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THE USE OF THE COORDINATED EFFECTS INDEX (CEI) AS A SCREENING TOOL IN PREMERGER ANALYSIS

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"There has no doubt to be fundamental research in science, but applied research is equally important for new improvements and changes in our techniques." - *Lal Bahadur Shastri*

ABSTRACT

We test the use of the Coordinated effects Index (CEI) proposed by Loertscher & Marx (2021) as a screening tool for merger analysis where coordinated effects are the main concern. We applied the metric to a recent merger in the soya meal market in South Africa. Testing the results against the decision of the Competition Tribunal of South Africa, returned a Negative-Negative result, meaning that the CEI metric indicated no risk of coordinated effects relating to the merger which is in line with the final decision of the Tribunal. This provides a foundation for the use of the CEI as a tool in the competition authority's methodological toolkit.

1. INTRODUCTION

The ultimate goal of competition policy in South Africa is to promote competition in order to protect consumers' purchasing power and to ensure markets remain competitive and inclusive. When a firm buys some or all of the stock or assets of another, the transaction is termed an "acquisition". If all of a firm is acquired the two firms are said to have "merged". One function of competition agencies is merger review and control. In South Africa, mergers are assessed mainly on whether they are likely to substantially lessen competition and/or have a negative public interest effect.

Horizontal mergers involve firms that sell substitutes. A horizontal merger may result in a merged firm with a larger market share, or it may allow the merged firm to eliminate its close competition. Unilateral effects relate to the concern about a situation in which a merger allows the merging firms to unilaterally - that is, independently of the reaction of the remaining competing firms - increase their market power in the absence of competitive constraints. Further, a horizontal merger may also make it easier for the remaining firms in the market to collude if it for example eliminates a firm that can be described as a maverick firm. *Coordinated effects arise when a merger creates or strengthens an environment for competitors to coordinate their behaviour to exert their joint market power*. This coordination can take many forms, such as tacit coordination or outright explicit collusion. Coordination negatively affects markets by undermining competition and raising the prevailing price level in the market.

Given the negative wealth effects associated with coordinated effects and the difficulty in detecting coordination amongst firms, competition agencies have identified coordination as a major concern in markets. So much so that US Judge, Richard Posner wrote in 1986 that the "*ultimate issue*" in reviewing a merger under the antitrust laws is "whether the challenged acquisition is likely to hurt consumers, as by making it easier for the firms in a market to collude, expressly or tacitly, and thereby force price above or farther above the competitive level." (Hospital Corp. Of America v. FTC, 807 F.2d 1381, 1386 (7th Cir. 1986), paras. 1 and 7.) This realisation has led to *the impact mergers have on the likelihood of coordination becoming central to merger analysis* both in the US and across the globe.

Recent developments in game theory have provided economists with a greater understanding of how coordination arises in markets and how mergers affect the likelihood of coordination within these markets. Fundamental to repeated-game theory is the notion that coordination is only sustainable if it is self-reinforcing or incentive-compatible. Simply put, the long-term benefits of coordination must outweigh the short-term benefits of defection. The theory of coordination has yielded a useful checklist of relevant market characteristics that affect the sustainability of coordination (see for example Ivaldi et al., 2003). These market characteristics consist of the number of competitors, the degree of symmetry among competitors, the anticipated growth in demand, and the extent of the periphery supply.

However, it is difficult to predict the likelihood of coordination based solely on these characteristics. This is due to the fact that markets are frequently characterised by certain factors that facilitate coordination and others that hinder coordination. Mergers pose a practical difficulty due to the fact that they affect a multitude of these factors simultaneously. This makes it difficult to assess the effect of mergers on the likelihood of coordination, and mergers are frequently left to the subjective interpretation of market characteristics. Both academics and practitioners recognise the need for quantitative analysis of coordinated effects for these reasons. These models take the form of either a structural model or prospective merger simulations. (Igami & Sugaya, 2022)

Screening is one quantitative analysis tool proposed to assist in the detection of merger-related coordinated effects. Screening helps by identifying industries and markets where coordination is more probable. This allows competition agencies to determine which mergers require a more in-depth analysis and provides a preliminary indication of the likelihood that mergers will result in coordinated effects. There are two primary types of displays: (1) Using the structural approach, these tests determine whether the market of interest contains factors that facilitate collusion, such as symmetry, demand and supply factors, etc. These structural screens attempt to answer the question, "with what probability will coordination form?" (2) According to the behavioural approach, these tests determine whether the market's current behaviour is

consistent with collusive or competitive behaviour. These behavioural screens attempt to answer the question, "How probable is market collusion?" (Motta, 2004)

In this paper, we explore the application of the *Coordinated effects Index (CEI)* model proposed by Loertscher & Marx (2021) as a structural screen and as a method of quantifying the effects mergers have on the likelihood of coordination in markets. The model gauges the risk of coordination within a market by directly assessing the level of symmetry within the market. The model focuses on quantifying the incentives firms have to coordinate and allows us to define what it means for a market to be at risk of coordination. We apply this model to a merger in the South African soya bean market, ex-post the merger with the outcome known, we then compare the results of the CEI against the decision of the regulator. The merger involved two downstream firms (DH Brothers Industries (PTY) LTD & Seaboard Corporation) acquiring a firm in the upstream market (Russelstone Protein (PTY) LTD) The Competition Commission of South Africa (Commission) recommended that the merger should be prohibited, stating that the merger was likely to result in a substantial lessening of competition through coordinated effects. The Competition Tribunal of South Africa (Tribunal), however, approved the merger subject to conditions. The Tribunal stated that no sufficient evidence of the likelihood of coordinated effects was provided by the Commission. (case number: LM061Jun20)

2. COORDINATED EFFECTS

This section presents an overview of the challenges that arise when evaluating coordinated effects in merger review. Theoretical models are frequently employed to investigate the coordinated effects in merger cases, with these models firms compete in various ways, including price competition, quantity competition, or price leadership. The Bertrand model, for example, assumes price competition, while the Cournot model assumes quantity competition. These models, along with the price leadership model, form the foundation of the game theoretic tradition of market analysis. These models offer a framework to evaluate the potential impact of coordination on market outcomes (Motta, 2004). This analysis places significant emphasis on the structural characteristics of the market that determine whether it is conducive to coordinated behaviour. Early analyses of coordinated effects frequently used a "checklist" approach, in which factors that facilitated collusion were placed in the "pro" column and those that impeded collusion were placed in the "con" column. Then, a subjective weighting scheme was used to determine if market conditions were sufficiently conducive to collusion. (Dick, 2003)

The origins of the checklist method can be traced back to the Chicago Analysis. Stigler (1964) made early contributions to the modelling of conditions that made interdependent pricing more or less probable. The

focus of his original paper was on the role product homogeneity played in the evolution of a price-fixing scheme. Later, Stigler expanded this framework to include the level of market transparency, with the central premise that having regular access to information on prices and sales facilitated the detection of deviations from agreed-upon behaviour. Stigler was the first to propose the two considerations associated with assessing coordinated interaction concerns. First, the firms involved in the coordination must be able to reach an agreement. Second, the ability to detect deviations is crucial in ensuring the agreement is adhered to.

This framework led to the development of game theoretic models that mathematically characterize the oligopolistic interactions among firms, with coordination being modelled through the use of infinitely repeated games (Shapiro (1989), Carlton & Perloff (2000)). In these models coordination is modelled through the use of infinitely repeated games, which are commonly referred to as punishment or grim-trigger strategy games. These models compare the payoffs from coordinating behaviour against the payoffs from deviating and acting competitively. These models are used to assess how various market factors affect the ability of firms to reach an agreement and the stability of these agreements. Theoretically and empirically, there is substantial support for these individual factors that influence the probability of coordination (Tirole, 1988; Motta, 2004; Harrington, 2004; Salop. 2010; and Werden & Froese, 1998).

However, many of these factors frequently point in opposite directions, and mergers often affect a number of these factors simultaneously. Mergers often alter certain characteristics which facilitate coordination while altering others which hinder coordination. Thus the job of the competition authority is not only to assess whether the market conditions are conducive to coordination but to *identify whether the merger affects market conditions to make successful coordination post-merger significantly more likely.* This again reduces the analysis to a subjective determination by the individual deciding the case. Given these challenges, there is increasing recognition of the importance of assessing coordinated effects directly and quantitatively. (Kovaic et al., 2009)

Overall, when assessing the effects of a merger on the likelihood of coordination in a market, competition authorities assess the extent to which the merger alters three conditions: *(1)* the merger must make it *easier for firms to reach a common understanding* of coordination; *(2)* The merger must alter the market conditions in such a way that *the coordination becomes more internally sustainable*, i.e. firms find it in their interests to adhere to the coordinated outcome; and *(3)* The merger must reduce competition outside of the coordination making the c*oordination externally sustainable*, by involving a maverick firm for

instance (Coate, 2008). These three conditions are extremely difficult to prove and without a fortified framework to work off of the job of the competition authority is increasingly difficult.

Despite these obstacles, market structure analysis continues to be widely utilised in merger analysis. This is due to the fact that the notion that the structure of a market plays a crucial role in determining the likelihood of coordination is still valid today, and there is no convincing alternative available. Tirole et al. (2003) provides a comprehensive analysis of structural characteristics and their influence on the probability of coordination. A list of market characteristics and their impact on coordination is provided below:

- Market Concentration: a merger that leads to a significant increase in the concentration of the market facilitates coordination.
- Entry barriers: high barriers to entry allow for prices to be increased without inducing entry, increasing the returns to coordination.
- The frequency of interaction: frequent interaction between competitors allows for firms to transfer information and monitor competitors with greater ease.
- Market transparency: information regarding prices and quantities which are readily available allows for the detection of deviations from coordinated behaviour, hindering coordination.
- Demand characteristics: markets which are characterized by steadily growing demand are more conducive to coordination than markets where demand is either declining or is subject to large fluctuations.
- Innovation: markets which are mature and where innovation plays little role are conducive to coordination.
- Symmetry: it is easier to coordinate among equals, firms that have similar cost structures and/or production capacities, are conducive to coordination. This is because symmetry amongst firms allows for incentives to be aligned.
- Product homogeneity: markets characterised by homogenous product quality and features and where firms compete solely on price are conducive to coordination as firms are able to reach an agreement more readily.
- Multi-market contact: firms which operate in more than one market are able to transfer information more easily and punish deviations across multiple markets, facilitating coordination.
- Demand elasticity and buying power: markets characterized by highly elastic demand and strong countervailing power are not conducive to coordination.

In the realm of coordination risk and cartel formation within a market, structural characteristics hold significant sway. While much attention has been paid to cost structures, it is imperative to recognize that both symmetry in costs and symmetry in market shares are instrumental in shaping the dynamics of coordinated behaviour. The argument that symmetry in cost structure plays a central role in promoting coordinated behaviour remains robust. Symmetry, in this context, goes beyond mere cost basis. It encompasses a scenario where firms exhibit comparable cost functions, a cornerstone concept in the study of market dynamics (Carlton & Perloff, 2005). This shared cost structure aligns the interests of firms more closely (Stigler, 1964). However, it is the intertwined relationship between symmetry in costs and symmetry in market shares that truly elevates the risk of coordination.

Symmetry in cost structures heightens the incentive for firms to coordinate in two fundamental ways. Firstly, it facilitates enhanced rent-sharing, with firms of lower cost bases benefiting more equitably from coordinated efforts (Tirole, 1988). This equitable distribution of gains serves as a powerful incentive for firms with cost advantages to engage in cooperative strategies, knowing they stand to reap substantial rewards. Secondly, symmetry in cost structures reduces the motivation to deviate from coordinated strategies. Firms with lower costs can effectively employ their superior efficiency as a tool for punishing potential deviators (Carlton & Perloff, 2005). This threat of punitive action acts as a deterrent, reinforcing the stability of coordinated behaviour.

Now, let us introduce symmetry in market shares into this intricate equation. Symmetry in market shares refers to a scenario where firms hold comparable market positions, neither being significantly dominant nor subservient to others. This symmetry amplifies the risk of coordination by creating an environment where firms share both market power and cost structure symmetry. When market shares are symmetrical, it fosters an environment of equilibrium, where no single firm possesses undue dominance. Such equilibrium further fuels the incentive for firms to cooperate. The absence of a clear market leader encourages firms to seek shared gains through coordination.

In this dual context of symmetry, both in cost structures and market shares, coordination risk reaches its zenith. Equitable sharing of benefits, coupled with the ability of efficient firms to enforce cooperation, converges with a balanced distribution of market power. This convergence becomes the crucible in which coordinated behaviour is forged. Thus, we conclude that symmetry in both costs and in market shares that severely impacts the risk of coordination or cartel formation within a market.

This paper presents the Loertscher & Marx (2021) model, offering a straightforward yet robust quantitative framework for the analysis of mergers. The central objective of this model is to examine the influence of mergers on market symmetry. It posits that mergers that restore symmetry may facilitate collusion among market participants, whereas those that introduce or exacerbate asymmetry tend to discourage collusion, assuming other factors remain constant. A key component of the model involves the utilization of market share distributions among competitors as a crucial determinant in assessing the potential coordination risk within the market. In Section 4, we provide an in-depth exploration of the model's mechanics and methodologies

We advocate for the incorporation of such models as integral components of competition analysis, as they assist in quantifying the effects of mergers on market structure. While the Loertscher & Marx model primarily concentrates on a single structural characteristic, our future direction involves expanding quantitative approaches in merger analysis, especially when coordinated effects are paramount. Our vision entails the integration of these models alongside other analytical tools, thus enhancing the regulator's toolkit for comprehensive market evaluation and antitrust enforcement.

It is worth mentioning that, while there has been storing in roads made through the utilization of simulation models to evaluate the coordinated effects of mergers, there are several challenges that hinder their use. One of the primary challenges is the requirement for a significant amount of data and assumptions related to market conditions, which is often not readily available in merger cases. Additionally, the accuracy of simulation models heavily relies on the assumptions and parameters used, which may not accurately reflect real-world market conditions (Salop, 2010). Furthermore, these assumptions are difficult to test empirically, making analysis more complex. Moreover, the development and implementation of simulation models can be time-consuming and costly (Weinberg & Hosken, 2013). Consequently, alternative quantitative measures that are less data or assumption intensive, yet offer a strong basis for merger analysis, are necessary.

3. THE MERGER

3.1. The Commission’s recommendation

On 23 April 2021, the Commission recommended to the Tribunal that the proposed transaction in which DH Brothers and Seaboard intended to acquire RussellStone Protein, be prohibited. The proposed merger included three firms. The acquirers, Seaboard Corporation (“Seaboard”) and DH Brothers Industries (Pty) Ltd (“DH Brothers”) operate at various levels in the industry. The target firm, Russelstone Protein (Pty) Ltd. (RSP) operates as a processor in the markets. Seaboard is active in the trading of both raw soya beans

(upstream) and soya meal (downstream). Seaboard is also a trader of other agricultural commodities such as soya hulls, crude soya oil, sunflower seeds, sunflower meal, sorghum, wheat, and maize. Seaboard mainly imports these products but often sources these locally, in recent years local production of soya beans has grown considerably, as can be seen in Figure 1. Seaboard has no crushing facilities of its own and currently holds a toll crushing agreement with RSP. Seaboard is RSP's sole client, and the processor has no other connection to the market. RSP's sole business activity is crushing soya beans into soya meal. DH Brothers operates in both the upstream and downstream market, operating as both a trader and processor. DH Brothers operates in the market through its subsidiary Willowton. The firm's activity lies mainly in the market for sunflower seed, soya bean crushing and oil refinery.

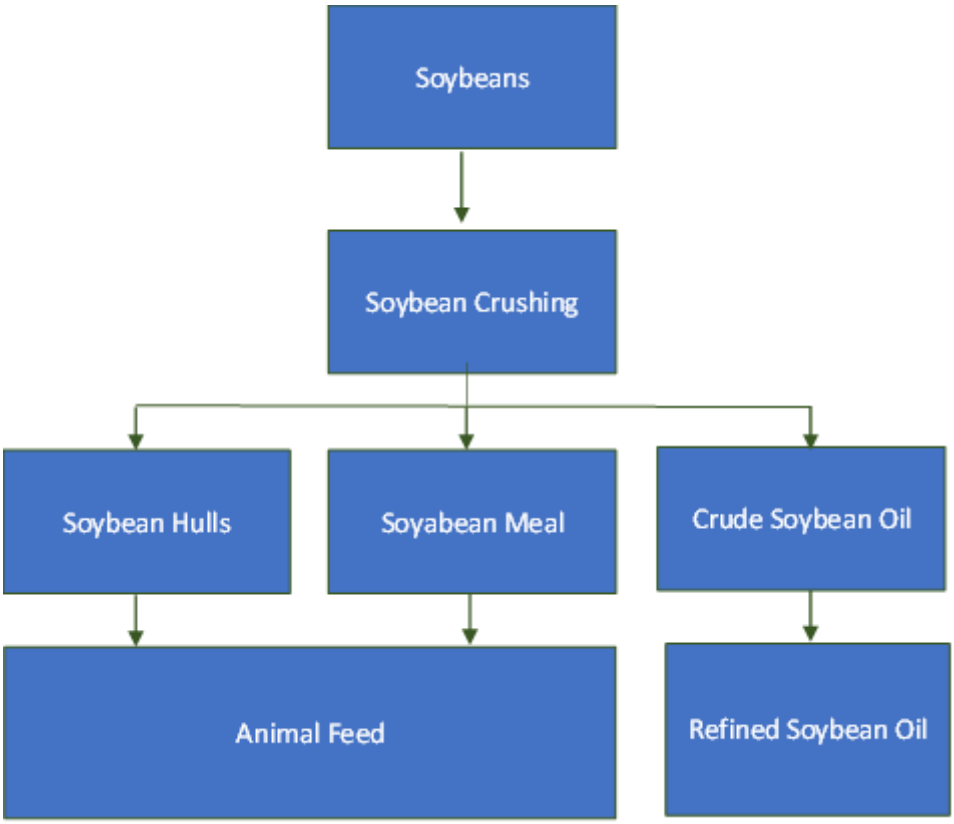


Figure 1 - Value Chain Diagram

Seaboard currently holds a 30% shareholding in RSP with the remaining 70% held by an independent third party. The transaction would involve seaboard acquiring an additional 20% shares and loan claims from RSP. While DH Brothers would acquire the remaining 50% of shares as well as loan claims. Seaboard and DH Brothers would thus have joint shareholding and control over RSP's assets. DH Brothers stated that the transaction presented an opportunity for them to expand their business activities and secure a consistent

supply of soya meal. For Seaboard the transaction provides an opportunity to reduce costs by vertically integrating. Under these circumstances the merging parties argued that there are substantial cost synergies attached to the merger.

The Commission correctly identified the market for soya meal as the relevant product market, as soya meal cannot be adequately substituted by other oilseed alternatives. This market is of considerable concern to consumers given its role in the food supply chain. Raw soya beans are produced both locally, inland, and imported from abroad. The relevant geographic region was defined as national including imports. In *the Commission's view*, the merging parties would be the largest competitors in the market for the sale of soya meal and would therefore be dominant in both the national and inland markets. The Commission concluded that the high post-merger market shares may limit competition and cause the merging parties to align their incentives to increase inland soya meal prices to import parity levels. At the heart of the Commission's concern is that the acquisition of RSP by two firms which compete downstream would serve to create a structural link between the two. This would require joint decision making regarding RSP operations. The Commission argued that this joint decision making would spill over into the downstream market, aligning the incentives of the two competitors. In other words, the merger would increase the likelihood of coordination. The merging parties contested this reasoning, stating that industry information regarding market trends, pricing, etc. are publicly available and that the merger would not result in the parties having information that is not already available. Furthermore, the merged parties argued that the characteristics of the market are not favourable for coordination and that competition would thrive post-merger.

3.2. The Tribunal's decision

In South Africa, the Competition Tribunal is responsible for reviewing mergers and acquisitions to ensure that they do not result in a substantial prevention or lessening of competition in any market. Coordinated effects arise when firms coordinate their actions in a way that harms competition, typically by reducing output, raising prices, or sharing markets. The Competition Tribunal evaluates coordinated effects by considering a range of factors, including market structure, the degree of market power held by the merging parties, the extent of entry barriers in the relevant market, and the likelihood of coordinated behaviour among competitors.

In its analysis, the Competition Tribunal also considers whether the merger is likely to result in a significant increase in market power that would facilitate coordination among firms. If the Tribunal concludes that coordination is likely, it may impose remedies to address the potential anticompetitive effects of the merger, such as requiring divestitures or imposing behavioral conditions on the merged entity. The procedure for

reviewing coordinated effects in mergers by the Competition Tribunal involves a number of steps. The merging parties are required to notify the Tribunal of their proposed transaction and provide all relevant information and documentation relating to the transaction, including any potential coordinated effects. The Tribunal may also seek additional information from the parties or third parties if it deems it necessary. Once the Tribunal has received all the relevant information, it conducts an investigation to determine whether the merger is likely to result in a substantial prevention or lessening of competition in any market, including any potential coordinated effects. The Tribunal may also seek the advice of experts in conducting its investigation. With the case at hand the Tribunal heard multiple witnesses and experts, Prof. L. Mncube being one.

On the 6th of August 2021 the Tribunal heard the closing arguments regarding the merger. Despite the Commissions suggestions that the competition effects of the merger were irremediable, the Tribunal ultimately decided to conditionally approve the merger. The Tribunal views mergers as having coordinated effects if the merger either strengthens existing coordination or make coordination more likely. While both of these are difficult to prove there are some guidelines for the assessment. As a starting point for the Tribunal, evidence must be provided that indicates market participants are able to (i) reach an agreement; (ii) monitor whether the agreement is being adhered to; (iii) punish deviation so as to make it costly; and (iv) believe that coordination is feasible. These four conditions are strongly linked to the structural characteristics mentioned in Section 2 of this paper. Below we summarise the Tribunals assessment of these market characteristics, their findings and the conditions attached to the merger. The last of these conditions, symmetry, is the factor of interest for this paper for the reasons discussed in the previous section.

First, the Tribunal considered the local pricing and transparency in the markets for soya meal. prices in the industry are based on IPP the components of which are transparent. With prices typically set at import parity pricing (IPP) levels for the coastal markets and IPP levels *less* discount for the inland markets. The Commission's concern was, given seaboards position as the main importer of soya beans in the market they would be able to manipulate the import price and thus manipulate the price in the market. The Commission's suggested this would take place by the manipulation of freight costs related to imported soya beans and soya meal. The defence argued that such suggestions were largely speculative, and that no evidence provided by Commission indicates that imports by other parties would not increase in the event of a post-merger, hypothetical small but significant, price increase by the merging parties. Moreover, the importation of soybeans has exhibited a declining trend, and as South Africa continues to enhance its self-sufficiency in meeting domestic demand, imports are anticipated to assume a diminished role in the market. This trend is visually depicted in Figure 1, illustrating the relationship between domestic soybean production and imports. It is worth noting that soybeans are employed here as a proxy for soybean meal. Additionally, the

market features several competitors, including major players that are integral to multinational corporations. These industry participants possess both a wealth of experience in soybean meal importation and the financial capabilities to respond effectively to any coordinated strategies pursued by the merging entities.

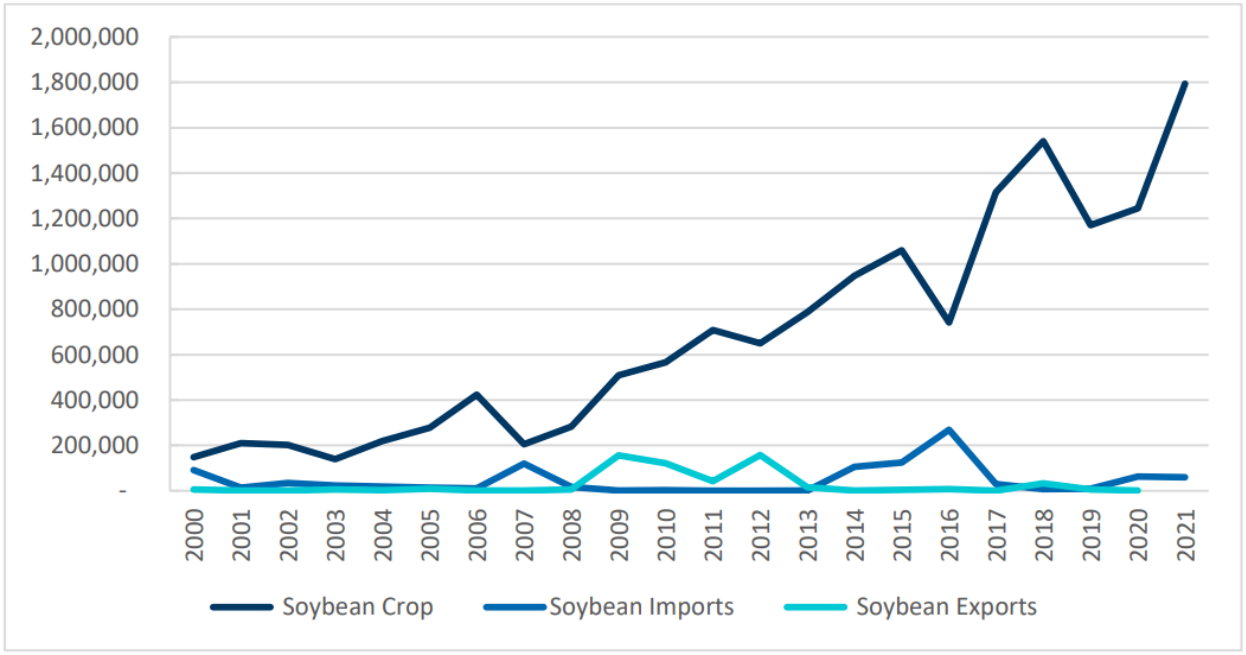


Figure 2 - Domestic Soya Bean Production Growth Relative to Imports (source: CEC, SAIGS, SARS)

Second, the Tribunal assessed the degree of product differentiation within the market. The Commission was of the view that the market for soya meal can be seen as a homogenous goods market. Markets which consist of homogenous goods are seen as conducive to coordination. However, the merging parties as well as many competitors provided evidence which indicates that soya meal is a heterogenous product. This is due to large differences in the nutritional components of soya meal. Nutritional differences largely affect the up bringing of the poultry or pigs, which affects the price farmers are able to charge for their livestock. These differences impact the farmers willingness to pay for various grades of feed. It was thus put forward that while soya beans are traded as a commodity on SAFEX, soya meal is characterised by certain quality differences and specifications. It was thus proposed that the market should be defined as a heterogeneous goods market. Heterogenous product markets makes it more difficult for coordinators to negotiate and enforce their contracts, as separate prices for every product grade and quality must be specified and monitored. In addition, as demand and supply conditions change across varying grades the monitoring and enforcing of agreements becomes more challenging.

Third, The Tribunal assessed the barriers to entry in the market for soya meal in South Africa. The Commission concluded that there exist high barriers to entry in the market, and that entry was unlikely to occur in the near future. After reviewing evidence, regarding the costs of greenfield crushing plants, it was

confirmed by the Tribunal that barriers to entry, in the form of plant and machinery, are high in the market. High barriers to entry allow for greater increases in prices by the coordinating firms, making coordination more profitable. However, evidence was put forward which suggests that these barriers are not insurmountable. Evidence was provided which showed that there has been recent and the steady increases in the crushing capacity by existing competitors. In addition, it was argued that entry could occur through the purchase of an existing crush plant. This evidence suggests that barriers to entry do not completely insulate the market. This is especially true regarding the trading market for soya which was identified to have low barriers to entry.

Fourth, The Tribunal assessed the presence of excess capacity in the market for crushing soya beans into soya meal in the South African market. It found that there existed a large level of excess capacity in the market. The Commission was of the belief that the excess capacity by competitors would not be able to resolve any potential price increase by the merging parties. This is because of the prevailing shortage of raw soybeans within the market. The Commission also put forward a notion stating that the excess capacity by the merging parties would be able to negate any actions by competitors that undermine price increases. The merging parties refuted this reasoning, stating that the excess capacity across the market together with the large market share of the rest of the market would be sufficient to constrain any price increase by the merging parties. COFCO, for example, is significantly larger than any other crusher, including Willowton and RussellStone, separately and together.

Fifth, the Tribunal assessed the level of countervailing power within the market. Countervailing power formed a critical component of the Commissions case, stating that despite customers being large and sophisticated countervailing power would be considerably weakened post-merger. According to the Commission the countervailing power of customers is over local producers, customers shift purchases towards international markets when they deem necessary. Given that Seaboard is the major importer of soya meal the Commission argued that this would drive customers towards Seaboard. The merging parties argued that the Commission carried a bias in this regard. From a survey conducted by the Commission itself majority of customers stated that they were able to switch between suppliers with relative need both by local and domestic supply. Furthermore, in the Commissions own record it was shown that the customers of the merging parties are well established feed manufacturers and that the market is characterised by short term contracts and the ability of customers to negotiate the terms of these contracts. This provides strong indication of countervailing power within the market.

Lastly, the level of asymmetries across the market plays a critical role in assessing the likelihood of coordination within the market. Asymmetries in market share and cost structures are generally seen to inhibit coordination within markets. This is because differences in market shares and cost structures affect

the incentives to coordinate as well as the ability to punish deviations. Within the market for soya meal there exists large market share asymmetries premerger, these would not be removed post-merger. With regards to cost asymmetries between the merged entities Willowton focuses on crushing and Seaboard focuses on imports and trading. Therefore, Willowton and Seaboard face completely different costs structures. Loertscher & Marx (2021) assess the effect of symmetry within markets and within allocation schemes, they found that both forms of asymmetries do not favour coordination. The CEI metric places asymmetries at the focal point of analysis, making it ideal for the use as a screening tool.

The above led the tribunal to state that in their view, the Commission, had failed to provide evidence that the proposed transaction would significantly increase the likelihood of coordination; that coordination would be feasible and sustainable post-merger; and that there is an incentive on the part of either Seaboard or Willowton to act in a coordinated manner. The Tribunal ultimately found that the Commission had failed to show that the proposed transaction is likely to result in the substantial lessening or prevention of competition in the Soya Meal industry, and that no justification for a prohibition was present. On the 31st of August 2021, the Competition Tribunal conditionally approved the proposed merger. The Tribunal did however realise the need for measures to be put in place to limit the level of information transfer between the entities and accepted the remedies proposed by the merging parties in good faith. The merger conditions attached to the merger are outlined below:

- The merger parties must adhere to confidentiality obligations that seek to prevent the sharing or exchange of sales information and competitively sensitive information between the competing businesses.
- Willowton and Seaboard are obliged to keep the business sites of their respective competing businesses and that of RSP separate; and all persons involved in the sales and operational activities of the competing businesses will not be allowed access to RSP's information technology systems;
- The merging parties must commit to competition law compliance through developing and implementing a competition law compliance programme. In addition, all sales, marketing, management and executive employees, as well as Directors of the respective merger parties will undergo competition law training;
- The merger parties must ensure that, within five days of the merger implementation date, persons involved in the businesses are given a copy of the merger conditions, with particular attention being drawn to the confidentiality obligations. The conditions must also be provided to newly appointed employees in the competing businesses as well as RSP; and

- To ensure compliance with the merger conditions, the merger parties must develop, adopt and implement a policy containing procedures for the implementation and on-going monitoring of the conditions.

4. THE MODEL

In order to understand how coordination affects markets, we first must define what efficient markets look like. An efficient market can be modelled as follows. Firm B (The Buyer) is in the market for so many units of good X. Firm B have a certain willingness to pay for such goods, this is typically expressed as a maximum ($P_B \leq P^*$). There are a set of firms which seek to supply firm B's demand. These firms are assumed to have asymmetric cost structures. These asymmetries are modelled in the firm's 'type' (θ_i). Firm *i* may be considered low-cost type while firm *j* may be considered high-cost type. Under incomplete information the cost structures of firms and the customers willingness to pay is unknown and is considered private information. The suppliers' type is drawn from a well-behaved distribution $\theta_i \in (0,1)$ With firms only being aware of their own type and firm B knowing only its own willingness to pay.

It is assumed that because the willingness to pay and the cost structures of competitors are private information, supplier bids are equal to their marginal costs ($P_i = C_i(\theta_i)$). If all the bids are above firm B's willingness to pay, no sale takes place. Firm B will accept any bid which is equal to or below its maximum willingness to pay. If two or more birds fall below the maximum willingness to pay, firm B will select the lowest bid. Thereby collecting P*-P as surplus. Note that here the supplier is assumed to make zero profit. However, this logic can easily be extended to include a minimum markup. This minimum markup can be seen to reflect the firm's cost of capital or the required return on investment. In which case firms make profits π_i , which is the ordinary rate of profit made under efficient markets.

Coordination within markets can take two forms. One being explicit which involves communication and side payments. The other is tacit coordination, which need not include communication or side payments. One form of tacit coordination in markets is allocation schemes, also commonly referred to as 'phases-of-the-moon' schemes. Allocation schemes work to increase the profits of suppliers by suppressing competitive bids in the market. This is done by selecting a firm which will be active in the bidding process while the others will remain inactive, hence the name Phases-of-the-moon. This is modelled as follows.

Say we have $K \geq 2$ Firms in an allocation scheme. The firm which is chosen to be active will bid a price higher than their cost-plus minimum markup ($P_i^k > P_i^c$). Those firms selected to be inactive bid a price higher

than the price posted by the active firm ($P_j^k > P_i^k$) So long as the price posted by the active firms is below firm B's maximum willingness to pay and no firm outside the scheme puts forward a lower bid, this will be the winning bid. Under this arrangement the firm will increase its profits compared to its ordinary profits, now making $\pi_i(k)$. The the inactive firms will make zero profits in this bid window. In other words, under the allocation scheme the active firm is able to collect the monopoly rents in the market.

The issue is, absent communication and side payments, the scheme must be able to allocate these rents in a satisfactory manner amongst the participants. Therefore, each firm must be selected frequently enough to be willing to participate in the allocation scheme. If this is not the case firms will be unwilling to join the allocation scheme and coordination will not take place in the in the market. The *participation constraint* is crucial to the formation of the allocation scheme. This forms the basis of the Coordinated effects Index (CEI) model. The participation constraints can be modelled as such, say firm *i* earns a profit of π_i (E.g. \$10m) in the competitive market and a profit of $\pi_i(k)$ (E.g. \$30m) under the allocation scheme when active. In order for firm *i* to be willing to participate in the allocation scheme the profits from being in the allocation scheme must be greater than being outside of the allocation scheme. This means that Firm *i*'s probability of being selected as the active firm in the bidding window must be greater than $\pi_i/\pi_i(k)$. (E.g. 10 / 30 or 33%). This creates our first equation:

$$s_i \pi_i(k) \geq \pi_i \qquad \text{(Participation Constraint)}$$

$$s_i \geq \frac{\pi_i}{\pi_i(k)}$$

The probability of selection (s_i) is referred to as the critical share. If the probability of selection is greater than the critical share the firm will be willing to participate in the allocation scheme. If it is not greater than the critical share then the firm be unwilling to participate in the allocation scheme. By extending this this participation constraints to the market we can gauge whether firms are willing to participate in allocation schemes, and therefore whether markets are at risk of coordination. Because the probabilities that define the allocation scheme must sum to unity, the participation constraints can be satisfied for all suppliers in K only if those suppliers' critical shares sum to less than unity. This naturally leads to the coordinated-effects index:

$$\sum s_i < 1$$

$$CEI = 1 - \sum s_i > 0$$

If the CEI>0 then there exists an allocation scheme which makes rational sense for suppliers in k to participate in. This indicates that the market is at risk of coordination by the subset of suppliers. However, it must be stressed that while the CEI may indicate the possibility of coordination in a market, it *does not prove* coordination is present within the market. When the CEI<0 it implies that there does not exist an allocation scheme which is rational for suppliers to participate in. This may be because the scheme might be inefficient. An inefficient scheme is one where the suppliers involved have different marginal costs or where the actions of suppliers outside the scheme erodes the possibility of firms within the scheme to extract rents. Thus, it is important to note that the probability of the CEI being greater than zero is heavily affected by both the level of symmetry amongst the participants and the number of firms within the scheme compared to the number of firms outside the scheme. The CEI therefor provides a very useful insight: *markets can be at risk of coordination but not all markets are at risk.*

Now that we have a basic understanding of markets and coordinated effects within these markets. We turn towards modelling mergers between firms in markets using the CEI framework. To do so we make use of a specific form of parameterization of the suppliers' costs distribution, which allows the use of premerger data to estimate the CEI both pre- and post-merger. This form of parameterization places emphasis on the "power" of suppliers, those suppliers with high values of α_i are seen as "large" or "strong" competitor, because in a market with set N of competing suppliers, supplier i's market share is $\alpha_i / \sum_{j \in N} \alpha_j$. If we set $A \equiv \sum_{j \in N} \alpha_j$ and $A_{-Z} \equiv \sum_{j \in N \setminus Z} \alpha_j$ then we can write the CEI in terms of its distributional parameters as follows:

$$\varphi^S(K) = 1 - \sum_{i \in K} \frac{(1 + \alpha_i + A_{-K})(1 + A_{-K})}{(1 + A_{-\{i\}})(1 + A)}$$

Mergers are prohibited when coordinated effects are of concern for two reasons. One, if the merger is seen to strengthen existing coordination. Two, if the merger makes coordination more likely within the market when it was not likely premerger. It proves useful to have a tool which is able to gauge the level of concern for both of these which makes use of pre-merger data. The CEI is such a tool and can be used as follows. If a market is characterized by $\varphi^S(K) \leq 0$ pre-merger and based on the same data is characterized by $\varphi^S(K) > 0$ post-merger, the merger is perceived to have created risk of coordination within the market where the risk did not exist premerger. Say that premerger it is shown that $\varphi^S(K) > 0$ and that post-merger the value of $\varphi^S(K)$ increases to an even more positive value. The merger is then seen to strengthen the existing risk of coordination within the market. Both scenarios indicates that the merger has the potential to increase the

likelihood of coordinated effects in the market. As a result, the CEI can be used as a screening tool to gauge the concern of coordinated effects in merger analysis.

5. APPLICATION

5.1. The data

The calculation of the CEI requires information on the distribution of market shares and margins. This paper relies on reports from the South African Grain Information Service ("SAGIS") and AFMA for the market size estimate of soybean products in South Africa. We possess a data set which contains the estimated market shares of all major competitors based on volumes sold to the end consumer, we take into account the fact that the soya as a commodity is traded multiple times over.

In this market we find that it appropriate to focus on volume market shares, as opposed to revenue market shares. This is because the products are provided on different terms by the sellers. For example, Willowton sells its products at a delivered price or ex works, Seaboard sells on either ex works, ex-port or delivered basis, while the terms of the other sellers' contracts are unclear. From this data we can calculate the CEI pre-merger. The major benefit of the CEI test is the fact that it can be easily conducted with data which is typically available in merger review cases. *Here we estimate the CEI for a pre-merger analysis, with the ultimate goal to compare the results of the CEI against the final decision of the Tribunal.* In the case at hand the exact market shares of the firms are confidential, in order to respect this, we provide the data using indicative range estimates The market shares are displayed in the table and graph below.

From these we can observe some key features of the market. The first and perhaps the most important is the fact that Seaboard is the major market share holder across all competitors in the market, holding just short of a third of the market. This explains the Commissions concern in the case as the combined market share of the three parties indicates a large section of the market. The second key feature is the fact that there are large fluctuations in the market share from year to year. This can be explained by the nature of the soya meal market, with large contracts between processors and farmers coming under negotiation frequently. This shows that the market is *contestable,* and that market share is often won by competitors. Third, we note that there exists a high level of asymmetries across the firm's market share. There are two large suppliers (market share > 15%), Three medium suppliers (10% > market share > 5%) and multiple smaller suppliers (5% > market share > 1%). Lastly, we note that the combined market share stands bellow the outright majority in each year, with the remaining firms outside of the mergers market share standing around 50%. This indicates that there exists a large level of supply outside of the merged parties.

TABLE 1: MARKET SHARE OF SOUTH AFRICAN SOYA MEAL MARKET (2017-2019)

Firm	2017	2018	2019
Willowton	0-3%	4-7%	8-11%
RSP	6-9%	6-9%	6-9%
Seaboard	36-39%	24-27%	27-30%
Combined	**42-51%**	**34-43%**	**41-50%**
Free State Oil	5-8%	7-10%	6-9%
Nedan	1-4%	3-6%	6-9%
Majesty	5-8%	8-11%	7-10%
COFCO	18-21%	12-15%	18-21%
CEOCO	1-4%	1-4%	1-4%
Bester	1-4%	0-3%	1-4%
Wilmar	2-5%	2-5%	6-9%
Other	6-9%	15-18%	0-3%
remaining	**36-51%**	**66-57%**	**59-50%**
Total Meal Market	**100%**	**100%**	**100%**

5.2. Estimating the CEI

In Table 2 below we estimate the CEI making use of the power formation from the methodology. This is a relatively simple procedure which makes use of the market shares of each firm. The market shares from the year 2019 are used and displayed in column two of the table. Column three displays the capacity or "power" of each firm (α). From this we can see that seaboard is clearly the most powerful competitor (with $\alpha = 0.2$) but is followed closely by COFCO (with $\alpha = 0.19$). At the bottom of this column is the sum of the capacities which provides the *A* component of the formula. The fourth column provides the sum of the capacities of the firms which are outside the proposed allocation scheme (A_{-K}). The fifth column provides the sum of all capacities excluding firm i for those firms inside of the allocation scheme. The second to last column calculates the 'critical share'. The very last column estimates the power parametrization of the CEI formula. This provides the CEI statistic. In Table 2, we present market share ranges and calculate the Competitive Effects Index (CEI) under the assumption of an industry margin set at 10%. This assumption is derived from a comprehensive discussion surrounding the profit margins observed within the crushing industry. It is noteworthy that a witness statement provided by Nedan explicitly indicated that the margin associated with soybean crushing into soya meal tends to be consistently low. In light of the prevailing market

characteristics, we consider the adoption of a 10% margin assumption to be both conservative and fitting for our analysis.

TABLE 2: THE COORDINATED EFFECTS INDEX

Firm Names	Market Shares	Not in K	α	A_{-K}	$A_{-\{i\}}$	s^K	$\boldsymbol{CEI_K}$
Willowton	8-11%	0	0,09	0,52	0,79	0,73	**-1,27**
RSP	6-9%	0	0,07		0,80	0,71	
Seaboard	27-30%	0	0,20		0,67	0,83	**NOT AT RISK**
Free State Oil	6-9%	1	0,06			0,00	
Nedan	6-9%	1	0,07			0,00	
Majesty	7-10%	1	0,08			0,00	
COFCO	18-21%	1	0,19			0,00	
CEOCO	1-4%	1	0,02			0,00	
Bester	1-4%	1	0,02			0,00	
Wilmar	6-9%	1	0,07			0,00	
		Sum of capacity (A)	0,87				

Source: Own calculations using data submitted to the Tribunal

5.3. Interpretation Of Results

The overall goal of this paper is to weigh the results of the CEI against that of the final decision of The Tribunal. This is to gauge the possibility of the use of the CEI metric as a tool for screening tool for merger analysis. From Table 2 we see that the CEI metric equates to -1.27. Recall from Section 4 that any CEI reading which is less than zero or negative implies that coordination within the market through the use of an allocation scheme is unlikely. This is because the structure of the market does not lend itself to coordination. This reading implies that the market is not at risk of coordination and is in line with the decision the Tribunal to overturn the decision of the Commission. Thus we have provided a negative-

negative result for the test of the CEI as a screening tool for coordinated effects of mergers. A negative-negative result means that the result of the CEI tests indicates no risk of coordination, and the decision of the Tribunal states no risk of coordinated effects.

The key to understanding this result is found in the level of symmetry, or rather lack thereof, within the market. When looking at the distribution of market shares in Table 1 the level of asymmetry between the firms is stark. These asymmetries remain post-merger. This is what leads to the strongly negative CEI result. The CEI places a specific emphasis on symmetry when estimating the risk of coordination within the market. The greater the level of asymmetry post-merger the less likely coordination is to take place. The presence of large and medium sized firms such as COFCO, Majesty, Free State Oil, Nedan and Wilmar restrict the merging party's ability to coordinate behaviour and drive-up prices.

These results are in line with the prevailing theoretical discussion around coordination, where symmetries play a critical role in determining the risk of coordination in markets. The need for metrics, such as the CEI, which allow the structural characteristics of the market to be assessed objectively and effectively in merger analysis is evident. Merger analysis lacks an agreed upon methodological framework and the review of mergers on structural characteristics is subjective, creating a grey area. While the CEI metric cannot be used in isolation and relied on completely it provides a critical first step towards creating a methodological framework.

6. CONCULSION

The primary objective of this paper is to assess the effectiveness of the Coordinated Effects Index (CEI), as proposed by Loertscher & Marx (2021), as a preliminary screening tool in the context of merger analysis where coordinated effects are a primary concern. We applied this metric to a recent merger in the South African soya meal market and compared the results with the decision reached by the Competition Tribunal of South Africa. Notably, the results indicated a Negative-Negative outcome, signifying that the CEI metric did not identify any substantial risk of coordinated effects associated with the merger. This alignment with the Tribunal's final decision strengthens the case for integrating the CEI into the toolkit of competition authorities.

However, it's important to acknowledge a significant limitation inherent in this study, which is its narrow focus on a single merger case. The chief factor contributing to this limitation relates to constraints surrounding data accessibility. This raises pertinent questions regarding the broader applicability and

generalizability of the findings. Nonetheless, this study serves as an initial exploration into the practical application of the CEI model.

While we recognize the potential for extending the model by incorporating additional structural factors to enhance its versatility, the absence of application to multiple mergers does constrain the depth of our conclusions regarding its practical utility for competition authorities. A promising avenue for future research involves adapting and tailoring the model to accommodate diverse structural factors across various merger contexts. This inquiry would not only fortify the argument for the CEI's inclusion in the competition authority's methodological toolkit but also amplify the comprehensiveness and reliability of the study's findings and recommendations. Therefore, further research and careful consideration of these potential extensions are warranted.

Subsequent investigations must delve into the efficacy of this tool, aiming to obtain a positive-positive result, where the CEI indicates a genuine risk of coordination, aligning with the Tribunal's decision to prohibit the merger due to coordinated effects. Moreover, it is imperative to test the CEI using various methodologies for calculating market shares, with a meticulous examination of the sensitivity to these methodological differences. It is crucial to emphasize that the CEI cannot operate in isolation; it is but one component of a broader analytical toolkit. While the CEI's focus on symmetry within the market is valuable, it is imperative to consider other relevant factors. Thus, the CEI serves as a valuable link in the ongoing development of a comprehensive and quantitative process required for the analysis of coordinated effects in merger assessments.

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