation of competition laws by the relevant authorities by means of dawn raids, issuing of fines, and other interventions. It is along these lines that the current study was undertaken.

2.4. Review of Recent Event Studies in Competition Infringement Cases

Event studies have been used in competition law to analyse the impact of competition infringements and penalties on company share prices. Bosch and Eckard (1991) reviewed share price reactions to prosecutions by authorities for cartel conduct among 127 New York

Stock Exchange (NYSE) and American Stock Exchange (AMEX) listed companies over the period 1962 to 1980. They used the daily price data of shares that were traded during that period to calculate the average abnormal return due to prosecution announcements, published by the Wall Street Journal (WSJ).

The Bosch and Eckard (1991) study used the market model to predict the abnormal returns for each share. The market is represented by the value-weighted index of the Center for Research in Security Prices (CRSP). The key findings of the study showed that on average, share prices fell by 1.08% in response to the WSJ announcement of price fixing indictments. In determining the profitability of cartel conduct in respect of these companies, they further estimated the value of losses attributed to this negative share price movement over the period 1962–1980, to be US\$2 180 000 000 (two billion, one hundred and eighty million dollars). The abnormal returns were then used to calculate the proportion of the loss linked to costs and penalties. This revealed that only 13% of the loss was attributable to the costs associated with the indictments, such as legal costs and penalty fees. The balance was linked to the perceived loss of monopoly profits, based on the finding that the absolute value of the abnormal share price was positively related to the estimated monopoly price in the market. Bosch and Eckard (1991) therefore conclude that equity markets view cartel conduct as profitable and therefore company valuations tend to decline when a company is indicted for price fixing. Provided the profits from such cartel conduct exceed the legal and penalty costs that a company may incur, the deterrent effect of competition enforcement may be minimal.

Aguzzoni, Langus and Motta (2013) assess the response of share prices to key events associated with antitrust prosecutions in the EU. These events comprise dawn raids at the start of the investigation, and infringement decisions at the conclusion. The study analyses competition infringement cases in the EU for the period January 1969 to November 2009 involving 180 companies listed on major exchanges (these include Frankfurt, London and New York stock exchanges). Using event study analysis, the authors estimate the market model to determine the abnormal returns that result from dawn raids and infringement decisions by competition authorities. Aguzzoni, Langus and Motta (2013) find that overall, share prices decline by 3.03% to 4.55% as a result of antitrust action. Dawn raids are found to reduce share prices by 2.89% on average and infringement decisions, by 3.57%. The authors find that at most, the proportion of the loss in company valuation after an infringement decision that can be attributed to fines is 8.9%. They therefore conclude that the key factor that causes the devaluation of the share price is the anticipated cessation of anticompetitive profits. The conclusion of the Aguzzoni, Langus and Motta (2013) paper is that competition enforcement results in companies losing prospects for large profits which drives their share price down, this indicates that antitrust enforcement can be an effective tool for discouraging cartel behaviour.

Below is a summary of key outcomes from these and other related event studies using the market model.

Table 2. 1: Summary of the recent empirical literature

Author/s and year	Title	Objective of paper	Findings
Mariuzzo, F., Ormosi, P.L. and Majied, Z., 2020	Fines and reputational sanctions: The case of cartels	To assess the deterrence effect of public and reputational sanctions due to cartel activity in the EU	On average, dawn raids resulted in a 0.85% decline in share price, penalty decisions resulted in a share price decline of 0.35%. The results of the study were significant. An unexpected outcome of the study is that the largest drop in share price was observed 9 days prior to the dawn raids.
Bos, I., Letterie, W. and Scherl, N., 2019	Industry Impact of Cartels: Evidence from the Stock Market	To evaluate the impact of dawn raids and infringement decisions on the share price of cartel and non-cartel companies in Europe	Significant negative impact on the share price of cartel members. However, the results for non-cartel members were ambiguous.
Aguzzoni, L., Langus, G. and Motta, M., 2013	The effect of EU antitrust investigations and fines on a firm's valuation	To assess the share price impact of investigations and fines relating to cartel conduct in the EU	On average, dawn raids resulted in a decrease in the share price of 2.89%; infringement decisions resulted in a 3.57% decrease in the share price.
Günster, A. and van Dijk, M., 2016	The impact of European antitrust policy: Evidence from the stock market	To analyse the response of share prices to investigation announcements, infringement decisions, and appeals in Europe	On average, dawn raids resulted in a 5% decline in share price; successful appeals resulted in approximately 4% increase in share valuation. The results of the study were significant.
Beverley, L., 2007	Stock Market Event Studies and Competition Commission Inquiries	To evaluate the impact on share prices of specific announcements by the European competition authority	In terms of market investigations, the study did not find conclusive evidence of the responsiveness of share prices to announcements by the competition authorities.

Author/s and year	Title	Objective of paper	Findings
Thompson, J.S. and Kaserman, D.L., 2001	After The Fall: Stock Price Movements and the Deterrent Effect of Antitrust Enforcement	To use share price data to infer the probability of recidivism after competition enforcement measures have been finalised	85% of the shares that were assessed reverted to their pre-enforcement values within 300 days of the announcement of indictment for cartel activity. This implies that enforcement efforts by competition authorities may not have an enduring impact in deterring cartel conduct.
Bosch, J.C. and Eckard Jr, E.W., 1991	The profitability of price fixing: evidence from stock market reaction to federal indictments	To estimate the impact on the share price following a cartel indictment announcement in the EU	On average, company share prices decreased by 1.08% following announcement of price fixing indictments.

Source: Author's compilation of selected empirical studies

3. Event Study Methodology

3.1. Background

Event study analysis seeks to evaluate how certain financial events can affect the valuation of a company's share by reviewing the stock market data (Beverley 2007). The key objective of event studies is to establish if there are any abnormal returns on the company share price following specific events. An abnormal return in this context is the difference between an observed return and the counterfactual (Peterson, 1989). In this regard the counterfactual, or the expected return, refers to the return that would have been observed had the event in question not occurred (Cichello & Lamdin, 2006). To the extent that share prices reflect the valuation of a company's assets, changes in these equity values can be expected to reflect the anticipated changes in the company's financial performance. Therefore, news about a company that is expected to result in a positive share price movement, stimulates investment in the company and *ceteris paribus* result in a price increase. Conversely, news that negatively affect the value of the company will *ceteris paribus* be expected to result in a share price decline (Bos, Letterie & Scherl, 2019).

In this study, the events of interest relate to potential cartel enforcement against a company in two respects. Firstly, in the form of an announcement or a dawn raid, indicating that a company is under investigation for suspected cartel activity. Secondly, the imposition of a penalty on the company for involvement in cartel conduct. The objective of the event study is therefore to isolate the abnormal return that results from the event(s) of interest to determine if investigations that relate to cartel activity matter to investors, and to determine if the announcement of penalties has an adverse impact on the valuation of the company.

In terms of EMH, markets are assumed to be efficient such that, when company news is announced that is material enough to affect the value of a company's share price, the share price should adjust rapidly to reflect the new expected value of future cash flows. As a result, the revised market valuation reflects the new, publicly available information (Kavanagh, 2008). Therefore, under the EMH, the primary assumption is that in determining share prices, the capital market completely and accurately reflects all relevant company information (Campbell, Lo & MacKinlay, 1997). Additionally, any new information that impacts on the fundamentals of the company will reflect immediately as a share price adjustment (Langus & Motta, 2007). As such, following a market announcement, the share price will provide the best estimate of the event's impact on the market value of the company.

The EMH requires knowledge of the exact date on which investors will receive information. For a listed company, such news may be shared through stock exchange news announcements and is then expected to reflect in changes in the share price. The news may also be shared through the competition authority's publications. However, this assumes that there are no information leaks prior to the formal announcement. In reality, material information concerning a company may reach some investors sooner than others, which may dilute the results of an event study (Beverley, 2007). Uncertainty on the exact dates of the event may result in low power when estimating the impact of an event and may result in falsely concluding that an event had no impact (Type II error). A redeeming feature of the event study methodology is that where an event is found to have influenced a share price, despite a low powered test which may affect the level of significance, the results may still be credible

provided there is sufficient background information to substantiate the findings (Cichello & Lamdin, 2006).

Event study analysis assumes that the event of interest was unanticipated (McWilliams & Siegel 1997). The existence of noise in the market, for example in the form of rumours that precede the formal announcement by the company or competition authority, can result in contamination in the estimation results. This information may therefore result in higher variances in the abnormal returns and yield statistical tests that are not robust or powerful (Jeng, 2015). Event study methodology also assumes that there are no other confounding effects that could have influenced the company's share price at the time of the announcement or event of interest (McWilliams & Siegel 1997). Factors such as the announcement of dividends, the resignation of a director or an impending merger could all impact the performance of the share price. Such events should therefore be recognised and understood, as they may affect the estimates and the validity of the findings.

3.2. The Building Blocks of an Event Study

The quintessential event study follows seven key steps: event definition, selection criteria, calculation of normal and abnormal returns, estimation procedure, testing procedure, presentation of empirical results, and interpretation and conclusions (Beverley, 2007).

In the context of the current study, these steps are discussed below:

3.2.1. Event Definition

The initial stage of an event study defines the event of interest and determines the period over which share prices of the company(s) involved in this event will be analysed. The time frame for each event is based on identification of an event window, which is the period over which the impact of the event on a company's share price will be observed. As stated above, in theory, the EMH holds that all value effects of announcements on price would reflect immediately after the information relating to the event is announced publicly. In practice however, it is understood that the impact of the event under study may be seen prior to the actual day if the market is anticipating the announcement, and after the day of the announcement if it takes time for the effects of the event to fully pass through to the company's share value (Beverley, 2007). The choice of an event window is key to the accurate observation of the market reaction. An event window that is too narrow may underrepresent the impact of the announcement. On the other hand, if it is too wide, there is a greater probability that it will include confounding events that may produce biased results (Cichello & Lamdin, 2006).

The conventional approach is to observe the estimation window as the period prior to the event window, to estimate the normal or expected returns. The hypotheses of interest are then tested in the event window (Jeng, 2015).

In this study, the events of interest relate to enforcement actions on potential and actual competition law infringements by companies. The focal areas for each case were the investigation announcement or dawn raid for potential cartel conduct by companies, and the final decision, which culminates in the imposition of a penalty by the Tribunal.

3.2.2. Selection Criteria

The second task in the event study analysis was to determine the criteria for inclusion of particular companies in the study. The key determinant for the companies included in the study was the availability of tradeable share price data. Ideally, the share price data in an event study should be consistently available and sufficiently liquid, which is often the case with companies that are listed on a formal stock exchange (Beverley 2007). The qualifying criteria may also be dependent upon the areas of interest for analysis. These may include industry, market capitalisation and time period (Campbell, Lo & MacKinlay, 1997).

For the current study, the first qualifying criterion for inclusion of companies was that they were listed on the main board of the JSE. Out of the +-370 listed companies listed on the mainboard, 23 were prosecuted for collusion between 2009 and 2019. Eight of these companies were excluded from the study due to insufficient share price history. The final list that formed the core focus of the study therefore comprised of 15 JSE listed companies that had been involved in and were successfully prosecuted for cartel activity.

It is worth noting that most of the cartel cases included in the study are in the manufacturing and the construction industries. This is in part due to the strategic focus of the Competition Commission, which places priority on seven sectors, including construction and infrastructure, food and agro-processing, and intermediate industrial inputs⁵. Secondly, other industries such as banking and telecommunications are highly regulated, which means that certain key measures, including prices, may be set by regulatory bodies. Furthermore, institutions such as banks and telecommunication companies may have more complex production processes and cost structures, which make it more difficult to identify and prove cartel conduct.

As this study focused on companies listed on the JSE, an additional bias in the results could be that share price movement resulted from other external factors, such as changes in interest rates. As such, the model used in the study included the FTSE/JSE All Share Index (ALSI) which tracks price movements across different companies and industries. The ALSI includes 150 companies listed on the JSE and is the exchange's largest index in terms of market capitalisation (JSE company website). It is also worth acknowledging that the liquidity of the various shares could differ significantly, even within the same markets. This is a common feature of stock market trading.

3.2.3. Estimating Normal and Abnormal Returns

Key to event study analysis is the ability to differentiate between the factors that affect the company(s) under study, such as the news of a dawn raid vis à vis those that impact the entire market, such as changes in legislation (Corrado, 2012). This separation allows for observation of abnormal share performance resulting from the impact of the relevant event on the valuation of the company in question.

To assess the impact of the events of interest, the first step was to determine abnormal returns.

⁵ The seven priority sectors of the Competition Commission are: food and agro-processing; healthcare; intermediate industrial inputs; construction and infrastructure; banking and financial services; information and communication technology; energy (Competition Commission, 2007).

The abnormal return (ϵ_i^*) can be represented as follows:

$$\epsilon_i^* = R_{it} - E[R_{it} | X_t] \quad [3.1]$$

Where R_{it} is the observed returns on company i at time t and $E(R_{it})$ represents the normal returns for company i for the time period t . X_t is the conditioning information for the normal return model.

3.2.4. Estimation procedure

Once the model for estimating the normal return was selected, the parameters of the model were estimated for the period preceding the event, that is, the estimation window. The event dates were determined based on when the news of the infringement or judgement became publicly available. The JSE SENS, the Commission media releases, and company financials were used to determine the event dates.

There is no consensus in the event study literature as to the ideal number of days to include in the estimation window. Estimation periods in the literature range from 100 to 300 days for daily studies. The decision to use a longer estimation window in this study, balances the need to get the most reliable and robust parameters with the risks of including potential structural shifts in model parameters over extended periods (Günster & van Dijk, 2016). In this study, the estimation window is taken as the number of trading days in a typical South African year, which is 115 days. The approach is similar to that used by Aguzonni, Langus and Motta (2013), Bosch and Eckard (1991) and Günster and van Dijk (2016).

There is no standard length for event windows, but the length should sufficiently accommodate potential leaks in the market and still be able to limit confounding effects (McWilliams & Siegel 1997). This study used an 11-day event window that included 5 days before and 5 days after the event date. For comparative purposes, it also included a 16-day event window, covering 5 days before and 10 days after the event. The 11-day event window captured potential information leakages prior to the event date. Furthermore, as SENS announcements are in some instances issued a day after the competition authority's announcement, this was accommodated for in the 11-day event window.

To confirm that any confounding effects were identified and accounted for, the SENS company announcements were screened during the event window for events such as dividend payouts, changes in executive management, earnings announcements, and mergers and acquisitions.

Table 3.1 below provides a summary of some recent event studies reflecting their choice of estimation windows and event windows.

Table 3. 1: Event and estimation windows in some recent studies

Event study	Author(s) and year	Stock exchange	Estimation window	Event window
A Re-examination of the Profitability of Price Fixing using Stock Price Movement: Has New Antitrust Legislation been a more Effective Deterrent of Price Fixing?	Detre and Golub (2004)	Multiple exchanges (including New York and NASDAQ)	150 days	11 days (-5; +5)
Reputational Penalties to Firms in Antitrust Investigations	van den Broek, Kemp, Verschoor and De Vries (2012)	Euronex Amsterdam	150 days	11 days (-5; +5)
The Effect of EU Antitrust Investigations and Fines on a Firm's Valuation	Aguzonni, Langus and Motta (2013)	Multiple exchanges (including Frankfurt, London and New York)	130 days	31 days (-20; +10)
Stock Price Evidence for Anticompetitive Effects in the Nexium Reverse-Payment Settlement	Drake and McGuire (2016).	New York and Bombay	120 days	7 days (-3;3)
The Impact of European Antitrust Policy: Evidence from the Stock Market	Günster and van Dijk (2016)	Multiple exchanges (including Frankfurt, London and New York)	220 days	11 days (-5; +5)
Industry Impact of Cartels: Evidence from the Stock Market	Bos, Letterie and Scherl (2019)	Multiple exchanges (including Frankfurt, London and New York)	200 days	31 days (-20; +10)

Source: Author's compilation based on a review of recent event study methodologies.

3.2.5. Testing Procedure

At this stage, a testing framework was devised for any abnormal returns calculated. This included defining the null hypothesis and establishing procedures to aggregate the calculated outputs over time and across the various companies.

The test of significance approach was adopted to accept or reject the null hypothesis. The decision to reject or fail to reject the null hypothesis is based on the test statistic, as outlined below. The null hypothesis H_0 states that the event does not have an impact on the mean or variance of the share price returns. This implies that under the null hypothesis the abnormal returns are expected to equal zero (Campbell, Lo & MacKinlay, 1997).

The test statistic is calculated and compared to its expected distribution under the null hypothesis. If the test statistic exceeds the critical value, which is typically at 10%, 5% or 1%, then the null hypothesis is rejected, and it can be concluded that the abnormal returns are not equal to zero (Kothari & Warner, 2006).

For this study, the null hypothesis was that the news of an investigation by the Commission would not have an impact on the company's share price. Similarly, the news of an adverse finding and accompanying penalties by the Tribunal would have no impact on the share price.

3.2.6. Presentation of Empirical Results, Interpretation and Conclusions

The findings of the analysis can then be presented, including diagnostics for testing the validity of the model. The final step involves making inferences based on the results of the study. Reflections of the implications of the findings and concluding remarks complete the analysis. The empirical results of this study will therefore illustrate whether investigations and penalties by South African competition authorities are viewed as negative and/or material by investors.

3.3. Econometric Approach

3.3.1. Market Model

To determine the counterfactual or the normal returns of a given share, the market model is adopted. This model relates the return of a particular share relative to that of the market portfolio. Under the market model, market-wide factors that affect share performance during the event window are held constant, enabling the isolation of the impact of company-specific events (Cichello & Lamdin, 2006). The abnormal return is the observed return on the share price during the event window minus the counterfactual share price during the same period. The market model seeks to eliminate the influence of factors that affect the market as a whole (Van Den Broek, Verschoor & De Vries, 2012). The model can be represented as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \quad [3.2]$$

With $E[\epsilon_{it}] = 0$; $\text{Var}[\epsilon_{it}] = \delta \epsilon_i^2$

Where R_{it} and R_{mt} are the returns on share i at time t , and the returns on the market are represented by an index of the stock exchange where the share is listed. ϵ_{it} is the zero-return

disturbance term. α and β are the OLS estimates of the slope and the intercept of the market model regression.

The timeline for the event is represented schematically in Figure 3.1 below.

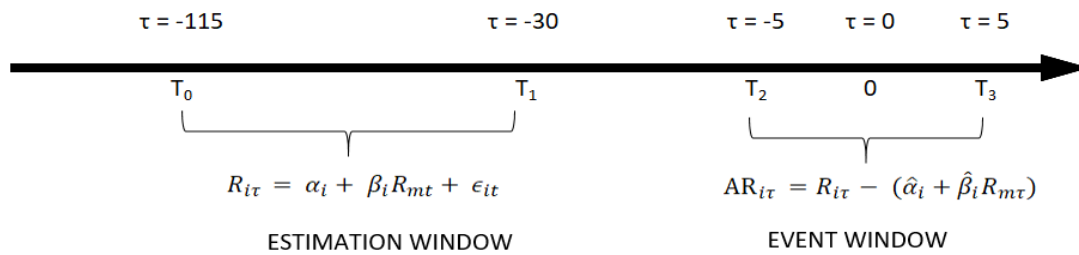


Figure 3. 1: The Timeline for an Event Study

Source: reproduced from Van Den Broek, 2012

The date of the event is defined as $\tau = 0$. This is the day on which the news of the event reaches the market, either through a press release by the Commission, a SENS announcement from the JSE, or a published decision by the Tribunal. In this study, the SENS announcements were the primary reference used to determine when information was provided to the investors. The predictive model estimates the parameters α and β during the estimation window.

The estimation of the normal return was calculated from $\tau = T_0$ ($\tau = -115$) to T_1 ($\tau = -30$) relative to the date of the event. The abnormal returns were then calculated at $\tau = T_1$ to $\tau = T_2$ which is the event window. Typically, the estimation window and the event window do not overlap (Van Den Broek, Verschoor & De Vries, 2012). This is important because the estimation of the normal return seeks to exclude the influence of the event.

Using the market model, the abnormal returns in the event window were constructed as the difference between the counterfactual and the actual return (Günster & van Dijk, 2016):

$$AR_{i\tau} = R_{i\tau} - (\hat{\alpha}_i + \hat{\beta}_i R_{m\tau}) \quad [3.3]$$

Where the abnormal return for share i at time τ , $AR_{i\tau}$, is the disturbance term of the market model.

The cumulative abnormal return (CAR) for the event window is calculated on the individual shares as follows:

$$CAR_i = \sum_{\tau=T_1}^{T_2} AR_{i\tau} \quad [3.4]$$

To test the hypothesis that abnormal returns are equal to zero the following t-statistic was then computed:

$$t = \frac{CAR_i}{\sigma_i} \quad [3.5]$$

Where σ_i is the standard deviation of abnormal returns during the event window. The market model may offer enhanced results in comparison to the constant-mean-return model, as the latter excludes the portion of the share price movement that results from variations in the market returns. This study adopted the market model in line with Aguzonni, Langus and Motta (2013), Beverley (2007), and Bosch and Eckard (1991). In this study the FTSE/JSE All Share index (ALSI) was used to represent the market.

An alternative to specifying abnormal returns as prediction errors in the market model can be extended to include dummy variables.

The specification of equation 3.2 including the dummy variable is:

$$R_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{m\tau} + \sum_{a=1}^A \gamma_{pa} D_{at} + u_{pt} \quad [3.6]$$

Where R_{it} is the return on the share during period t; $R_{m\tau}$ is the return on the market portfolio in the period and, β and γ are the estimated parameters. u_{pt} is the error term. The dummy variable D_{at} represents one or more dummy variables for each event window. It assumes a value of 1 during the event window and 0 otherwise. The coefficient of the dummy variable will therefore measure the average abnormal return for the company across all the event periods (Cichello & Lamden, 2006).

3.3.2. The Nonparametric Theil's Approach

The ordinary least squares (OLS) methodology used in the estimation of equations 3.3 and 3.6 relies on the assumption that the error terms are normally distributed. However, daily share price data has often been found to vary from this assumption, with empirical evidence suggesting that daily returns exhibit fatter tails than is typical of normal distributions (Brown & Warner, 1985). If the normality assumption is violated, this can produce biased estimates of the abnormal returns (Saleh, 2007).

To overcome this challenge, for robustness checks the study used a non-parametric estimator using Theil's approach to estimate the market model (Aguzonni, Langus & Motta (2013); Saleh 2007).

Contrary to the OLS methodology, the Theil's approach does not make any assumptions on the distribution of the error terms.

Using the market model equation [3.2], this approach followed the six steps discussed below:

The first step in this process was to sort the N data pairs of $(R_{m\tau}, R_{it})$ in ascending order of the market return $R_{m\tau}$. Where N is the number of data points in the estimation window. Secondly, the data pairs were separated into two equal groups of size j based on the median. If N is an odd number, the middle point was excluded. The third step calculated a slope parameter β for each of the data pairs in each group using:

$$\beta \left(j, j + \left(\frac{N}{2} \right) \right) = \frac{R_{\left(j + \left(\frac{N}{2} \right) \right)} - R_j}{R_{m\left(j + \left(\frac{N}{2} \right) \right)} - R_{m_j}} \quad \text{for } j=1 \text{ to } \frac{N}{2} \quad [3.7]$$

Then, choosing the median value $\hat{\beta}_i$ as the best estimate for β .

The fourth step is to use the estimated $\hat{\beta}_i$ to estimate the N parameters:

$$\hat{\alpha}_{i\tau} = R_{i\tau} - \hat{\beta}_i R_{m\tau} \quad [3.8]$$

At step five we selected the median of the intercepts $\hat{\alpha}_{i\tau}$ as the best estimator of α .

Finally, for each day and company in the event window, the nonparametric abnormal returns were calculated as:

$$\widehat{AR}_{i\tau}^* = R_{i\tau}^* - (\hat{\alpha}_i + \hat{\beta}_i R_{m\tau}^*) \quad [3.9]$$

The Theil's estimators are median-based, and this offered the additional benefit of excluding any outliers from the estimation, which would be on the extreme ends of the ranking. This may have had the advantage of helping avoid bias in the estimates which may have resulted from the presence of outliers.

4. Effectiveness of Cartel Enforcement in South Africa

In this study, the researcher sought to analyse the impact of news of interventions of the Commission on the share prices of the affected companies. The results and the interpretation of the results of the study are presented in this section.

Table 4.1 below provides a summary of the results of the OLS and the Theil methodology. It provides the percentage CAR as calculated in the 11-day and the 16-day event window. The results reflect the share price movement at the investigation announcement and the penalty announcement stages. The results are assessed against the null hypothesis that the news of interventions by the Commission has no impact on the valuation of companies, that is, the Cumulative Abnormal Return (CAR) on the company share price is equal to zero.

The parametric approach uses the market model and OLS to predict the counterfactual share price returns and to determine the abnormal returns that result from the events of interest. By contrast, the Theil non-parametric approach looks at the median of the pairwise slopes during the estimation period as the best estimator for the slope parameter (Dang et al., 2008). The reason for including the non-parametric analysis in this study was because it does not rely on the assumptions of OLS. Daily share prices in particular are often found to exhibit non-normality; however, non-parametric tests do not require that the prices be normally distributed (Corrado, 2011). The main limitation associated with non-parametric tests, however, is that they deal with ordinal data. The implication is that some detailed information contained in the original dataset may be lost in the process of ranking (Vaughan, 2001). Non-parametric tests are therefore used in conjunction with OLS tests to check the robustness of the results, and to confirm the validity of conclusions based on these results (Campbell, Lo & MacKinlay, 1997).

As depicted on Table 4.1, in a vast number of the cases, the OLS and Theil estimates have the same sign. In terms of the value of the CAR however, the results suggest that the Theil method is more conservative and as such, in most instances reflects a lower value than the

one calculated using OLS. This may be due to the exclusion of outliers that is built into the Theil method.

Table 4. 1: Summary of Cumulative Abnormal Return results

Company	Case	Method	Investigation announcement				Penalty announcement			
			Event window (-5,5)		Event window (-5,10)		Event window (-5,5)		Event window (-5,10)	
			CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value
ArcelorMittal	Case 1	Parametric	-13,0007**	0,015	-9,448	0,177	-6,491	0,342	-4,032	0,612
		Thiel	-20,154***	0	-23,016***	0	-1,489	0,495	0,004	0,990
Aveng	Case 1	Parametric	13,856*	0,076	10,489	0,334	2,751	0,792	17,710	0,214
		Thiel	1,436*	0,065	2,593	0,331	1,490	0,743	8,106	0,191
	Case 2	Parametric	1,203	0,886	6,053	0,583	-7,804	0,326	-6,755	0,453
		Thiel	-3,982	0,362	-1,292	0,82	-2,737	0,379	-1,614	0,646
	Case 3	Parametric	-2,998	0,6	-0,176	0,979	-2,728	0,519	-3,669	0,584
		Thiel	-0,726	0,771	0,597	0,837	-0,093	0,589	-1,730	0,551
Basil Read	Case 1	Parametric	-8,244	0,12	-9,141	0,182	2,993	0,568	2,509	0,667
		Thiel	-4,304	0,129	-5,063*	0,093	0,524	0,799	-0,381	0,874
KAP Industrial	Case 1	Parametric	15,213	0,429	15,22	0,427	2,105	0,765	11,367	0,188
		Thiel	5,172	0,533	4,523	0,585	0,131	0,965	3,705	0,306
Murray & Roberts	Case 1	Parametric	-2,67	0,52	-7,364	0,32	-2,635	0,768	-1,534	0,878
		Thiel	-0,492	0,714	-2,548	0,435	-0,071	0,985	0,801	0,853
	Case 2	Parametric	-6,567	0,34	-8,31	0,374	-3,962	0,439	-10,273	0,317
		Thiel	-2,833	0,334	-3,859	0,53	-2,620	0,237	-5,684	0,206
Oceana	Case 1	Parametric	-8,776*	0,051	-0,939	0,903	-4,384	0,538	-6,911	0,340
		Thiel	-5,429**	0,008	-2,228	0,512	-1,907	0,714	-1,142	0,545

Company	Case	Method	Investigation announcement				Penalty announcement			
			Event window (-5,5)		Event window (-5,10)		Event window (-5,5)		Event window (-5,10)	
			CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value
Omnia	Case 1	Parametric	-1,104	0,722	0,27	0,937	-4,838	0,418	-3,662	0,551
		Thiel	0,106	0,936	1,018	0,502	-2,482	0,345	-2,117	0,431
PPC	Case 1	Parametric	5,067	0,520	3,301	0,686	-0,742	0,873	3,432	0,542
		Thiel	2,708	0,519	2,256	0,424	-0,756	0,709	0,839	0,730
Raubex	Case 1	Parametric	6,894	0,398	9,904	0,236	-4,703	0,446	-2,635	0,723
		Thiel	2,762	0,404	3,662	0,276	-1,650	0,530	-0,446	0,888
RMB Holdings	Case 1	Parametric	-3,112	0,792	0,014	0,999	-3,710	0,234	-5,037	0,220
		Thiel	0,24	0,961	2,123	0,704	-1,328	0,279	-2,154	0,208
Sasol	Case 1	Parametric	4,36	0,261	1,37	0,781	-8,117	0,196	-8,622	0,288
		Thiel	0,538	0,749	-0,509	0,798	-4,166	0,135	-4,720	0,197
	Case 2	Parametric	2,582	0,722	2,636	0,736	3,629	0,367	8,809	0,140
		Thiel	1,798	0,571	2,128	0,532	0,900	0,703	2,723	0,284
Stefanutti	Case 1	Parametric	-2,636	0,499	0,23	0,961	-3,389**	0,040	-4,552	0,188
		Thiel	-0,387	0,758	-2,252	0,632	-0,918	0,164	-1,150	0,435
	Case 2	Parametric	0,869	0,918	0,884	0,921	16,196	0,127	21,56*	0,091
		Thiel	0,947	0,798	1,202	0,756	9,293*	0,053	12,603**	0,030
Steinhof	Case 1	Parametric	-3,544	0,539	-10,11	0,124	0,789	0,822	-5,142	0,273
		Thiel	-1,472	0,546	-4,32	0,114	0,618	0,689	-2,025	0,344
Tiger Brands	Case 1	Parametric	3,193	0,387	-1,159	0,793	-3,037	0,519	-3,093	0,584

Company	Case	Method	Investigation announcement				Penalty announcement			
			Event window (-5,5)		Event window (-5,10)		Event window (-5,5)		Event window (-5,10)	
			CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value	CAR (%)	P-value
		Thiel	2,643*	0,083	0,186	0,927	-0,116	0,954	0,415	0,865
		Parametric	-11,403	0,16	-13,924	0,111	-2,243	0,790	-0,722	0,937
	Case 2	Thiel	-4,79	0,183	-5,869	0,131	-0,357	0,921	0,506	0,898
	WBHO	Case 1	Parametric	-7,166	0,429	-8,319	0,364	3,754	0,403	4,484
Thiel			-2,235	0,57	-1,966	0,623	0,941	0,667	2,337	0,341
Case 2		Parametric	-0,472	0,402	-7,057	0,299	-10,163	0,044	-10,953	0,122
		Thiel	-1,547	0,561	-1,855	0,525	-3,986*	0,080	-3,957	0,229
Case 3		Parametric	-0,472	0,402	-7,057	0,299	-3,007	0,644	-4,712	0,463
		Thiel	-1,547	0,561	-1,855	0,525	-1,077	0,712	-1,807	0,530

*Significant at 10%; ** Significant at 5%; ***Significant at 1%.

Source: Author's compilation from Stata output

The general results of the study indicate that in most of the cases, the news of an investigation or the imposition of a penalty in South Africa does not necessarily result in a statistically significant negative movement in share prices. Several factors may contribute to this outcome. Firstly, in many instances the Commission investigates and prosecutes each company's case independently. This means that two members of the same cartel may have different timelines for when their case is initiated and eventually concluded. As a result, news of the cartel may reach the market when one cartel member is prosecuted, and this could be well before other members of the cartel have been investigated. By the time the investigation and penalties occur, such news has already been priced into the affected company share price(s). For example, in the case of the bread cartel, Premier Foods was first to approach the Commission and indicate its willingness to cooperate with the investigation into the alleged cartel conduct between themselves, Tiger Brands and Pioneer Foods. While Tiger Brands and Premier Foods had concluded their cases by 2007, Pioneer Foods continued to contest the matter until it was eventually concluded with a penalty in February of 2010.⁶

Secondly, many of the cases take several years to be concluded, and this also results in the news of a penalty being neither new nor shocking to the market. For instance, with the construction cartels, the initial cases against ArcelorMittal South Africa Ltd (ArcelorMittal), Aveng Ltd (Aveng), Wilson Bayly Holmes-Ovcon Ltd (WBHO) and others, commenced in 2009, with many not concluded until seven years later.

Thirdly, the size of the penalties may be viewed by investors as not material enough to erode the value of their investment in a company, even if it is found guilty of cartel conduct. Section 59(2) of the Competition Act No. 89 of 1998 (the Act) specifies that the penalty for cartel conduct may not exceed 10% of a company's turnover, including exports, in the preceding financial year. It is often the case that the penalty eventually imposed is lower than the 10% threshold. If investors expect a penalty amounting to 10% of revenue, then the news of a significantly lower penalty relative to the originally expected penalty may be received favourably. A lower penalty will have a lower impact on the company's immediate profitability. In addition, in some cases, both the Commission and the Tribunal have been amenable to payments being made over a few years, usually three years, which also lessens the impact on profitability in one single year. One key insight from the study is that the size of the penalty on its own, as well as relative to the size of the company's revenue, particularly matters to companies that form part of a group of companies. This confirms the findings of both theoretical and empirical studies that the size of penalties holds some significance in the matter of deterrence. If investors are affected by investigations and penalties for collusive behaviour, they are more likely to exercise more effective oversight over the behaviour of the managers of their companies. This can contribute to deterrence.

Finally, in some markets where widespread collusion is detected and where some firms are repeat offenders, it is possible that announcements of additional cartel conduct do not lead to further negative impacts on share prices. Investors may already have priced in a culture of collusion into

⁶ Competition Commission v Pioneer Foods (Pty) Ltd (15/CR/Feb07, 50/CR/May08) [2010] ZACT 9 (3 February 2010).

the company's share price. In addition, if company profitability had proven resilient to previous findings and penalties, investors may take the view that the latest penalties are unlikely to be detrimental to the company's profitability. Even more so if the companies had already made provision for potential penalties in their preceding annual financial statements, which is routine when it is likely that the company will be penalised.

It is with noting that companies in the construction sector are disproportionately represented in the sample of assessed companies in this study for several reasons. First, the construction sector was part of the sectors selected that the Commission prioritised for scrutiny and enforcement. Second, the construction sector had several companies that were listed and involved in collusion. Third, the deliberate focus on the construction industry revealed widespread cartel conduct and resulted in the large number of cases that unfolded in the period of study. This also created opportunity for leakages to occur because early investigation announcements would be expected to alert the market and enable investors to anticipate other investigations in the industry as well as possible adverse findings.

The sections that follow below highlight the findings of the analysis at company level.

4.1. ArcelorMittal South Africa (JSE: ACL)

The case against ArcelorMittal began in June 2008 with a dawn raid on its co-conspirators, Highveld Steel and Vanadium Corporation Limited (Highveld), Cape Town Iron and Steel Works (CISCO), and the South African Iron and Steel Institute (SAISI). The case referred to the Tribunal comprised of three separate complaints involving cartel activity in the manufacturing of long steel, flat steel, and scrap metal. In June 2008 another co-conspirator, Scaw South Africa (Scaw) applied for and was granted conditional immunity under the Corporate Leniency Policy (CLP). The first SENS announcement from ArcelorMittal relating to this matter was issued in September of 2009. However, the case was only concluded in August of 2016, some eight years later. The penalty amount was R 1 500 000 000, which was to be paid over a five-year period. The penalty was a record for a single company at the time, and covered all cartel conduct against ArcelorMittal (Competition Tribunal, 2016). News of the investigation resulted in negative and significant returns in the 11-day event window, with the calculated CAR using the OLS estimation of -13% over the 11-day window. The share price also exhibited negative CAR in the 16-day window, but this was not statistically significant. The announcement of the administrative penalty was associated with negative CAR in both the 11-day and the 16-day event windows, but the results were not statistically significant.

Important to note is the fact that in 2015, ArcelorMittal made a provision of R1 245 000 000 for the penalty as the present value of the administrative penalty, which would have amounted to R1 500 000 000 in 2016.⁷ In its previous financial statements, ArcelorMittal informed investors of the potential for a penalty of up to 10% of its turnover for various cartel-related matters. In the

⁷ See ArcelorMittal Integrated Annual Report for the year ended 31 December 2016, p.56; available at <https://www.arcelormittal-reports.com/reports/integrated-2016/pdf/full-afs.pdf>

years preceding the final settlement of the cases, investors were informed of the settlement discussions that were taking place between the company and the Commission. This meant investors were expecting that a penalty would be imposed on the company, which would have resulted in investors pricing the penalty into the share price. Further, the fact that the penalty was to be paid over a 5-year period meant that it had a reduced impact on the immediate financial position of the company over the period, compared to a situation where ArcelorMittal would have been required to pay the full penalty immediately. Thus, by allowing for a later settlement, the present value of the penalty was effectively reduced.

4.2. Aveng Limited (JSE: AEG)

Aveng had three concluded cases in the period of study. The first case was initiated in 2008 and involved cartel conduct in the manufacturing of precast concrete products including pipes, culverts and manholes. Infraset, a division of Aveng Ltd, was investigated and found to have colluded in fixing prices, dividing markets and allocating tenders when one of its co-conspirators Rocla (Pty) Ltd (Rocla), applied for leniency. The case was concluded in February 2009 with an adverse finding against Aveng and a penalty of R46 000 000, which was 8% of Infraset's turnover.⁸ The penalty was paid in three equal instalments. Rather than declining at the announcement of the investigation and penalisation, the share price rose. The increase was only statistically significant in the 11-day window of the investigation announcement phase, where the calculated CAR was 14%. The penalty was applied only to the revenue attributable to Infraset and not the entire Aveng Group revenues and was lower than the 10% threshold. Infraset was identified as a non-core business and constituted a small part of the Aveng Group. A decision was then taken to discontinue the Infraset operation.⁹ The small size of the Infraset business relative to the entire Aveng portfolio, meant that the significance of the penalty to the entire Aveng Group was an even smaller percentage of its revenue. This insulated the Aveng Group from the impact of the penalty.

The second case was initiated in February 2009 and began with an investigation into cartel conduct in the construction of stadiums for the 2010 FIFA Soccer World Cup. The construction companies that were investigated included Aveng, Group Five Limited, Murray & Roberts, and WBHO. Applications for immunity through the CLP further revealed that there was widespread, if not endemic, cartel conduct within the construction industry. This resulted in a decision by the Commission to use the Construction Fast Track Settlement Programme as a way of expeditiously dealing with investigations in the industry. The Commission issued a media release in February 2011, inviting members of the construction industry to come forth and settle cases expeditiously and on favourable penalty terms through the CLP. This process resulted in the disclosure of multiple instances of cartel activity across various construction projects. Aveng ultimately paid an administrative penalty of R306 576 143. The case was concluded in June 2013¹⁰. In this case, the initial announcement yielded positive, statistically insignificant results. The penalty

⁸ Competition Commission Annual Report 2008/2009.

⁹ Aveng Group Integrated Annual Report 2018.

¹⁰ Competition Commission v Aveng (Africa) Ltd (016931) [2013] ZACT 76 (23 July 2013).

announcement might have been anticipated due to the many cases in the industry. However, the share price declined upon the penalty announcement, but this was not statistically significant. Despite the size of the penalty, it represented a small percentage (less than 1%) of the Aveng Group revenues, which were declared to be around R53 000 000 000 (53 billion rands) in 2014 (Aveng, 2014).

The third case relates to cartel conduct in the manufacturing of wire mesh, an input in the construction industry. Murray & Roberts, a co-conspirator in the wire mesh cartel, was first to apply for leniency. This led to the disclosure of the activities of Aveng (trading as Steelectedale), Murray & Roberts and others, which included price fixing, collusive tendering and allocation of customers. The case was concluded in February 2011. For their role in the cartel, Aveng faced a fine of R128 904 640. The penalty represented 8% of Steelectedale's annual turnover for the year 2008.¹¹ In this case, the share price showed a negative but statistically insignificant CAR in response to news of the investigation and the penalty

4.3. Basil Read Holdings Limited (JSE: BSR)

Basil Read Holdings Ltd (Basil Read) was one of the construction companies investigated for widespread cartel conduct in the construction industry, starting with an investigation into the construction of stadiums for the 2010 FIFA Soccer World Cup in February 2009. For its part, Basil Read applied for leniency. As part of this process, Basil Read disclosed its participation in the construction cartel in multiple projects within the industry. The case was concluded in July 2013, with a penalty of R94 936 248.¹² The announcement of the investigation resulted in a negative CAR, but this was not statistically significant. However, the share price experienced a positive CAR when the penalty was announced. The news of the penalty was likely to have been anticipated by the market due to the broad investigation in the construction industry. In addition, the quantum of the penalty may have been viewed by investors as a relatively small share (1.7%) of the company's reported revenue of R5 500 000 000 in 2012 (Basil Read, 2012).

4.4. KAP Industrial Holdings (JSE: KAP)

The KAP Industrial Holdings (KAP) case involved cartel activity in the manufacturing of foam for the automotive and furniture industries. The Commission referred the case against KAP, Steinhoff, Loungefoam (Pty) Ltd and Feltex Holdings (PTY) Ltd to the Tribunal in September 2007 for price fixing and market division. The case was concluded in June 2016 after a lengthy litigation process. The companies were each fined R 1 750 000.¹³ The results for KAP showed a positive CAR which was not statistically significant to both news of the investigation and the penalty. In terms of the investigation, there were no major announcements on the part of the accused

¹¹ Competition Commission v Aveng (Africa) Ltd t/a Steelectedale and Others (84/CR/DEC09) [2012] ZACT 32 (7 May 2012).

¹² Competition Commission v Basil Read Holdings (Pty) Ltd (016949) [2013] ZACT 69 (22 July 2013).

¹³ Competition Commission v Kap Raw Materials (Pty) Ltd, Loungefoam (Pty) Ltd, Steinhoff International Holdings Ltd, Kap Industrial Holdings Ltd and Feltex Holdings (Pty) Ltd CR076Sep08/SA254Mar16.

companies. KAP did not issue a SENS announcement concerning the matter, therefore investors may have been largely unaware of the case. The case was concluded in 2011 and the penalty was relatively low considering that KAP's revenue in the prior year was reported as R15 700 000 000 (approximately 0.01% of turnover) (KAP, 2015). The extended period that it took to conclude the case as well as the relatively low administrative penalty, may therefore explain the positive albeit statistically insignificant movement in the share price, which was observed in both the 11-day and the 16-day event windows.

4.5. Murray & Roberts Holdings Limited (JSE: MUR)

Murray & Roberts Holdings Limited (Murray & Roberts) had two cases concluded in the period under study. The first case related to cartel conduct that started as an investigation into the construction of stadiums for the 2010 FIFA Soccer World Cup. Like the other parties involved in the construction cartel, Murray & Roberts applied for leniency and assisted to uncover a range of construction projects in which the construction companies had colluded to fix prices and divide markets. The case was concluded in July 2013, with an administrative penalty of R309 046 455.¹⁴ The share price exhibited negative CAR in the 11-day as well as the 16-day event windows. This was the case at the announcement of the investigation as well as at the announcement of the penalty.

The second case was initiated by the Commission due to additional construction projects that were uncovered through investigations into cartel activity in the industry. Regarding these projects, it was found that Murray & Roberts, WBHO, and others were involved in price fixing and collusive tendering. A further administrative penalty of R64 141 798.86 was therefore imposed on Murray & Roberts in October 2015.¹⁵

As expected, both cases indicated negative share price returns on the announcement of the investigation and the announcement of the penalty. These results were, however, not statistically significant.

4.6. Oceana Group Limited (JSE: OCE)

The case against Oceana Group Limited (Oceana) involved price fixing and allocation of markets in the supply of pelagic fish. Along with its co-conspirators, Foodcorp (Pty) Ltd, Premier Fishing SA (Pty) Ltd and others, Oceana formed a cartel in the fishing industry where they agreed to fix prices for raw and canned fish, entered into non-compete agreements and allocation of suppliers to divide markets. The case was concluded in April 2012 with an administrative penalty of R34 750 050 which represented 5% of Oceana's turnover in the year 2010.¹⁶ Oceana's share

¹⁴ Competition Commission v Murray & Roberts Ltd (017277) [2013] ZACT 75 (22 July 2013).

¹⁵ Competition Commission v Murray & Roberts Limited (CR128Mar11/SA153Oct15) [2015] ZACT 128 (9 December 2015).

¹⁶ Competition Commission v Oceana Group Ltd and Another (50/CR/May12) [2012] ZACT 40 (19 June 2012.)

price exhibited negative and statistically significant returns at the announcement of the investigation in the 11-day event window where the CAR was calculated at -8.8%. The returns also exhibit a downward trend at the penalty announcement stage in the 11-day and the 16-day event windows. However, these were not statistically significant.

4.7. Omnia Holdings Limited (JSE: OMN)

The Omnia Holdings (Omnia) case involved cartel conduct in the market for manufacturing of fertiliser. Omnia, along with Sasol Chemical Industries Limited and Yara South Africa (Pty) Ltd, was found to have engaged in price fixing and allocation of markets. The case was concluded in May 2018 and an administrative penalty of R30 000 000 was imposed on Omnia.¹⁷ Omnia's CAR at the announcement of the investigation showed a slight decline in the 11-day event window, with positive CAR when the 16-day event window was used. The positive share price movement could be attributable to the unaudited six-month financial results indicating that Omnia's revenue had increased by 25.7% (Omnia, 2013) which were released later in the same month (November 2013)). Upon the announcement of the penalty, Omnia's share price indicated a downward trend as expected. These results were, however, not statistically significant.

4.8. PPC Limited (JSE: PPC)

In June 2009, the Commission conducted a dawn raid on the premises of PPC Limited (PPC) as part of the investigation into cartel conduct in the cement manufacturing sector. PPC issued a SENS announcement the following day confirming that there had been a raid at the premises of "the major cement manufacturers" and indicating that PPC had, since the inception of competition legislation in the country, ensured compliance with the Act (PPC, 2009). Upon the announcement of the investigation, the share price exhibited positive but statistically insignificant returns in the 11-day and 16-day event windows. At this time, PPC issued a general SENS announcement acknowledging the investigation into the construction industry, without specifically mentioning or implicating PPC in any wrongdoing. Apart from the investigation, in the prior month PPC had appointed a new Chief Executive Officer and announced positive interim results, showing revenue increases of 12% (PPC, 2009). The investors may therefore have viewed the company favourably in the period leading up to the investigation announcement. PPC went on to apply for leniency and was granted conditional immunity. The share price experienced negative CAR in the 11-day event window upon the announcement of the conditional immunity. The 16-day event window on the other hand showed positive, statistically insignificant returns. The positive returns may have resulted from investors realising that in this case, PPC would not be liable for an administrative penalty.

¹⁷ Competition Commission v Yara South Africa (Pty) Ltd and Omnia Fertilizer Ltd (CR006May05/SA080Jun18) (5 September 2018).

4.9. Raubex Group Limited (JSE: RBX)

Raubex Group Limited (Raubex) is another construction company that was implicated in cartel activity in the construction of the World Cup stadiums and several other projects. Following an invitation from the Commission, Raubex also applied for leniency. Raubex's share price exhibited positive returns at the news of the investigation. This may be attributed to the fact that Raubex did not issue a SENS notice when the investigation was announced. Investor may have therefore been unaware of the investigation at the time that it was initiated. In this case a penalty of R58 826 626 was ultimately imposed on Raubex.¹⁸ This represented approximately 2.1% of the company's revenue in the preceding year (Raubex, 2012). There was a downward trend in the share price when the penalty was announced. This was consistent in the 11-day as well as the 16-day event window. However, the results were not statistically significant.

4.10. RMB Holdings Limited (JSE: RMH)

RMB Holdings (RMB), along with Nooordwes Ko-operasie Limited (NWK) were implicated in cartel activity relating to collusive conduct in the trading of grain on the South African Futures Exchange (SAFEX). The two parties, who both compete in trading grain, were found to have entered into a vertical agreement. In terms of this agreement, the supplier of storage services (NWK) and its customer (RMB), agreed to divide the grain market and allocate customers. An administrative penalty of R2 100 000, amounting to 3% of the value of the grain affected by the cartel conduct¹⁹ was imposed on RMB. The RMB share price experienced a statistically significant reduction in returns upon the announcement of the investigation in the 11-day event window. However, when examined over a 16-day event window, the CAR on the share price was positive. This may have reflected the market's initial shock over the possible collusion and involvement of a major banking group, but the share price recovered strongly between the end of the 11-day event window and the end of the 16-day event window. The share price declined upon the announcement of the penalty in the 11-day and 16-day event windows, but the results for both windows were not statistically significant.

4.11. Sasol Limited (JSE: SOL)

Sasol had two concluded cases. The first case related to cartel conduct in the manufacturing of fertiliser. In this case, Sasol Nitro, a division of Sasol Chemical Industries Limited, was found to have colluded with two other fertiliser manufacturers, namely Kynoch Fertiliser (Pty) Ltd and Omnia Fertiliser Limited, to fix prices and divide markets. The case for Sasol was concluded in May 2009 with an administrative penalty of R250 680 000, which constituted 8% of Sasol Nitro's turnover for the year ending 2004/2005.²⁰ In the case of the fertiliser cartel, the initial

¹⁸ Competition Commission v Raubex (Pty) Ltd (017012) [2013] ZACT 65 (22 July 2013).

¹⁹ Competition Commission v Rand Merchant Bank, a division of First Rand Bank Ltd (44/CR/Jun11) [2011] ZACT 51 (14 July 2011).

²⁰ Competition Commission South Africa v Sasol Chemical Industries Ltd; Competition Commission South Africa v Sasol Chemical Industries Ltd and Others (31/CR/May05) [2009] ZACT 33 (20 May 2009).

announcement did not yield the expected results, as the share price exhibited an upward trend upon the announcement in both the 11-day and the 16-day event windows. This could be attributable to another competition matter that was unfolding two weeks prior involving Nationwide Poles. In this case Sasol Carbo Tar, a division of Sasol Ltd was found to have been involved in price discrimination²¹. Sasol issued a notice indicating its intention to appeal the matter citing that price interventions by the competition authorities could have a detrimental impact on business by discouraging growth and economies of scale (Sasol, 2005). This response by Sasol may have created an impression amongst investors that future actions by the Commission would also be challenged. The announcement of the penalty was made in May 2009 and resulted in the share price declining in both the 11-day and the 16-day event windows, but the results were not statistically significant.

The second case involved alleged collusion in the market for petroleum products. In this case, Sasol approached the Commission with a request for leniency due to conduct involving themselves and their competitors, including Shell SA (Pty) Ltd, Chevron SA (Pty) Ltd, and Engen Ltd. These petroleum companies were alleged to have engaged in information exchange relating to prices. The case was concluded in May 2018, with a decision by the Commission that no penalty would be pursued, as the alleged information exchange between the respondents had ceased in 2009. Instead, recommendations were given for future conduct.²² In this case, the share price exhibited positive and statistically insignificant returns at the investigation and the conclusion stages. In terms of the investigation, it is notable that Sasol proactively contacted the Commission and issued a SENS announcement detailing their plan towards ensuring compliance with Competition Law. Given the outcome of the case, the investors may have favourably viewed the news of the events.

4.12. Stefanutti Stocks Holdings Limited (JSE: SSK)

Stefanutti is another construction company implicated in cartel activity in that industry, with two concluded cartel cases in the period under study. Stefanutti applied for leniency in April 2011. Subsequently, the company paid an administrative penalty of R306 892 664.²³ Stefanutti's share price experienced negative CAR at the announcement of the investigation as well as the announcement of the penalty. These results were only statistically significant using the 11-day window of the penalty announcement, where the calculated CAR was -3.4%.

With regard to the second case, Stefanutti applied for leniency for involvement in collusive tendering. Although this was treated as a separate matter, both cases were initiated during 2011 and resulted from the invitation by the Commission for construction companies to apply for

²¹ Sasol Oil (Pty) Ltd v Nationwide Poles CC (49/CAC/Apr05) [2005] ZACAC 5 (13 December 2005)

²² Competition Commission South Africa v Chevron SA (Pty) and others (CR098Oct12/SA245Nov17) [2018].

²³ Competition Commission v Stefanutti Stocks Holdings Ltd (017038) [2013] ZACT 63 (22 July 2013).

leniency and settle on favourable terms for cartel activity.²⁴ The second case was therefore not a shock to the market, as investigations were already underway in connection with collusion in the industry. The initial announcement of the investigation was associated with a positive share price movement. This case concluded with Stefanutti being granted conditional immunity, which could explain the positive and statistically significant abnormal share price returns and the CAR of 21.6% at the conclusion of the case, when looking at the 16-day event window.

4.13. Steinhoff International Holdings NV (JSE: SNH)

The case against Steinhoff involved collusion in the manufacturing of foam for automotive and furniture industries. Details of the case were discussed in section 4.4.4 above under KAP Industrial. The initial announcement resulted in a reduction in the share price, both in the 11-day and 16-day event windows. It is worth noting that while the Steinhoff case was initiated in 2007, it was only concluded in 2016, with a penalty of R 1 750 000.²⁵ The initial positive movement in the share price in the 11-day event window may have meant that the announcement did not reach investors expeditiously, particularly as no SENS announcement was issued regarding this matter. Considering that Steinhoff was declaring revenue upwards of €3 000 000 000 (three billion Euros) in 2016, the penalty of R1 750 000 was extremely small. Nonetheless, the share price exhibited negative returns in the 16-day event window. Given the quantum of the penalty and the amount of time it took to conclude the case, it is possible that the negative returns resulted from the announcements that Steinhoff made around the same time regarding their intended acquisition of Poundland Group Plc, a British chain store (Steinhoff, 2016), as opposed to a response to the penalty. The negative CAR results were, however, not statistically significant.

4.14. Tiger Brands Limited (JSE: TBS)

Tiger Brands' first case related to the much-publicised bread cartel of the late 1990s to 2000s, which involved Tiger Brands, Premier Foods (Pty) Ltd (Premier), Pioneer Foods (Pty) Ltd, and Foodcorp (Pty) Ltd. These companies were investigated for price fixing and division of markets in the Western Cape and nationally. Premier was the first to apply for leniency and was granted conditional immunity. Tiger Brands also applied for leniency and provided additional information to the Commission to assist in the investigation. As Tiger Brands and its co-conspirators are vertically integrated, cartel activity was further uncovered upstream in their respective milling businesses.

For its participation in the bread and milling cartels, Tiger Brands paid a fine of R98 784 869.90. This amounted to 5.7% of Tiger Brands' national turnover from the bakery division for the financial year 2006 (Competition Commission, 2007). This represented only 0.77% of the group's revenue (Tiger Brands, 2006). Upon the news of the investigation, the share price exhibited a slight upward

²⁴ Competition Commission v Stefanutti Stocks Holdings Limited (CO142Sep15) [2015] ZACT 108 (14 October 2015).

²⁵ Competition Commission v Kap Raw Materials (Pty) Ltd, Loungefoam (Pty) Ltd, Steinhoff International Holdings Ltd, Kap Industrial Holdings Ltd. and Feltex Holdings (Pty) Ltd CR076Sep08/SA254Mar16.

movement in the 11-day event window. However, for the 16-day event window, the share price exhibited the expected downward CAR. This may have meant that investors had anticipated the case, given that Premier had already applied for leniency and provided information on the cartel. On the other hand, this particular case attracted a much media attention, and this may have resulted in the decline in the share price in the days after the investigation was announced. The penalty announcement resulted in a negative share price movement in both the 11-day and the 16-day event window. These results were, however, not statistically significant.

The second case involved Adcock Critical Care (AICC), which at the time was wholly owned by Tiger Brands. The conduct involved collusive tendering and allocating customers in the private hospital market. AICC and its co-conspirators Fresenius Kabi South Africa (Pty) Ltd (FKSA), Dismed Criticare (Pty) Ltd and Thusanang Health Care (Pty) Ltd, were investigated for collusive tendering in the supply of medical supplies. AICC and FKSA were also alleged to have divided the private hospital market among themselves. The matter was referred to the Tribunal in February 2008, and soon thereafter Tiger Brands conducted its own internal investigation of its subsidiary's conduct. Tiger Brands then applied for leniency and the case was concluded with an administrative penalty of R52 502 800. In this case, the share price declined during the window for the announcement of the investigation as well as the window for the announcement of the penalty. The results were, however, not statistically significant.

4.15. Wilson Bayly Holmes-Ovcon (WBHO) Limited (JSE: WBO)

With regard to WBHO, there were three concluded cases during the study period. In this instance, these cases were investigated concurrently, in part due to the increased focus by the Commission on the construction industry. The first case stemmed from the construction cartel already discussed above. Like its competitors (Murray & Roberts, Aveng and others), WBHO responded to the Commission's invitation to come forth with information on cartel activity in the construction industry. The case was concluded in July 2013, with an administrative penalty of R311 288 311.²⁶ This was approximately 1.7% of the group's revenue (WBHO, 2012). Both the announcement of the investigation and the announcement of the penalty resulted in a decrease in the share price and the CAR in the 11-day and the 16-day event windows. However, the results were not statistically significant.

The second case related to cartel conduct between WBHO, Concor (Pty) Ltd, and Lennings DEC Rail Services (Pty) Ltd (Lennings) for collusive tendering in respect of a project to upgrade the railway line between Sishen and Saldanha. Lennings was the first to apply for leniency. The case was concluded with a penalty against WBHO amounting to R10 244 135.50.²⁷ The initial announcement resulted in a negative but statistically insignificant decrease in the share price in the 11-day and 16-day event windows. The news of the imposition of the penalty resulted in a negative, statistically significant movement in the share price in the 11-day event window, where

²⁶ Competition Commission v WBHO Construction (Pty) Ltd (017061) [2013] ZACT 74 (22 July 2013).

²⁷ Competition Commission v WBHO Construction (Pty) Ltd (018549) (21 February 2014).

the calculated CAR was -10%. The share price also experienced negative returns in the 16-day event window, but this result was not statistically significant.

The final WBHO case related to further cartel activity in the construction industry involving WBHO and Aveng, Stefanutti, and Murray & Roberts, among others. WBHO applied for leniency for its involvement in price fixing, market allocation, and collusive tendering in respect of several construction projects, which were not discovered in the previous cases. As WBHO was first to approach the commission in this case, it was granted conditional immunity.²⁸ The share price exhibited negative returns in the initiation phase in the 11-day and 16-day event windows. At the conclusion of the case, the share price experienced positive CAR. This may have been a result of the announcement that no penalties would be applicable to WBHO in this instance. The results were not statistically significant.

5. Conclusion

The key objective of this study was to assess the impact of the news of cartel-related investigations and cartel penalties on company share prices. Given that cartel conduct, if successfully prosecuted, results in a loss in profitability as companies no longer enjoy supra-competitive profits, the expectation is that company share prices will exhibit negative returns upon the news of an investigation, and upon the imposition of penalties for cartel conduct. Such negative returns indicate that investors viewed the future prospects of the said company negatively. In addition, since penalties are an expense, there is also a short-term impact on the profitability reported in the period(s) in which it is paid. This is another aspect that causes a decline in the share price. In turn, the decline in the share price indicates that the enforcement actions by competition authorities have a deterrent effect on cartel conduct.

Classical event study methodology was employed to examine the returns of a sample of 15 JSE listed companies that were successfully prosecuted for cartel conduct in the period 2009 to 2019, at two stages of the enforcement process. First, the returns were observed at the initial announcement of the investigation. Second, the returns were evaluated at the announcement of the penalty.

The findings of this study indicate that in most instances, the news of an investigation and penalties for cartel conduct resulted in negative returns, as was observed in most cases. However, in most instances these negative returns were not statistically significant. Three key factors may have affected the results. Firstly, the effective penalties imposed on individual divisions or subsidiaries within a group's company structure were relatively low compared to the company's revenues. This means that penalties are not significant enough to have a meaningful impact on the overall valuation of a company. For instance, in the case of Tiger Brands, penalties constituted 5.7% of the national turnover of their bakery division but were less than 1% of the group's revenues. Secondly, due to delays in the process between the investigation and the penalty stage, present values of the penalties were discounted, leading to lower effective fines.

²⁸ Competition Commission v WBHO Construction (Pty) Ltd (CR234Feb16/SA049Jun16) (13 July 2016).

During the investigation process, delays may also have meant that investors could have already priced in the penalties by the time the case was eventually concluded. Thirdly, as different cartel members were prosecuted at different times, information relating to the enforcement process may have reached the markets before all pending investigations were finalised.

The key limitation of this study relates to the sample size. To be included in the study companies were required to be listed on the JSE. This meant that a large proportion of successfully prosecuted cases could not be included, as they were not listed. The second limitation is that the sample had a disproportionate representation of construction companies due to widespread collusion in the construction industry during the period under review, which caused increased focus by the competition authorities. This indicates that broad conclusions could not be drawn on all companies or industries as to the effect of enforcement announcements on the valuation of their companies. These limitations are, however, not unique to this study.

This study provides evidence that for the most part, investigation and penalty announcements did not result in statistically significant negative share price returns. This suggests that the enforcement actions conducted by competition authorities during the study period may not have affected shareholders significantly enough. In other words, in its current form, and from a penalisation perspective, the process of investigating and prosecuting cartels may not create a strong disincentive for cartel conduct.

Competition authorities may therefore consider a number of revisions to the existing cartel enforcement framework. Firstly, where applicable, the 10% threshold for penalties associated with cartel conduct should be applied to the entire group under investigation, not just one of their divisions or subsidiaries. Extending the penalty threshold to the entire group may put more pressure on shareholders and management to ensure that compliance measures are in place to combat cartel activity at all levels throughout the company. The risk of significant penalties and reductions in profitability will, in this regard, serve to discourage cartel conduct. Secondly, it is recommended that individuals be held personally liable for their involvement in cartels, thus expediting criminal prosecutions, possible jail sentences and fines. This may increase individual accountability, which could result in a change of behaviour. Finally, competition legislation relating to cartels should be reviewed to place the onus of proof on the accused colluding companies as opposed to the applicants, who may be small businesses or individuals. This would create a further incentive for companies to ensure that their policies and culture is compliant with anti-cartel laws.

References

- Aguzzoni, L., Langus, G. and Motta, M., (2013). The effect of EU antitrust investigations and fines on a firm's valuation. *The Journal of Industrial Economics*, 61(2), pp.290-338.
- Aveng Limited (2020). SENS. Aveng. Available at: <https://aveng.co.za/sens.php>. [Accessed 22 November 2020].
- Ball, R. and Brown, P., (1968). An empirical evaluation of accounting income numbers. *Journal of accounting research*, pp.159-178.
- Basil Read Holdings Limited (2020). Investors results and reporting. Basil Read. Available at: <http://www.basilread.co.za/investors-results-and-reporting.php> [Accessed 22 November 2020].
- Beverley, L. (2007). *Stock Market Event Studies and Competition Commission Inquiries*. CCP Working Paper No. 08-16. University of East Anglia.
- Bianconi, M., Richards, D. and Yuan, H. (2015). *Equity Prices and Cartel Activity*. Discussion Papers Series, Department of Economics, Tufts University.
- Bos, I., Letterie, W. and Scherl, N., (2019). Industry Impact of Cartels: Evidence from the Stock Market. *Journal of Competition Law & Economics*, 15(2-3), pp.358-379.
- Bosch, J.C. and Eckard Jr, E.W. (1991). The profitability of price fixing: evidence from stock market reaction to federal indictments. *The Review of Economics and Statistics*, pp.309-317.
- Brown, S.J. and Warner, J.B., (1985). Using daily stock returns: The case of event studies. *Journal of financial economics*, 14(1), pp.3-31.
- Campbell, J.Y., Lo, A.W. and MacKinlay, A.C. (1997). *The econometrics of financial markets*. Princeton University Press, Princeton, NJ.
- Cheung, A.W.K., (2011). Do stock investors value corporate sustainability? Evidence from an event study. *Journal of Business Ethics*, 99(2), pp.145-165.
- Cichello, M. and Lamdin, D.J. (2006). Event studies and the analysis of antitrust. *International Journal of the Economics of Business*, 13(2), pp.229-245.
- Competition Tribunal (2005) Matter between Nationwide Poles v Sasol (Oil) (Pty) Ltd. Case ref: (72/CR/Dec03). Available at: <https://www.comptrib.co.za/case-detail/4048>
- Competition Commission (2009). Annual Report 2008/2009. Competition Commission. Available at: <http://www.compcom.co.za/wp-content/uploads/2019/10/annual-report-2008-2009.pdf>
- Competition Tribunal (2009) Matter between Competition Commission South Africa v Sasol Chemical Industries Ltd; Competition Commission South Africa v Sasol Chemical Industries Ltd

and Others. Case ref: (31/CR/May05). Available at:
<http://www.saflii.org/za/cases/ZACT/2009/33.html>

Competition Commission (2011) Competition Commission invites construction firms to settle. Competition Commission. Available at:
<http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/MediaRelease-Competition-Commission-invites-construction-firms-to-settle.pdf>

Competition Tribunal (2011) Matter between Competition Commission. Competition Commission v Rand Merchant Bank, a division of First Rand Bank Ltd. Case ref: (44/CR/Jun11). Available at:
<http://www.saflii.org/za/cases/ZACT/2011/51.html>

Competition Tribunal (2012) Matter between Competition Commission and Aveng (Africa) Ltd t/a Steeledale, case no. 84/CR/Dec10. Available at
<http://www.saflii.org.za/za/cases/ZACT/2012/32.pdf>

Competition Tribunal (2012) Matter between Competition Commission v Oceana Group Ltd and Another. Case ref: (50/CR/May12). Available at
<http://www.saflii.org/za/cases/ZACT/2012/40.html>

Competition Tribunal (2013). Matter between Competition Commission and Aveng Limited. Case ref: 016931. Available at <http://www.saflii.org.za/za/cases/ZACT/2013/76.pdf>

Competition Tribunal (2013) Matter between Competition Commission and Basil Read Holdings (Pty) Ltd. Case ref: 016949. Available at <http://www.saflii.org/za/cases/ZACT/2013/69.pdf>

Competition Tribunal (2013) Matter between Competition Commission v Murray & Roberts Ltd. Case ref: (017277) [2013] ZACT 75. Available at
<http://www.saflii.org/za/cases/ZACT/2013/75.html>

Competition Tribunal (2013) Matter between Competition Commission v Raubex (Pty) Ltd. Case ref: (017012). Available at <http://www.saflii.org/za/cases/ZACT/2013/65.html>

Competition Tribunal (2013) Matter between Competition Commission v Stefanutti Stocks Holdings Ltd. Case ref: (017038) ZACT 63. Available at:
<http://www.saflii.org/za/cases/ZACT/2013/63.html>

Competition Tribunal, (2014). Matter between Competition Commission v WBHO Construction (Pty) Ltd. Case ref: (018549). Available at: <https://www.comptrib.co.za/case-detail/6195>

Competition Tribunal (2015) Matter between Competition Commission v Murray and Roberts Limited. Case ref: (CR128Mar11/SA153Oct15). Available at
<http://www.saflii.org/za/cases/ZACT/2015/128.html>

Competition Tribunal (2015) Matter between Competition Commission v Stefanutti Stocks Holdings Limited. Case ref: (CO142Sep15). Available at: <http://www.saflii.org/za/cases/ZACT/2015/108.html>

Competition Tribunal, (2016). Matter between Competition Commission and ArcelorMittal South Africa Limited. Case ref: 018259. Available at <https://www.comptrib.co.za/case-detail/7177>

Competition Tribunal (2016) Matter between Competition Commission and Kap Raw Materials (Pty) Ltd, Loungefoam (Pty) Ltd, Steinhoff International Holdings Ltd, Kap Industrial Holdings Ltd and Feltex Holdings (Pty) Ltd. Case ref: CR076Sep08/SA254Mar16. Available at <https://www.comptrib.co.za/case-detail/6976>

Competition Tribunal (2016) Matter between Competition Commission v WBHO Construction (Pty) Ltd (CR234Feb16/SA049Jun16). Available at: <http://www.saflii.org/za/cases/ZACT/2017/51.html>

Competition Tribunal (2018) Matter between Competition Commission South Africa v Chevron SA (Pty) and others. Case ref: (CR098Oct12/SA245Nov17). Available at: <http://www.saflii.org/za/cases/ZACT/2018/107.pdf>

Competition Tribunal (2018) Matter between Competition Commission v Yara South Africa (Pty) Ltd and Omnia Fertilizer Ltd. Case ref: (CR006May05/SA080Jun18). Available at <http://www.saflii.org.za/za/cases/ZACT/2010/15.pdf>

Cichello, M. and Lamdin, D.J. (2006). Event studies and the analysis of antitrust. *International Journal of the Economics of Business*, 13(2), pp.229-245.

Connor, J.M., (2008). *Global Price Fixing* 2nd Updated and Revised Edition. Springer, Berlin.

Corrado, C. J. (2011). Event studies: A methodology review. *Accounting and Finance*. Accounting and Finance Association of Australia and New Zealand, vol. 51(1), pp.207-234.

Dang, X., Peng, H., Wang, X. and Zhang, H. (2008). *Theil-Sen estimators in a multiple linear regression model*. Ole Miss Edu., University of Mississippi.

Detre, J.D. & Golub, A.A., (2004). *A Reexamination of the Profitability of Price Fixing Using Stock Price Movement: Has New Antitrust Legislation Been a More Effective Deterrent of Price Fixing?* Staff Papers 28668, Department of Agricultural Economics, Purdue University.

Drake, K.M., & McGuire, T.G. (2016). Stock Price Evidence for Anticompetitive Effects in the Nexium Reverse-Payment Settlement. *Journal of Competition Law and Economics*, 12(4), pp.735-748.

Eckbo, B.E. (1983). Horizontal mergers, collusion, and stockholder wealth. *Journal of Financial Economics*, 11, pp. 241-273.

Fama, E.F., Fisher, L., Jensen, M.C. and Roll, R., (1969). The adjustment of stock prices to new information. *International economic review*, 10(1), pp.1-21.

Fama, E.F., (1970). Efficient capital markets: A review of theory and empirical works. *Journal of Finance*, pp.383-417.

Gopane, T.J. and Mmotla, R.M. (2019). Stock Market Reaction to Mega-Sport Events: Evidence from South Africa and Morocco. *International Journal of Sport Finance*, 14(4), pp.193-210.

Günster, A. and van Dijk, M., (2016). The impact of European antitrust policy: Evidence from the stock market. *International Review of Law and Economics*, 46, pp.20-33.

Hartzenberg, T. (2006). Competition Policy and Practice in South Africa: Promoting Competition for Development Symposium on Competition Law and Policy in Developing Countries. *Northwestern Journal of International Law and Business*.

Jeng, J.L. (2015). *Analyzing Event statistics in corporate finance: Methodologies, Evidences, and Critiques*. Springer.

Johannesburg Stock Exchange Limited (2020). What is the JSE All-Share Index. JSE. <https://www.jse.co.za/grow-my-wealth/what-is-the-jse-all-share-index> [Accessed 19 June 2020].

KAP Industrial Holdings (2020). SENS. KAP Industrial. Available at: <https://kap.co.za/investor-relations/sens/> [Accessed 18 November 2020].

Kavanagh, J. (2008). How can stock market data and event studies be used in competition policy? *Competition Law Journal*, 7(3), 261-270.

Klassen, R.D. and McLaughlin, C.P., (1996). The impact of environmental management on firm performance. *Management science*, 42(8), pp.1199-1214.

Kothari, S.P. and Warner, J. (2006). *Econometrics of Event Studies*. Handbook of Corporate Finance: Empirical Corporate Finance, edited by B. Espen Eckbo. pp.3-36. (Elsevier/North-Holland).

Langus, G. and Motta, M., (2007). *The Effect of EU Antitrust Investigations and Fines on a Firm's Valuation* (No. 6176). CEPR Discussion Papers.

Levenstein, M. and Suslow, V.Y. (2003). Contemporary international cartels and developing countries: Economic effects and implications for competition policy. *Antitrust LJ*, 71, p.801.

Levenstein, M.C. and Suslow, V.Y. (2006). What determines cartel success? *Journal of Economic Literature*, 44(1), pp.43-95.

Lundgren, T. and Olsson, R., (2010). Environmental incidents and firm value—international evidence using a multi-factor event study framework. *Applied Financial Economics*, 20(16), pp.1293-1307.

MacKinlay, A.C. (1997). Event Studies in Competition and Finance. *Journal of Economic Literature*, Vol. XXXV (March 1997), pp.13-39.

Maphwanya, R. (2017) Cartel likelihood, duration and deterrence in South Africa. *Competition Law and Economic Regulation*, p.49.

Mariuzzo, F., Ormosi, P.L. and Majied, Z. (2020). Fines and reputational sanctions: The case of cartels. *International Journal of Industrial Organization*, 69, p.102584.

McWilliams, A. and Siegel, D., (1997). Event studies in management research: Theoretical and empirical issues. *Academy of management journal*, 40(3), pp.626-657.

Motta, M. (2004). *Competition Policy: Theory and Practice*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511804038

Omnia Holdings Limited (2020). SENS. Omnia. Available at: <https://www.omnia.co.za/investors-and-media/sens-feed>. [Accessed 18 November 2020].

Peterson, Pamela P. (1989). Event Studies: A Review of Issues and Methodology. *Journal of Business and Economics*, Vol 28 , No3 (Summer, 1989), pp 36-66

PPC Limited (2020). SENS. PPC. Available at: https://www.ppc.africa/corporate/investors-media/industry-news#ppc_sens. [Accessed 20 November 2020].

Raubex Group Limited (2020). SENS. Raubex. Available at: <https://www.raubex.co.za/index.php/investor-relations/sens>. [Accessed 20 November 2020].

Saleh, W., (2007). Investors reaction to dividend announcements: parametric versus nonparametric approach. *Applied Financial Economics Letters*, 3(3), pp.169-179

Sasol Ltd. (2020). SENS. Sasol. Available at: <https://www.sasol.com/investor-centre/stock-exchange-news-service-sens-0> [Accessed 29 November 2020]

South Africa (1998). The Competition Act, no. 89 of 1998. Available at: <http://www.compcom.co.za/wp-content/uploads/2017/11/pocket-act-august-20141.pdf> . [Accessed 12 June 2020].

South Africa (2018). The Competition Amendment Act, no. 18 of 2018. Available at: https://www.gov.za/sites/default/files/gcis_document/201902/competitionamendment-act18of2018.pdf . [Accessed 22 November 2020].

Steinhoff International Holdings NV (2020). SENS. Steinhoff. Available at: <https://www.steinhoffinternational.com/sens.php>. [Accessed 20 November 2020].

Tamechika, H., (2020). Effects of environment-related stimulus policies: An event study approach. *Case Studies on Transport Policy*, 8(3), pp.895-900.

Thompson, J.S. and Kaserman, D.L. (2001). After the fall: Stock price movements and the deterrent effect of antitrust enforcement. *Review of Industrial Organization*, 19(3), pp.329-334

Tiger Brands Limited (2020). Investor. Tiger. Available at: <https://www.tigerbrands.com/investor> . [Accessed 20 November 2020].

Van den Broek, S., Kemp, R.G., Verschoor, W.F. and De Vries, A.C. (2012). Reputational penalties to firms in antitrust investigations. *Journal of Competition Law and Economics*, 8(2), pp.231-258.

Vaughan, L., (2001). *Statistical methods for the information professional: A practical, painless approach to understanding, using, and interpreting statistics* (Vol. 367). Information Today, Inc.

Wilson Bayly Holmes-Ovcon Limited (2020). Investors. WBHO. Available at: <https://www.wbho.co.za/investors/>. [Accessed 22 November 2020].