

The importance of information exchange in dampening competition in industries historically characterised by regulation – issues from South Africa¹

Catherine Corbett, Reena das Nair, Sunel Grimbeek and Liberty Mncube

WORKING PAPER- NOT FOR CITATION

1. Introduction

The role of information exchange in chilling competition is particularly significant for South Africa given its history of extensive state support, high levels of concentration and pervasive regulation in many industries. Sanctions imposed on South Africa in the apartheid era led government to strongly support strategic local industries. In some of these industries, cartels were officially sanctioned by the state to ensure security of supply. Highly disaggregated, frequent and individualised company information exchange often occurred through industry boards and trade associations which were mandated by government to oversee objectives like collective planning, regulating markets and setting prices. These boards and associations were largely disbanded in the new democracy, but several merely rebranded under the private sector and continued with activities such as information exchange.

Many South African markets in the intermediate industrial product and food sectors have characteristics that make them susceptible to collusive conduct (duopolistic or oligopolistic structure, high barriers to entry, inelastic demand and relatively homogenous products). Information exchange at the high level of disaggregation seen to occur between competitors in these markets may reduce strategic uncertainty of rivals' behaviour, reducing incentives to compete vigorously through secret discounting amongst other means.² Therefore the information exchange in itself may have the effect of dampening competition and could amount to an agreement to allocate markets in situations where the exchange ensures there is little or no incentive to attract customers away from a competitor. Given well-understood pricing mechanisms or market allocation principles established in the period of regulation and state control, information exchange in these markets could also have been used to facilitate ongoing adherence to these historic arrangements.

This paper seeks to show the possible impact of continued information exchange in dampening competition in two such industries that were formerly regulated- the milling and fuels industries. In the case of milling, information exchange on sales volumes through an industry association persisted after direct price fixing meetings and communication between members were uncovered. We are still not seeing the competitive outcomes expected after the explicit cartels were stopped. The questions we seek to address here are whether information exchange facilitated ongoing coordination and whether the effect of this information exchange is sensitive

¹ This paper presents the views of the authors and not necessarily those of the Competition Commission of South Africa. The authors acknowledge contributions from Josh Greenberg and Avias Ngwenya of the Competition Commission of South Africa. We also thank Prof. Joseph Harrington of Johns Hopkins University and Dr. Simon Roberts of the Competition Commission of South Africa for useful guidance provided.

² As found in *UK Tractor Registration Exchange* OJ [1992]L68/19. Albæk et al. (1997) state that it is widely accepted that secret discounting is a natural, if not essential, feature in oligopolistic markets.

to the number of players in milling industry. In the fuels industry, the information exchange regime changed from an individualised exchange of company sales data to an industry aggregated exchange. The concern here is that such highly disaggregated, company-specific exchange in the earlier regime could have reduced incentives to compete. We assess further whether the aggregated information exchange regime is still potentially problematic in markets with fewer players.

The debate on information exchange between competitors remains a controversial area of competition policy. Economic theory generally acknowledges that collusion is made difficult if firms compete under a veil of ignorance concerning the actions of rivals. Following Stigler (1964) and Green & Porter (1984), economic theory on information exchange and collusion focuses on the importance of observability in maintaining cartel stability. When cheating cannot be observed, it is more likely that firms will deviate from an agreement. With information exchange, it is easier to distinguish between deviations due to cartel members cheating on an agreement and deviations because of events that are empirically indistinguishable from cheating otherwise (i.e. the inference problem is reduced). For this reason, firms in the cartel may find it useful to invest in information collection in order to support the collusive equilibrium. The ability to monitor and enforce collusive agreements or understandings is an important part of such arrangements.

Close monitoring of competitors' conduct made possible by highly disaggregated information exchange in and of itself can dampen competition and maintain prices above competitive levels. The incentive for an individual firm to offer more competitive prices (or other attractions over its rivals) is that it will increase its own sales at the expense of its rivals. It may have lower margins on each individual sale under the lower price, but will increase its overall returns because of the increased sales being made. If these increased sales are not achieved, or are only sustained for a very short period because rivals respond similarly, then the incentive to offer the more competitive prices is substantially reduced and competition is weakened. Information exchange, especially at an individualised and disaggregated level, through increased transparency could therefore remove incentives to compete vigorously.

There is little empirical evidence in general on collusion and information exchange. Two notable examples of this work include Fuller et al. (1990) and Albæk et al. (1997) who find that improving transparency in an industry leads to significant and stable price increases above the competitive level. This paper aims to contribute to this research.

The structure of this paper is as follows. Section 2 will begin with an overview of the characteristics and the history of regulation in the agriculture and fuel industries. It looks briefly at the Commission's past experiences with information exchange in cartel cases in the milk, steel and fertiliser markets. It then discusses the possible treatment of information exchange under South African competition law.

Section 3 describes the Commission's recent information exchange case in the wheat-to-bread (milling) value chain. Competitive outcomes after the formal cartel was uncovered are not being observed. Firms' profit margins have been maintained or have increased since the cartel was stopped and sharp input cost reductions have not led to corresponding output price reductions. Preliminary assessments of market share volatility also suggests that, for the main products of white and brown flour, firms are not attracting market share away from rivals as would be expected in a more competitive environment. There is no consistent finding that this effect is greater in markets with fewer players.

In Section 4, the possible impact of individualised information exchange in the fuel industry is assessed. The exchange of sales volumes between South African petroleum companies included the exchange of monthly sales volumes, by individual company, product, magisterial district and customer grouping. This information was aggregated over the industry in October 2007 following potential competition concerns and ceased completely in January 2009. Preliminary empirical analysis suggests that in the commercial diesel submarket, the aggregation of information exchange has increased the volatility of market shares and has seemingly encouraged oil companies to compete for market share more actively. Further, the aggregation to industry level may still be problematic in submarkets with smaller number of players.

Finally, section 5 will briefly discuss the lessons drawn from these case studies on the potential impact of information exchange between competitors in the special context of historically regulated industries.

2. Industry characteristics, history of regulation and treatment of information exchange cases in South Africa

The legacy of apartheid resulted in an economy that was highly concentrated and in which many markets were monopolized.³ This was largely due to regulation and extensive state support which the apartheid government implemented to guard strategic industries. Protectionist policies resulted in barriers to foreign direct investment and barriers to entry were further accentuated by large geographic distances from international markets.

Up until the nineties, marketing of agricultural products in South Africa including grain products such as wheat was extensively regulated by the state through the Marketing Act of 1937 (consolidated in the Marketing Act of 1968).⁴ Institutions mandated to implement the legislation included the Land and Agricultural Bank as well as various, product-specific control boards. The Wheat Board was the main intermediary between the farm gate and the processing level of wheat products. The system operated through a single fixed-channel, wherein the boards set a price at which the total production of wheat would be purchased, marketed and sold under the single channel. The agricultural co-operatives were generally appointed as agents of the relevant boards and functioned as regional monopolies. Under these schemes, farmers were paid a fixed price at delivery to the co-operative, regardless of where the delivery was made. This resulted in substantial cross-subsidisation from farmers proximate to the market to farmers situated further away from the market.⁵ The system was meant to ensure the stability of agricultural prices as well as the reduction of marketing margins between producers and consumers.

The first democratic government initiated a complete transformation of the industry with the introduction of the Marketing of Agricultural Products Act, No. 47 of 1996. Changes included the closure of the boards, a conversion from quantitative trade restrictions to tariffs and gradual

³ In this era, a handful of conglomerate groups dominated the economy. The Anglo American Corporation itself accounted for 43 percent of the Johannesburg Stock Exchange's capitalisation in 1994. Source: McGregors WhoOwnsWhom

⁴ Kirsten and van Zyl (1996)

⁵ Vink & Kirsten (2000)

reductions in the tariffs themselves. After deregulation, industry associations were formed to replace the control boards.

In the fuels or petroleum sector, government intervened primarily with the aim of developing a self-sufficient, indigenous refining and synthetic fuels industry. The regulatory framework implemented therefore favoured local manufacture, indigenous production and the dominance of the state oil company. In certain instances, key policy issues were never legislated, rather, a system of 'gentlemen's agreements' was put in place by the oil companies to regulate the industry.⁶

This industry was regulated until 1999 when the Competition Act of 1998 came into force. The major oil companies applied for and were granted exemptions until 2000. The exemptions were broad, encompassing the full spectrum of petroleum products, and were granted to ease the transition from the state's regulated regime to one governed by competition laws. The prices of certain products, such as petrol at the retail/pump level, illuminating paraffin at the retail level and liquid petroleum gas at the refinery gas level, are still regulated by the Department of Minerals and Energy (DME). In the regulated period, prices for refined products were mainly calculated on an import parity price basis, where hypothetical transport costs were added to a free-on-board international price to arrive at a local South African price as though the product was imported (which in reality was not- it was refined locally). This pricing structure was later known as the "basic fuel price" (BFP) and was the foundation for the wholesale list selling price for petroleum products.

Exchange of information between the oil companies began as early as the 1960s with a single company tasked to gather and disseminate information. In 1989 the National Energy Council requested that this data be submitted to government on a more disaggregated level for the research purposes and to inform pricing policy. This exchange of information was taken over by the South African Petroleum Industry Association (SAPIA) in 1994. The purpose of SAPIA, to which all the oil companies still belong, was to create a platform for the oil industry to engage with the new African National Congress government and other stakeholders.⁷ The data exchanged was claimed to be used to inform investment decisions, facilitate efficient production and resource allocation planning as well as to achieve cost savings through improved operational efficiency.

Information exchange practices that were ingrained in the milling and fuels markets in the apartheid years for purposes of government control continued unhindered under the auspices of these industry associations.

These practices are endemic in several other industries. The Commission has previously looked at cartel cases in the milk, fertiliser and steel industries in which information exchange occurred. In these markets, information exchange took the form of private, individualised exchanges on pricing (forthcoming increases or reductions, procurement prices) sales volumes (usually on a monthly basis), rolling forecasts, capacities, expansion plans and import volume information. The exchange occurred through bilateral communication, trade associations, third party collectors, private committees made up exclusively of cartel members etc. Each of these markets is concentrated and faces high barriers to entry. The products in question are relatively

⁶ Rustomjee et al (2006)

⁷ Some of the objectives of SAPIA include delivering petroleum products to the South African economy at world competitive prices as well as fostering cooperation among its members on common concerns such as health, safety and the protection of the environment (www.sapia.co.za)

homogenous and face inelastic demand. These were industries in which former government intervention and regulation was extensive and information exchange systems were put in place to facilitate government objectives. Several years after deregulation and privatisation, cartel behaviour persisted in these markets and the Commission is of the view that the information exchanged through the various platforms encouraged this.

Relevant sections of the Act

A case of information exchange restricting competition could be brought under Section 4 (1) (a) of the South African Competition Act. Under this section, an agreement⁸ or concerted practice⁹, between parties in a horizontal relationship is prohibited if it has the effect of substantially preventing or lessening competition in a market, unless a party to the agreement, concerted practice or decision can prove that any resulting technological, efficiency or other pro-competitive gain outweighs that effect. Therefore, respondents are given the opportunity to put forth any efficiency justifications for the information exchange.

Section 4(1) (b) of the Act prohibits agreements or concerted practices that involve '*directly or indirectly fixing a purchase or selling price or any other trading condition*'. Information exchange under our law could be regarded as a form of indirect customer or market allocation when there is no incentive to attract customers away from competitors, as such actions, if immediately visible to competitors through the information exchanged, undermine attainable benefits to the firm. This may be the case for highly disaggregated and individual company information being shared in markets where there are few players and relatively homogenous products. Agreement to exchange information could also be considered an indirect form of price fixing. If it prevents secret discounting given the greater probability of detection, then the impact of the exchange may be that prices are indirectly 'fixed'. Under this interpretation then, an information exchange agreement could be considered a contravention of the Act and it could be argued that the very object of the information exchange is to restrict competition.¹⁰

The Competition Tribunal of South Africa has not yet ruled on a restrictive horizontal practices case that deals with information exchange as anticompetitive in itself, so the interpretation of the law remains uncertain.

3. The milling industry

3.1. The concern with information exchange in the milling industry

The Commission is currently investigating two complaints of potential anti-competitive information exchange in the milling and baking industries, involving industry bodies- the National Chamber of Milling (NCM) and the South African Chamber of Baking (SACB). The first complaint involves the sharing of market sensitive information on milled wheat flour and bread

⁸ The South African Competition Act in Chapter 1 defines an agreement, when used in relation to a prohibited practice, to include a contract, arrangement or understanding, whether or not legally enforceable.

⁹ A concerted practice is defined as a cooperative or coordinated conduct between firms, achieved through direct or indirect contact, that replaces their independent action, but which does not amount to an agreement.

¹⁰ das Nair and Mncube (2009)

through the NCM and the SACB respectively. This complaint involves four main companies that are vertically integrated which both mill wheat and bake bread. The second complaint relates to firms operating in the white maize milling industry exchanging information through the NCM, involving most companies active in this industry. The focus of this section will be on the first complaint, in particular the ongoing investigation on potential anti-competitive behaviour in the wheat milling industry.

These complaints follow from investigations into price fixing in bread, wheat flour and milled white maize. The bread cartel case has already been heard by the Competition Tribunal, with pending appeals before the Competition Appeal Court, whilst the wheat flour cartel and milled white maize cases have been referred to the Tribunal. In the wheat milling cartel, the Commission established that Tiger Brands, Pioneer Foods, Foodcorp, Premier and a smaller fifth producer, Godrich Mills, had telephonically and in various meetings, directly fixed (by uniformly increasing) the selling price of milled wheat flour to their customers; agreed on implementation dates of price increases; and discussed bakery (customer) allocation between competitors from 1996 to 2007.

An important reason for the ongoing information exchange investigations is that although the price fixing cartels were uncovered in late 2006 and early 2007 with corporate leniency granted (through the Commission's Corporate Leniency Policy (CLP) process) to two of the cartel participants, the milling industry does not appear to have become more competitive since then. The first CLP was granted in March 2007 to Premier Foods. It appears as if margins after this have either been maintained or increased over time, as sharp input cost reductions have not led to price reductions and market shares have remained relatively stable.

Our analysis into the impact of information exchange in the milling industry seeks to address two main questions. First, whether the outcomes observed in the post-cartel period are competitive and if not, whether this can be ascribed to ongoing coordination through better monitoring via sales information sharing by members of the NCM. Tacit coordination is more likely after explicit collusion, because firms may have learned ways to align behaviour during the explicit cartel.¹¹ It may also benefit firms to continue coordinating their behaviour in order to minimise the difference between prices observed under the cartel period and apparent lower prices that would be expected after the explicit cartel was stopped. This reduces potential damages claims by affected parties.¹²

Second, economic theory provides a foundation for the view that firms who face numerous rivals are constrained in their incentive and ability to coordinate.¹³ We do a preliminary assessment on whether the exchange of information has a greater effect on dampening competition in markets with fewer players.

To address these questions we look at price, cost and margin trends over time and volatility in market shares over time using a market share persistence formula. Before moving to an empirical discussion of information exchange in this industry, we briefly describe the structure of the market, characteristics of the product, type of competition and the level and detail of the information exchanged.

¹¹ Connor (2004)

¹² Harrington (2004)

¹³ Dick (2003)

3.2. Characteristics of the market

The products

Wheat flour is essentially an intermediate product either used internally by vertically integrated companies for their own bakery operations, or sold to other firms to bake bread or manufacture other products such as cakes and biscuits. The main products produced from the milling process of wheat in South Africa include brown and white flour (for bread production), industrial flour, wheat offal (used for cereals and animal feed) and cake flour.

Wheat flour is a relatively homogenous product. The four major firms use similar milling production methods and supply flour for the same applications downstream (baking). The firms also face similar input cost shocks, as well as other supply-side and demand shocks. This increases their ability to anticipate the conduct of rivals.

The competitors and type of competition

The wheat milling industry in South Africa is highly concentrated, with four firms controlling approximately 97% of the industry. These firms are all members of the NCM, as is the fifth smaller player implicated in the cartel activities, Godrich Mills. These players all interact in more than one market at the same time, as they are all vertically integrated with their own baking operations and they are active in various other food and agro-processing activities. All four of these companies also have extensive presence in a number of geographic markets. The wheat that is milled into flour is sold to independent bakeries (the largest being the in-store bakeries of the main supermarket chains), as well as to the retail market (such as cake flour for home baking, etc).

There are high barriers to entry in the milling market in South Africa associated with economies of scale and requirements of having a proper distribution network. The four major firms face no credible threat of entry or expansion by other competitors which implies that the long run benefit of maintaining tacit collusion increases as the pie remains shared among the few. In addition, these firms are also not milling at full capacity, holding a credible threat to punish deviants.

It appears that competition in milling markets occurs through pricing. Pricing of individual firms are not publically observed. However, the NCM data exchange allows members to observe industry sales with little delay and at the level of disaggregation described below.

3.3. The level of detail of the information exchanged

The NCM collects data from its members on monthly volume of sales per product, per province, per pack size, per customer category and exports. In addition, the NCM collects information from its members relating to annual production, packaging and distribution costs. In return members receive, for each category of information supplied to the NCM, the firm's own values and an industry aggregated value in terms of percentage changes of sales totals on a month-to-month basis.

There are generally three broad types of information received by NCM members:

- Weekly industry data concerning volumes of milled wheat and milled maize sold (based on information submitted by each of the members by 12h00 every Monday and received back from the NCM at 14h00 that day);

- Monthly industry production and sales volume data, disaggregated by region, product, pack size and customer category (based on information submitted by the members on the 15th day of each month and received back from the NCM at the end of each month); and
- Average annual costing data (based on information submitted by each member during January or February each year and received back from the NCM during or about May of the relevant year)

3.4. Empirical analysis

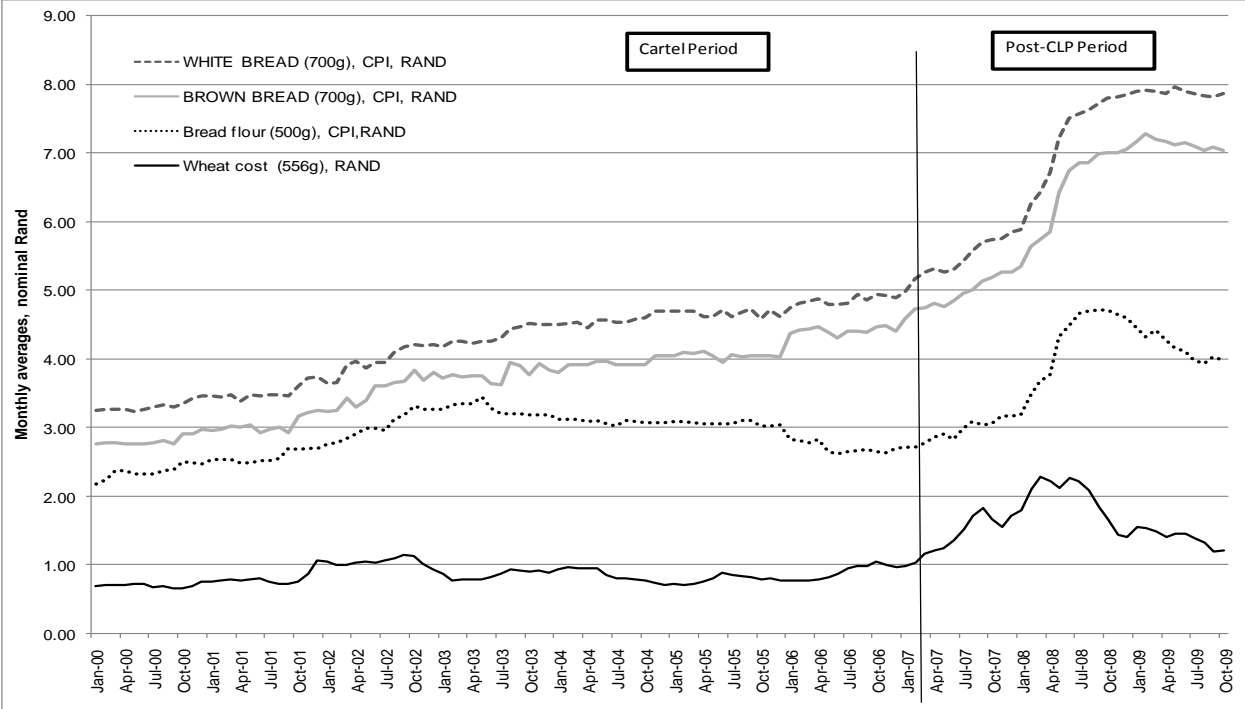
Our investigation, at this initial stage, can broadly be split between an empirical analysis of market share volatility and the sharing of sales data over time and an assessment of prices and margins over time to determine whether the industry has become more competitive after the uncovering of direct price fixing communications or not. Preliminary analysis and tests have been conducted in order to assess the key questions arising from this case- in particular whether the supposed end of the wheat milling cartel in March 2007, when leniency was granted to Premier Foods by the Commission, has led to more competitive outcomes for consumers and whether the information exchanged had a greater impact in submarkets where there were a smaller number of players than in others.

Prices, costs and margins over time

Assessing average prices over time reveals that bread flour prices increased post the CLP application in March 2007 (Figure 1). This may be attributed to increased cost of wheat as the main input, as well as an increase in fuel and energy costs. However, the price of bread flour (and therefore bread) during the same period has remained stubbornly high and sticky downwards, despite costs of the key input material, wheat, subsequently declining.¹⁴

¹⁴We acknowledge that studies have shown in some markets that the phenomenon of prices increasing rapidly with stickiness downwards can be ascribed to asymmetric pricing and not necessarily collusion. See Tappata (2009)

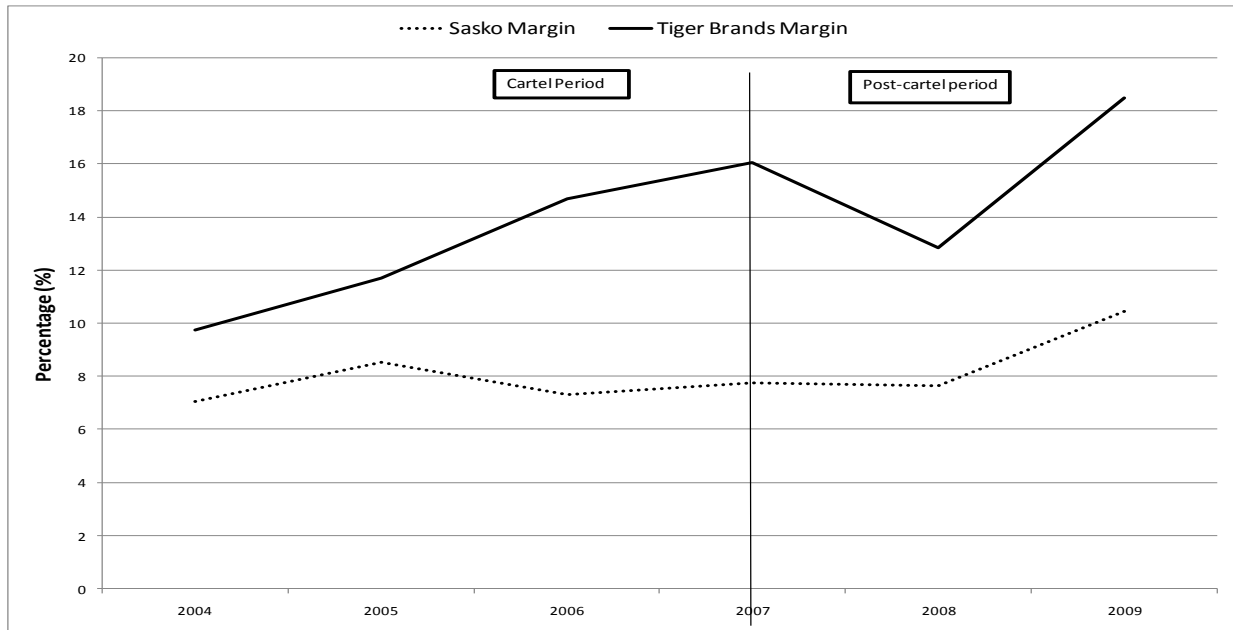
Figure 1: Wheat, flour and bread prices (monthly averages, nominal Rand)



Source: Statistics South Africa, SAFEX and SAGIS data

It is further evident from Figure 2 below that the operating profit margin, in particular of Tiger Brands’ milling and baking division, declined significantly following the granting of leniency in March 2007 to Premier Foods and this becoming public knowledge. Margins have since recovered and increased to levels higher than during the cartel period for both companies.

Figure 2: Margins for the milling and baking industries (2004 – 2009)



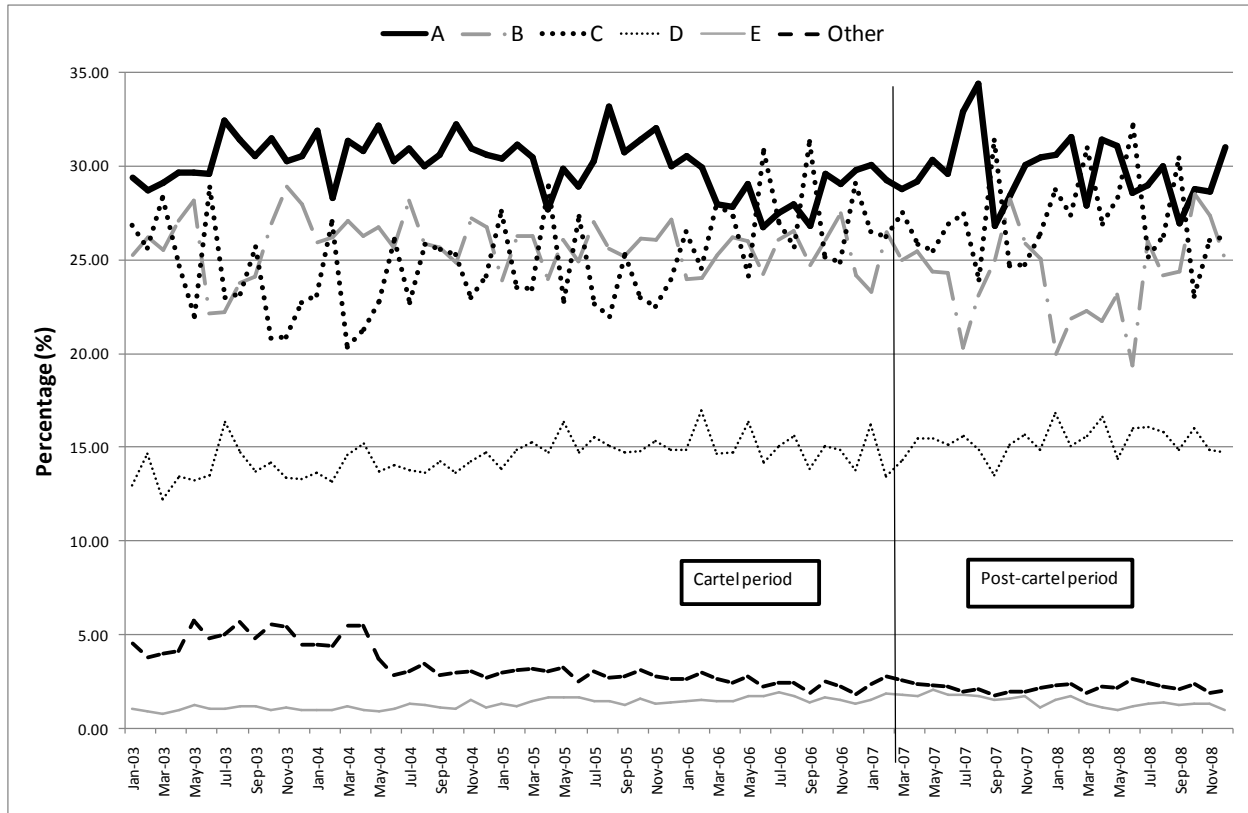
Source: Margins were calculated using the annual financial statements of Pioneer Foods (Sasko) and Tiger Brands. Both of these are public companies and listed on the Johannesburg Stock Exchange (JSE)

Prices have not declined following sharp decreases in input costs since the end of 2008 and competitive outcomes for consumers are still not being observed in the post-cartel period. As stated previously, these outcomes in the industry have raised real concerns about potential ongoing anti-competitive conduct or tacit collusion in the milling industry through the exchange of detailed sales data through the NCM. The potential negative effect on consumer welfare is even more serious in that bread is one of the staple foods consumed by a large proportion of the South African population, with a pronounced detrimental effect on poor consumers. While wheat prices generally fluctuate due to the internationally traded nature of the commodity, bread prices in South Africa have constantly been on a steady upward trajectory and margins have widened. The manager of Pioneer Food's subsidiary division, Sasko, indicated in his testimony before the Tribunal as part of the bread cartel hearings that bread prices were never reduced when input costs declined as consumers apparently did not appreciate fluctuations in bread prices.

Market share volatility and movements of sales across firms over time

Figure 3 provides the monthly national market shares over time of total milled wheat flour for all wheat milling members of the NCM for the period 2003-2008. These individual shares have remained relatively stable over time. We would have expected more volatility in share once the cartel was stopped if competition indeed occurred at a national level.

Figure 3: Monthly National Market Shares for All Flour Products (2003-2008)¹⁵



Source: Own calculations based on National Chamber of Milling (NCM) data

However, it appears that regional dynamics differ between different bread flour products and that there are only two or three competitors in certain of these submarkets (see Table 1 below). In certain regions like the Western Cape, which is the major geographical area of wheat farming in South Africa, there are also some bigger regional players in specific flour products such as white bread flour. It is therefore important to analyse disaggregated regional and per product market shares in order to fully understand the dynamics in different submarkets of the industry. This is an ongoing process in our analysis of potential information sharing in this industry.

As a preliminary analysis of market shares in order to identify particular submarkets of interest for further research, we calculated average market share variability measures over time for the different regions and flour products to check for movements in sales across firms. To measure this exactly would require customer-specific data which at present is not available for this case. We therefore used the following formula which only requires market-level data:

$$\frac{1}{2} \sum_{i=1}^n |s_{i,k}^t - s_{i,k}^{t-1}| \quad (1)^{16}$$

¹⁵ Note that the smaller milling companies which are members of the NCM but that do not form part of the recent referral of price fixing and customer allocation conduct to the Competition Tribunal has been included in the category named “Other” in Figure 3

where s_i^t is firm i 's sales or market share in market k in period t .

The formula above measures the movements in sales across firms over time. If the variability in average persistence during the cartel period and the period after the first CLP application in March 2007 is negligible in particular regions, then market share volatility (a proxy for competition) has not increased as expected in the post-CLP period in those regions. We emphasise that this is only the beginning stage of investigation and such analysis serves to direct regions for further investigation.

Table 1 below provides a summary of average market share persistence measures calculated for different provinces and flour products using the above formula for the period before the first leniency application in March 2007 as well as for the period after the supposed end of the formal cartel meetings.

Table 1: Average persistence measures for white and brown bread flour (Pre- and Post March 2007)¹⁷

Region	Time Period	White bread flour	T-test	Brown bread flour	T-test
Western Cape	Pre March 2007	5.10 (3)		7.88 (3)	
	Post March 2007	3.50		6.68	
Eastern Cape	Pre March 2007	7.38 (3)		4.86 (2)	
	Post March 2007	7.41		3.49	
Northern Cape	Pre March 2007	8.60 (4)	*	7.70 (5)	**
	Post March 2007	10.36		9.53	
Free State	Pre March 2007	6.89 (4)		5.63 (3)	
	Post March 2007	5.26		5.82	
Kwazulu Natal	Pre March 2007	5.42 (4)		5.67 (4)	
	Post March 2007	4.82		6.03	
Gauteng	Pre March 2007	4.41 (4)	*	4.45 (4)	**
	Post March 2007	5.69		5.91	
Mpumalanga	Pre March 2007	6.09 (5)		5.37 (4)	
	Post March 2007	5.65		5.32	
Limpopo	Pre March 2007	7.92 (4)		4.93 (4)	
	Post March 2007	7.99		4.68	

¹⁶ Note that the measure is multiplied by a half. This is because when adding the absolute values, both positive and negative changes are counted as positives. The half therefore helps in deflating the measure of market share variability.

¹⁷ There are more observations (50) for the pre-March 2007 period than for the post-March 2007 period (21) when the Commission received the first leniency application for cartel conduct in the wheat milling industry. The average persistence measures calculated and indicated in Table 1 may therefore not be an entirely accurate reflection of market share volatility over time as averages were not calculated for the same number of observations for the two different time periods. However, it does provide an initial indication of trends in market share volatility for the industry over time and is useful in providing some guidance in terms of particular submarkets and/or regions which should be analysed in more detail in future.

North West	<i>Pre March 2007</i>	6.35 (5)	*	6.83 (4)
	<i>Post March 2007</i>	9.63		6.83

** Significant at the 5% level

* Significant at the 10% level

Source: NCM Data

The results in Table 1 show that for most of the regions, average persistence measures for the two time periods have not changed significantly. For white bread flour, this is true in all regions except for the Gauteng, Northern Cape and North West provinces, where there seems to be greater variability, although still not very large. For brown bread flour, most of the regions except for the Northern Cape and Gauteng show relative stability in market shares.

There appears to be no consistent relationship between the number of players and market share variability. More research needs to be done to see whether market share variability was greater where regional players that did not form part of the cartel would be expected to pose a competitive constraint on firms forming part of the cartel in these regions.

Continued coordination through information sharing and monitoring using the NCM data might be a real concern in the wheat milling industry in South Africa which warrants further empirical analysis. This may well explain, at least in part, the anticompetitive outcomes we are still observing in the post-cartel period. However, the meetings in the cartel period may suggest that the information exchange alone was not sufficient to maintain collusive outcomes. This will have to be taken into account.

Way forward

Further empirical analysis will be conducted over the next few months to test our hypothesis that persisting coordination is the reason we are not seeing more competitive outcomes post cartel. Conducting comprehensive qualitative research into specific submarkets to get a better understanding of the market dynamics will direct further empirical work, especially in understanding the relevant geographic market in which persistence of market shares could be further assessed. The impact of other possible cost pressures and demand conditions will also be considered, together with the potential efficiencies gained in this industry through the exchange of sales volume data. We will also assess discounting behaviour, customer switching (to see if market allocation had persisted) and regional trade balances. Regression analysis will be conducted to test the relationship more formally between the number of players in a market and the market share persistence over time. This will assist the Commission in offering industry some guidance on what the acceptable level of information exchange would be in particular geographic markets with given number of players.¹⁸

¹⁸ As undertaken in the fuels case described below.

4. The petroleum industry

4.1. The concern with information exchange in the fuels industry

The history of regulation in the petroleum industry has created well understood pricing points that could allow for coordinated behaviour to continue in markets which are no longer regulated and in which exemptions from competition law no longer apply. This was the finding in the recent price fixing case in the bitumen market, a petroleum product used to make tar to pave roads. The leniency applicant in this case admitted to continued coordination in the post-exemption period based on established import parity pricing formulas and suitable escalations.¹⁹

In the presence of such well-established pricing points that emanate from the regulatory framework, information exchange at the level of disaggregation seen via the SAPIA platform is of particular concern. For unregulated products these pricing bases could act as focal points off which competition would occur only through discounting. If secret discounting is discouraged through the exchange of disaggregated information and consequent increased ability to monitor market shares, then competitive outcomes are unlikely.

Particularly in the oil industry, which is oligopolistic in nature, the information exchange in itself may have had the effect of stifling hidden competition by reducing incentives to engage in competitive behaviour. A player has no incentive to secretly discount to gain market share if it knows that this action is immediately visible to its competitors through the information exchange, who, given interdependencies in such markets, are likely to respond by also discounting.

As there was a change in the level of aggregation with which the data was exchanged through SAPIA as explained below, this case study presents a unique opportunity to analyse the effects on the market of individualised data exchange in comparison to a regime of industry aggregated data exchange. We seek to test the following two theories. Firstly, increased volatility in market shares post aggregation would indicate that, *ceteris paribus*, companies did not seek to expand market share as actively (through vigorous discounting or by attracting customers away from each other) under the regime of individual company information sharing (pre-2007) as under the aggregated data sharing regime. This hypothesis should only hold for submarkets with more than two players as submarkets with two players would still be able to ascertain their competitor's share of the market by looking at their own sales and deducing their rivals' activity from industry totals, without individual data being shared.

Related to this, the second step of our analysis seeks to establish whether information exchange in its aggregated form had different effects on submarkets with larger numbers of players in comparison to the results in the individualised information sharing regime. This would indicate whether competition is negatively affected even after information is aggregated over the industry.

We first briefly describe the structure of the petroleum market, the product we are focusing on and pricing in general. We then describe the level and detail of the information exchanged through SAPIA before presenting our empirical findings.

¹⁹ Competition Commission press release of 4 March 2010 available at <http://www.compcom.co.za/2010-media-releases/>

4.2. The characteristics of the market

Product and pricing

Preliminary empirical analysis was done on commercial diesel to assess whether the information exchanged at the individualised company level had indeed stifled competition. This product group was chosen because it is an unregulated product and has a large impact on costs in the Commission's priority areas of construction, agriculture and intermediate industrial products.

The DME regulates the pricing of the following petroleum products, at specific levels of the value chain, all of which are posted on their website and published in a gazette on the first Wednesday of every month:

- petrol at the pump
- illuminating paraffin at a maximum single national retail price
- liquid petroleum gas at a maximum refinery gate price.

These prices are calculated on an import parity pricing basis, or the hypothetical cost of importing refined product (at the BFP). The final price of these fuels includes a marketing margin which requires as input to the calculation, the average price of fuels such as diesel. The DME posts the wholesale list selling price (WLSP) of diesel on its website, along with the regulated product prices. Although not regulated, the industry uses this posted WLSP as a list price for wholesale diesel. Since all the oil companies start off with this as the base, competition between them would occur largely through discounts off this wholesale list price and through quality of service delivery.

Diesel is divided into grades according to the level of sulphur present in the fuel. In 2006 the DME changed the maximum sulphur content specification of diesel from 0.3%S for commercial uses to 0.05%S. Commercial diesel is a homogenous product in that all oil companies grade their diesel identically and these products are substitutes in end use.

The competitors and type of competition

The six major petroleum refining and marketing companies and their subsidiaries collectively accounted for over 90% of the South African diesel market in 2008. The oil companies' refineries are not always located in the markets they serve and therefore they make bulk sales to each other and swap product to different geographic regions. There are seven major oil companies that operate in South Africa today. These are BP, Caltex, Engen, PetroSA, Sasol, Shell and Total. All of these companies, except PetroSA, are vertically integrated from refining to storage to wholesale marketing and retail.²⁰ Most companies use crude oil as feedstock to produce diesel. Sasol also manufactures part of its diesel output from coal. PetroSA uses natural gas as its feedstock. The cost of producing diesel, even from the same feedstock input, depends on the configuration of the specific refinery.

²⁰ Merger between Sasol and Engen, Competition Tribunal decision 2006, 101/LM/Dec04

These competitors operate in a market with very high barriers to entry. Establishing a refinery and access to distribution networks is expensive. Imports of refined product are tightly regulated.

Competition in the diesel market appears to occur through pricing. As explained, industry uses the DME posted wholesale list price as the starting point for pricing, off which discounts are negotiated and offered to customers. The final discounted price therefore is private information. What was observed by companies in the pre-October 2007 era was individual company sales data as described below.

4.3. The level of detail of the information exchanged

Prior to October 2007, industry statistics at company level collected by SAPIA were distributed to its members monthly with a lag of two months. The data included monthly sales volumes disaggregated by specific product grade, by province and magisterial district where sales were made, by customer grouping (trade category). This information was also sent to the DME, but it is noteworthy that the information exchanged between members was of a more disaggregated level than that received and required by the DME for regulatory and security of supply purposes. This information was not accessible to the public. The data shared was extensive- monthly volume data disaggregated over 42 product grades, 12 trade categories, 9 provinces and 400 magisterial districts by individual company was exchanged.

Between October 2007 and January 2009, the statistics were aggregated over the industry (no longer shared by individual company) but still shared by trade category and magisterial district. Post January 2009, no information has been exchanged although this data has been assimilated and submitted to the DME by the provider that collates it.

4.4. Empirical analysis

We tested whether market share variability in the agricultural sector increased on average after October 2007, when the information exchanged changed from individualised company level to aggregated industry level. We also tested whether market share variability after October 2007 is more sensitive to greater number of players in a given submarket.

The indication is that competition between the petroleum companies occurs at a trade category level in terms of the oil companies' marketing efforts. Much of the analysis will therefore be centred on this level of information disaggregation. Monthly data for the period January 2003 to December 2008 is used in the analysis.

I. Market share variability increased on average after October 2007

Using the measure of aggregate variability across firms shown in equation 1 we calculated the average variability for the period January 2003 to September 2007 during which individual company data was exchanged through SAPIA, as well as for the period October 2007 to December 2008 when industry aggregated data was exchanged. The statistics for sales of diesel to the agricultural sector are presented in table 2. This sector was chosen as it impacts on one of the Commission's priority sectors and adds to the analysis on the impact of information exchange in this sector from section 3. As in the milling case, we emphasise that this exercise is not conclusive in itself, but assists us in identifying further areas for investigation.

We display the results of the agricultural sector which indicate not only that the information sharing had a significant impact on market share variability in this sector, but also to indicate the general effect of information exchange on this vital sector of the South African economy. Agricultural cooperatives are one of the largest commercial consumers of diesel in South Africa. Individual farmers also buy diesel from the petroleum companies, although on a smaller scale.²¹

Table 2: Average variation in diesel market shares across provinces in the agricultural sector²²

Region	Data exchange regime	Farmers	T-test ²³	Agricultural Cooperatives	T-test
Eastern Cape	<i>Individualised</i>	7.01	**	7.06	*
	<i>Aggregated</i>	8.47		11.1	
Free State	<i>Individualised</i>	8.57	**	5.48	
	<i>Aggregated</i>	14.6		5.36	
Gauteng	<i>Individualised</i>	8.74	**	6.01	
	<i>Aggregated</i>	13.71		6.52	
KwaZulu Natal	<i>Individualised</i>	4.47	**	2.59	
	<i>Aggregated</i>	8.47		2.75	
Limpopo	<i>Individualised</i>	8.2		3.45	**
	<i>Aggregated</i>	10.89		6.41	
Mpumalanga	<i>Individualised</i>	6.01	**	5.84	
	<i>Aggregated</i>	10.44		6.39	
North West	<i>Individualised</i>	9.88	**	7.31	
	<i>Aggregated</i>	15.6		9.04	
Northern Cape	<i>Individualised</i>	6.46		6.93	*
	<i>Aggregated</i>	10.94		9.93	
Western Cape	<i>Individualised</i>	7.55		4.9	**
	<i>Aggregated</i>	9.33		9.23	

** Significant at the 5% level

* Significant at the 10% level

Source: SAPIA data

²¹ If the dampening of price competition through information exchange occurred in diesel, an input into farming activities, this pricing would further add to already high food price inflation, which has a serious effect on the country's poor.

²² As in milling, there are more observations (58) for the pre-October 2007 period than for the post-October 2007 period (15) when the data exchanged was aggregated. The average persistence measures calculated and indicated in Table 3 may therefore not be an entirely accurate reflection of market share volatility over time as averages were not calculated for the same number of observations for the two different time periods. However, it does provide an initial indication of trends in market share volatility for the industry over time and is useful in providing some guidance in terms of particular submarkets and/or regions which should be analysed in more detail in future.

²³ A one-sided t-test was conducted between the observations before October 2007 and those after this date to establish whether the mean of the market share variation under the aggregated data regime were statistically greater than those under the individualized data sharing regime.

Table 2 shows that average variability in market shares in several markets is higher in an aggregated data sharing regime than in an individualised one. Many of these display statistically significant increases in market share variability. We can thus infer that, in general, more competitive rivalry is observed under the exchange of aggregated data than individualised data as greater discounting and increased customer switching are potentially occurring. This result supports the general understanding of the potential anticompetitive effects of individualised data sharing in oligopolistic markets.²⁴

A full set of comparisons in other trade categories is provided in appendix 1. Not all trade categories show an increase in market share variability when data is aggregated. Reasons for this possibly include, amongst others, the length of contracts and the size of the market. Markets with longer contractual periods would not show sufficient variability in the 15 month period between October 2007 and December 2008. Markets which require upfront capital investment, such as the tanks required for storing diesel at mining sites, might see longer contractual periods as new suppliers would require new tank installations.

Below we show more general results in respect of a change in variability in market shares between the individualised and aggregated data sharing regimes.

II. Market share variability after October 2007 is more sensitive to increased number of active players in a submarket

The measure of market share variability depicted in equation 1 was regressed against the number of players in the market along with a dummy for the change in information sharing regime. Given the nature of the data, fixed effects panel regressions are used.²⁵ The regression run is as follows:

$$\text{Market Share Variance}_{kt} = \beta_{1k} + \beta_2 \text{Num}_{kt} + \beta_3 (\text{Num}_{kt} \times D_{kt}) + \beta_4 D_{kt} + u_{it} \quad (2)$$

where Num_{kt} is the number of players in market k for time period t , and D_{kt} is a dummy variable equal to 0 if t is before October 2007 and equal to 1 if t is after October 2007.

The interaction term $(\text{Num}_{kt} \times D_{kt})$ was included in order to establish the sensitivity of market share variability to the number of players in a market after information exchanged was aggregated.

The hypothesis is that markets with more active firms would display greater variation after October 2007 because it would be more difficult to distinguish between the sales of individual competitors. We expect this interaction term to be positive if it is more difficult to monitor competitors' market shares under aggregated information exchange when there are a larger number of players compared to under disaggregated information exchange.²⁶

²⁴ This result was tested using a fixed effects regression of market share variation on a dummy for the change in information sharing regime in October 2007 and the coefficient on this variable was positive and significant.

²⁵ The data contains volume sales by company over time which is a panel data format. A fixed effects analysis was undertaken following significant p-value results from a Hausman test conducted on the fixed and random effects regression options.

²⁶ Firms with market shares of less than 2% were omitted from this analysis as these can be classified as trivial players who are not a real competitive threat to firms with more than 2% market share. Data after

Two approaches were used to assess the relationship between market share variability and the number of players. The first used data at the national level between trade categories. This sought to establish whether a general relationship existed across all trade categories in relation to the number of market players and variability in market shares. The second approach looked at the relationship between these variables at magisterial districts level by trade categories.

The fixed effect regression (Equation 2) was therefore run at the national level and by each trade category. Table 3 shows the results of this regression at the national level.

Table 3: Fixed effects regression results- National

	Number	Number*D	Dummy	Constant
National	2.8759 **	1.8602 **	-5.4146 **	4.4802 **

** Significant at the 1% level

The significant positive coefficient of the 'Number' variable shows that on a national level, for both information exchange regimes, individualized and aggregated, the number of firms present in a submarket is positively related to the variability of market shares in that market. We can therefore infer that on average, oil companies find it more difficult to monitor and maintain stability in a market with more competitors in a regime of aggregated information exchange. An interpretation of the dummy and interaction variables shows that variability in market shares in an aggregated information exchange regime is greater than in an individualised exchange regime when more than three players are present.²⁷

In order to increase the number of observations tested, a similar fixed effects regression was performed on each trade category by magisterial district in order to assess the above impact on the number of competitors and information exchange regime on each customer grouping. Table 4 shows the results of this regression.

Table 4: Fixed effects regression results-Trade category

	Number	Number*D	Dummy (D)	Constant
Agricultural Co-ops	4.0678 **	0.7712 *	-1.7948 **	0.5718
Construction	3.1844 **	1.6011 **	-5.4142 **	4.6119 **
Farmers	1.0441 **	6.0412 **	-15.0148 **	14.4373 **
Government	6.7920 **	6.9645 **	-12.6521 **	1.8500
Local authorities	8.8249 **	-2.6005	1.1749	-6.3639 **
Local marine fishing	2.9372 **	-1.6495	2.0140	3.7724
Mining	1.8401 **	0.3763	-3.8647 **	5.2643 **
Public Transport (non local Authority)	5.3770 **	0.4849	-2.7556 *	-1.8307 **

January 2009 was not included owing to the unreliability of data submissions after this point as well as the short time period of data available.

²⁷ For the period after October 2007 market share variance is more sensitive to the numbers of players in a positive relationship as $Dummy+(3* Number*D) = -5.4146+(3*1.8602) = \text{positive}$

	Number	Number*D	Dummy (D)	Constant
Road Haulage	2.2907 **	1.6096 **	-5.2769 **	3.8722 **
Transnet	16.2252 **	-3.0923	0.5894	-12.4818 **

** Significant at the 1% level

* Significant at the 5% level

These results show a positive relationship between the number of players and the market share variability for all customer groupings. We can infer from this result, like in Table 3, that market share variability is on average positively related to the number of players in each of these submarkets. As before, we expect the interaction term to bear a positive sign which would indicate that market share variability is more sensitive to the number of players after October 2007 compared to before October 2007. ²⁸

This is the case in five of the ten trade categories where there are positive significant coefficients for the interaction variable. In the other five trade categories, the coefficients of the interaction variables are all insignificant and are either negative or close to zero (less than 0.5 in this case). These insignificant coefficients can possibly be explained as follows. For local marine fishing, the analysis may be weaker because there are fewer coastal magisterial districts. Local authorities and Transnet (state transport entity) generally have long term tenders which could also weaken the analysis for these trade categories. Similarly, the analysis of mining may be weak as there is a large amount of long term investment in the mining industry.

These results, very generally, support the hypothesis that individualised information exchange has had an impact on diminishing competition in the industry, as proxied by the variability in market shares. Competition is more evident under an aggregated data exchange regime than under an individualised one. Additionally, aggregated data exchange is still of concern in markets with a small number of players, in this case, in markets with less than three players.

Way forward

These results are preliminary and other possible influences on market share volatility of commercial diesel need to be taken into account in subsequent analysis. These include the effect of fluctuating crude oil prices, the relationship between changes in crude oil prices and discount patterns of non-crude refineries, entry episodes and the importance of diesel prices to customers relative to security of supply and investment considerations. Going forwards, an analysis of discounting behaviour, customer switching, regional trade balances and expansion strategies in the diesel market would be necessary to see if the results presented here are

²⁸ In Caves and Porter (1978), on measuring the stability of market shares, a comparison of absolute and relative market share variability using $\frac{1}{2} \sum_{i=1}^n \left| \frac{s_{i,k}^t - s_{i,k}^{t-1}}{s_{i,k}^{t-1}} \right|$, where $s_{i,k}^t$ is the market share for player i in market k for time period t , was undertaken as a test of the reaction of the market to exogenous shocks. The above regression exercise was replicated on a relative measure of market share variance which did not produce significant coefficients. This was conducted in order to determine if the results were robust for a change in the specification of the dependent variable. Note that the Commission is aware that this specification of the dependent variable may produce biased results when testing variation in industries with few players. In fact, Caves and Porter excluded markets with fewer than four players. Our entire market contains six major players. The direction of the bias is not yet understood and as such work on formulating a specification of the market share variation that would not result in bias owing to the number of firms is underway.

supported. Alternative specifications of the dependent variable would be considered in order to minimise the bias stemming from the small numbers of players in these submarkets.

Possible efficiency benefits with regards to national security of supply and investment considerations as claimed by the oil companies would also have to be considered in arriving at a solution that is less harmful to competition.

5. Lessons drawn from case studies

Many cartels recently uncovered by the Commission have been in formerly regulated industries. Often in these cartels, pricing, market or customer allocation principles were entrenched in the regulatory period, creating well-understood foundations for ongoing coordination in the liberalised era. Information exchange practices were often part of these arrangements and continued post regulation. These may well contribute to why we are not seeing more competitive outcomes in certain markets after formal cartels were stopped and why competitive rivalry is not as vigorous in others.

In the milling industry, aggregated industry sales data as exchanged by the NCM may be sufficient to sustain ongoing coordination, resulting in the lack of competitive outcomes seen. However, in this preliminary stage of analysis, there appears to be no relationship between this effect and the number of players in a given submarket.

Although the fuel case is at an early stage, theory and international experience on the possible negative effects on competition of sharing individualised and disaggregated information is supported in our findings. In the diesel market, individualised data exchange in itself could be the reason for diminished competitive rivalry as proxied by decreased market share variability in this regime compared to the aggregated data exchange regime. Additionally, aggregating data over the industry does not seem to remedy competition concerns in markets with three or fewer players.

The results of such analyses, once completed, will assist the Commission in establishing internal guidance on the minimum acceptable levels of information exchange in these industries, as well as other in industries with similar characteristics.

Appendix 1

Table 5: Average variability in diesel market shares across provinces in other sectors

Region	Data exchange regime	Mining	T-test	Government	T-test	Local Government	T-test	Public Transport	T-test	Construction	T-test
Eastern Cape	<i>Individualised</i>	13.92		11.85		12.37		5.8		12.37	
	<i>Aggregated</i>	12.23		18.82	*	14.92		6.85		14.92	
Free State	<i>Individualised</i>	7.02		17.82		14.5		10.65		14.5	
	<i>Aggregated</i>	9.46		18.83		8.49		3.81		8.49	
Gauteng	<i>Individualised</i>	5.15		14.49		6.02		5.56		6.02	
	<i>Aggregated</i>	5.23		12.96		10.72	*	11.37	*	10.72	*
Kwazulu Natal	<i>Individualised</i>	9.87		8.02		8.42		5.9		8.42	
	<i>Aggregated</i>	7.89		11.91	**	15.72	**	7.16		15.72	
Limpopo	<i>Individualised</i>	5.55		20.15		11.69		14.04		11.69	
	<i>Aggregated</i>	6.06		20.83		10.17		3.39		10.17	
Mpumalanga	<i>Individualised</i>	3.03		12.65				4.97			
	<i>Aggregated</i>	2.48		3.54				4.38			
North West	<i>Individualised</i>	5.45		17.28		14.92		10.61		14.92	
	<i>Aggregated</i>	5.07		6.27		10.6		11.38		10.6	
Northern Cape	<i>Individualised</i>	5.25		43.38		26.05		28.33		26.05	
	<i>Aggregated</i>	5.52		38.22		13.94		16.98		13.94	
Western Cape	<i>Individualised</i>	6.53		20.58		8.79		3.65		8.79	
	<i>Aggregated</i>	14.15	**	5.16		9.6		18.08	**	9.6	**

Source: SAPIA data

REFERENCES

- ALBÆK, S. *et al* (1997) Government-Assisted Oligopoly Coordination? A concrete case. *The Journal of Industrial Economics*, vol.45, no.4 (Dec 1997), pp. 429-443
- CAVES, R.E. & PORTER, M.E. (1978) Market structure, oligopoly and stability of market shares. *The Journal of Industrial Economics*, vol. 26, no. 4
- CONNOR, J.M. (2004) Price fixing Overcharges: Legal and Economic Evidence. Working Paper, Department of Agricultural Economics, Purdue University
- DAS NAIR, R. & MNCUBE, L. (2009) The role of information exchange in facilitating collusion – insights from selected cases. *Paper presented at the 3^d Annual Competition Conference South Africa*, September 2009
- DICK, A.R. 2003. Coordinated interaction: Pre-Merger Constraints and Post-Merger effects. *Geo. Mason L. Rev.* vol 12:1
- FULLER, S.W. *et al* (1990) Effect of Contract Disclosure on Price: Railroad Grain Contracting in the Plains. *Western Journal of Agricultural Economics*, 15(2): 265-271
- GREEN, E. & PORTER, R. (1984) Non-Cooperative Collusion under Imperfect Price Information. *Econometrica*
- HARRINGTON, J.E. (2004) "Post-Cartel Pricing during Litigation," *Journal of Industrial Economics*, Vol. 52, December 2004, 517-533.
- KÜHN, K. & VIVES, X. (1994) Information Exchanges Among Firms and their Impact on Competition. *Institut d'Anàlisi Econòmica (CSIC)*.
- OVERGAARD, P. B. & MØLLGAARD, H. P. (2008) Information exchange, market transparency, and dynamic oligopoly. IN COLLINS, W. D. (Ed.) *Issues in competition law and policy*. Newyork, American Bar Association.
- RUSTOMJEE, *et al*. (2006) Possible reforms to the fiscal regime applicable to windfall profits in South Africa's liquid fuel energy sector, with particular reference to the synthetic fuel industry- A discussion document for public comment.
- STIGLER, G. (1964) A theory of oligopoly. *Journal of Political Economy*, 72 (1964)
- TAPPATA, M. (2009) Rockets and feathers: Understanding asymmetric pricing. *RAND Journal of Economics*, vol. 40, no.4, Winter 2009, pp. 673-687
- VAN ZYL, *et al*. (1996) Policies, markets and mechanisms for agricultural land reform in South Africa. *Mimeo*
- VINK, N. & KIRSTEN, J. (2000) Deregulation of agricultural marketing in South Africa: Lessons learned. *The Free Market Foundation 2000*.