"Measuring Unilateral Effects under Data Scarcity: A Merger Case in South Africa"

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Abstract

In this paper, we use a differentiated-products set up to assess the impact on competition of a merger between Greif and Rheem South Africa. Both parties are active in the industrial packaging products sector. The parties' activities overlap, among others, in the production of large steel drums. Our analysis suggests that there is a low degree of substitutability between large steel drums and other products in the market. For this reason, we focus our competitive assessment on the unilateral effects of large steel drums.

We rely on a limited amount of relatively high-level data to arrive to robust conclusions on the unilateral effects that the merger would induce. We study these unilateral effects using two empirical tools, the upwards pricing pressure (UPP) and the gross upwards pricing pressure index (GUPPI). These two measures are complementary in assessing the competitive harm that the merger could induce. UPP nets out the incentive to raise prices due to lower competition with the incentive to reduce prices due to lower marginal costs. GUPPI focuses on the incentive to raise prices post-merger and is linked to the market definition that competition authorities use when defining the relevant market. To our knowledge, this paper provides the first application in the African continent of such empirical analysis.

We calculate these two measures following the conclusion of the Tribunal. We conclude that both UPP and GUPPI consistently signal that the merger would create strong incentives to raise prices.

1.   Introduction

The difficulty to obtain detailed data in developing countries is considered an obstacle for the implementation of an effect-based competition policy. In this paper, we show how elsewhere widespread empirical analyses can be transposed to the context of data scarcity in a merger. By means of a simple differentiated-products oligopoly model, we rely on a limited amount of relatively high-level data to arrive to robust conclusions on the unilateral effects that a merger would induce.

To our knowledge, this paper provides the first application in the African continent of such empirical analysis. Practitioners (such as competition lawyers and economists) have an interest in monitoring how the use of these tools evolves in areas where they have recently been introduced: what analysis was proposed, and how it was received in the proceedings. In our case, we show how a simple, yet well-grounded approach can be useful in situations and countries where data availability, such as it is for example the case in certain South African sectors, is limited.

We base our analyses on the unsuccessful merger between two South African companies. On the 17th of March 2017, Greif International Holding B.V. ("Greif" hereafter) and Rheem South Africa (Pty) Ltd. ("Rheem") applied for approval to merge before the Competition Commission of South Africa ("Commission").[1,2] The parties are two of the largest providers of industrial packaging solutions in the country.

The Commission was concerned that the merger would give rise to unilateral effects arising from the loss in competition. The Commission focused its inquiry on large steel drums, as they accounted for the largest proportion of the merging parties' sales. In this market, the merging parties would enjoy an estimated market share of about 90 percent post-merger. According to the Commission, the operation constituted a merger to a near monopoly. The Commission also found that barriers to entry were high and that customers had limited countervailing power. On the 19th of June 2017, the Commission prohibited the merger and issued its reasons.

The parties disputed the Commission's market definition. They argued that the relevant market was broader than large steel drums and included other forms of packaging, such as large plastic drums and reconditioned large steel drums. The parties claimed that the merger would create strong efficiencies, likely to be transmitted to the consumer in the form of lower prices.

On the 3rd of July 2017, the merging parties requested the Competition Tribunal ("the Tribunal") to reconsider the Commission's decision to prohibit the merger.[3] In their brief to the Tribunal, the merging parties argued that the Commission had erred in concluding that the merger would result in a substantial lessening of competition. The Tribunal of South Africa finally blocked the case on the 31st of January 2019.[4]

In this paper, we estimate empirically the incentives that the consolidated entity would have to raise prices post-merger. We model the market using a simple logit model to calculate the diversion ratios

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[1]   The proposed merger between Greif and Rheem had previously been notified and prohibited in 2004 by the Commission. The Commission concluded in its 2004 decision, that Greif and Rheem were the only manufacturers of large steel drums in South Africa. In addition, the Commission found that there was limited substitutability between large steel drums and other products and post-merger the merged entity would be able to unilaterally increase prices.

[2]   Note that NERA Economic Consulting has assisted the South African Competition Commission in this case.

[3]   Under South African competition law, merging parties can approach the Tribunal to reconsider a merger following a decision from the Commission. The Tribunal, an administrative body composed of specialist (lawyers and economists) members rather than judges, makes its decisions through an inquisitorial adjudication process.

[4]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 1.

between the firms. We then calculate the UPP and GUPPI measures using data on prices and quantities sold provided by the Commission.

The rest of the article is organized in the following way. We first provide context on the South African market for industrial packaging products and the specific macroeconomic conditions that the country experienced during the period of analysis. We then turn to the empirical UPP and GUPPI analysis. Our findings suggest that the merged entity would have an incentive to act unilaterally and raise prices.

2.   The market for industrial packaging products

Greif and Rheem are both active in the market for industrial packaging products. Industrial packaging refers to all forms of packaging that transport a product from their fabrication to the next step in the production line, all the way to the final consumer. As such, there are several formats used to store the products, the biggest of which is bulk transport by tanker (ships or trucks). With lower quantities, companies use intermediate bulk containers, large to small drums and other smaller types of packaging (such as pails and cans).

The activities of the parties overlap in the production of large and small steel drums, steel pails and knock-down drums. Knock-down drums are mainly directed to the export market, while small steel drums and pails are easily substitutable with plastic containers. The product of competitive interest consists, therefore, of large steel drums.[5]

Large steel drums have a capacity between 210 and 235 litres and can be of four types: tight-head or open-head and lacquered or plain.[6] A key aspect of the drums is the thickness of gauge of the steel. The main advantages of steel drums are their strength and easy storage, they can stand high temperatures while being non-inflammable and they may be the only type of packaging allowed for certain dangerous products. Their main drawbacks are their weight and potentially corrosiveness.

Large steel drums are used in a variety of sectors:[7] petrochemicals and lubricants; specialty chemicals; paint and paint solvents; and other sectors, such as pharmaceutical or food and beverages. The aforementioned characteristics of large steel drums render them the preferred option for petrochemicals. Steel drums are also used for solvent-based products, especially in the paints and paint-solvents sector. Both the merging parties and the Commission decided to focus their attention on the first three application sectors, because they represent the bulk of each merging party's 2015 volume.

The nature of products of each industry determines what type of industrial package is more appropriate. In these industries, firms can choose between new steel drums and other alternatives, which are:

-    Thick-gauge steel drums, which can be reconditioned up to eight times. Reconditioned drums are considerably cheaper than new drums. They are, however, less aesthetically appealing, and despite an exhaustive cleaning process, may still contain traces of past products or of the cleaning process itself. Hence, they are not viable for products in the human food chain nor are they approved by the UN to transport hazardous materials;[8]

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[5]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 2.

[6]   Tight-head drums have sealed tops with two bungs to store liquid products. Open-head drums have a removable lid that makes them a preferred option for semi-liquids and dry products.

[7]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 5.

[8]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 66.

- Plastic drums, which are suitable for water-based products within the paints and paints solvent sector. They are not, however, appropriate for corrosive and solvent chemicals or for substances that need to be heated to enter the drum, as they can only withstand temperatures up to 65ºC without losing their properties. The dimensions of plastic drums are not the same as those of their equivalent capacity of large steel drums. Due to this difference in size, the substitutability between still and plastic is low. For example, a switch from steel to plastic drums in an industrial setting, where the drums' handling is usually automated with machines, can prove prohibitively costly if the machinery needs to be adapted to the differences in sizes.[9]

- New or reused intermediate bulk containers: (IBCs) are a large type of industrial container with a capacity of five times that of a regular large steel drum. They are used for liquid or granulated substances, but they are unsuitable for the storage of hazardous products or small shipments. In addition, switching from new steel drums to IBCs involves higher adaptation costs than those of switching from steel to plastic drums; and[10]

- Other drums, such as fibre drums.

2.1. Substitutability patterns by application sector

As previously stated, large steel drums are mainly used in three sections: petrochemicals and lubricants; specialty chemicals; and paint and paint solvents. Both the merging parties and the Commission agreed that the different applications sectors did not constitute separate relevant markets. The degree of substitutability between large steel drums and other packaging solutions, however, is very different depending on the application sector. We have gathered in Table 2.1 all the alternatives available in each application sector and assessed their degree of substitutability with large steel drums.

In the petrochemicals sector, for example, internal standards and end-customer requirements render any package other than steel drums an unlikely option in most cases. There is, nevertheless, a trend in the market that aims to adapt plastic drums to the petrochemicals sector. Therefore, we categorize the substitutability between plastic and steel as weak, as we do for the substitutability between new and reconditioned drums. To the extent that IBCs have a plastic interior and/or require large quantities to be transported, the substitutability with steel drums is almost nil.

In the specialty chemicals sector, industrial customers could substitute new with reconditioned steel drums provided they are not transporting hazardous or delicate elements. We therefore characterize their substitutability relation as weak. The different properties of plastic (especially in terms of heating or tolerance to chemicals) render plastic drums an unviable option in many cases in this applications sector. For this reason, we define the substitutability patterns between them as low or nil.

Finally, for the paints and solvents sector, as long as the external appeal is not an issue, new and reconditioned drums are substitutable for the same paint or paint-solvent. Inside this sector, nevertheless, plastic drums are not the preferred option with solvent-based products, which is why we consider their substitutability with steel to be weak.

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[9] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 68

[10] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 73

Table 2.1: Degree of substitutability of large steel drums

	Steel vs reconditioned	**Steel vs plastic**	**Steel vs IBC**
Petrochemicals and lubricants	Weak	Weak	Nil
Specialty chemicals	Weak	Nil	Nil
Paints and paints-solvents	High	Weak	Nil

Source: Own appraisal.

2.2. Macroeconomic conditions impact intermediate products

Industrial containers are an intermediate good in the production chain. As such, their production tends to be correlated with that of the overall industrial performance. If GDP per capita in the country decreases, then the industrial packaging sector as a whole should also experience a decrease in volumes. For example, Rheem's 2015 executive committee minutes stated that *"the poor drum sales are not a reflection of us losing any business but a result of how badly our customers are performing in their respective markets".[11]*

Indeed, GDP per capita growth rate in South Africa saw a slight decrease in the 2015 – 2018 period.[12] This stagnation had an effect in volumes demanded to the industrial packaging sector, whether it was steel or plastic, new or reconditioned drums.

Figure 2.1 depicts the monthly volumes sold in the country between 2014 and 2016 for a selected number of companies in the industrial packaging sector. [13] The volume of large steel drums sold by the parties has a decreasing trend. The quantity of large plastic drums and reconditioned drums sold also decreased. Out of the four market players we are considering, Rheem exhibits the least decreasing trend. There are some instances where the volumes of the industrial packaging solutions fall sharply, like the end of 2015 and 2016. These correspond to the summer season in South Africa, where industrial production is generally slowed down.

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[11] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 163.

[12] We refer to annual GDP per capita growth rate obtained from the World Bank.

[13] We include those firms for which we have monthly data.

Figure 2.1: Volumes of industrial packaging solutions decline over the period

Greif
Rheem
Megapack
Anchor

01/2014   07/2014   01/2015   07/2015   01/2016   07/2016
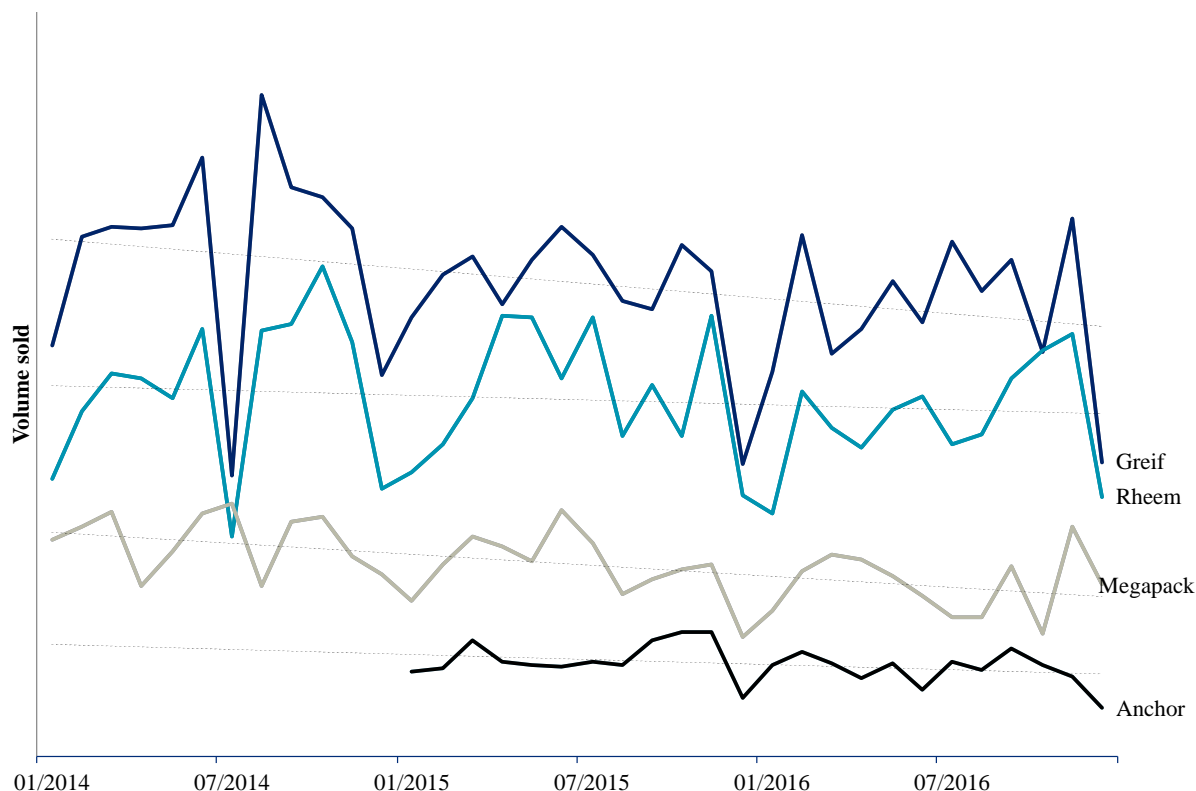
Source: Own calculations using data submitted to the Commission.

The merging parties argued that, given the macroeconomic conditions, the counterfactual to the merger may not be one in which both parties continue to complete, but one in which Rheem would inevitably exit the market within five to seven years.[14] The parties, however, did not provide any further failing-firm defence.

The Tribunal considered and rejected the merging parties proposed counterfactual. The Tribunal found that financial weakness, while perhaps relevant in some cases, is probably the weakest ground to justify a merger, and can certainly not be the primary justification for permitting one. Rheem had, prior to the merger, invested significant capital in a new large steel drums production line. This would make economic sense for a firm that intended to remain active, competitive and prepared for the future.[15] Furthermore, evidence suggested that global players such as Mauser wanted to enter the South African market.[16] The Tribunal concluded that the status quo was the likely counterfactual. Furthermore, the Tribunal found that Rheem would continue to remain profitable and viable in the market.[17]

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[14] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 148.

[15] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 173.

[16] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 174.

[17] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 183.

3.   Quantifying the unilateral effects of the merger

Following any merger, the consolidated entity can exert a higher market power since it can increase its profit by raising the price of one or both merging parties' products, thus harming consumers. This ability to increase profits by raising prices is called unilateral effects.

In differentiated-products markets, unilateral effects tend to arise particularly when the two merging companies have highly substitutable goods. The closer are the substitutes, the larger are the unilateral effects.

The UPP and the GUPPI are two metrics that empirically quantify the incentives of a merged entity to implement such potential price change after a merger.[18] They go beyond simple market shares comparisons by incorporating demand elasticities and marginal costs. This way, they capture additional market dynamics and efficiency gains claimed by the merging parties, which market shares fail to reflect. These indices provide an intuitive way to highlight and measure the degree of competition and the level of cost savings that would offset the risks of the increase in market power, and help regulators and courts make a decision based on a metric that takes all available information into account.

Often the UPP and the GUPPI are calibrated based on simplifying *ad hoc* assumptions. For instance, they are evaluated only for the two merging firms, irrespective of the presence of other firms or the existence of other products. In this paper, we employ a logit specification to model the drum's South African market that allows us to obtain coherent estimates of UPP and GUPPI with respect to the relevant market. UPP and GUPPI are, however, only reliable indications of the unilateral effects that the merger may induce provided the model they rest on is correct. We will further discuss the reasons why we believe a logit model is the right framework in this section.

This part is devoted to the computation of these indices for the Greif/Rheem proposed merger. We first elaborate on the logit model and explain how we estimate the diversion ratios, which constitute the building blocks to calculate the unilateral effects of the merger. We do so by modelling the market in a differentiated-products setup, which requires a low quantity of data. Secondly, we discuss our empirical approach to the definition of the relevant geographic and product market. We finally perform the UPP and GUPPI tests and discuss their implications.

3.1.   The logit model and diversion ratios

The market for large steel drums is a differentiated-products market. Following the discussion on section 2.1 on the substitutability of large steel drums, we can conclude that products are horizontally differentiated. This basic differentiation renders the logit model the most adequate to approximate the functioning of this market.

The logit model, whose mathematical formulation we briefly recall in the Technical Appendix, rests on the assumption that the products are equally independent from one another. The main implication of this assumption, which in economic terms is called the independence of irrelevant alternatives, can be better grasped using the classical textbook example. Let us consider the market for transportation, in which the individual can either take a blue bus, a red bus, or his own car. Following an increase in the price of blue bus journeys, the model assumes that the shares of people taking the red bus and people taking their private car will increase by the same amount. But this is not a realistic outcome. In reality, blue bus users would mainly switch to taking a red bus, which is closer in attributes to their previous choice, and the share of people taking their own cars would merely be affected.

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[18]   For the UPP see Farrell J. and Shapiro, C. (2010), 'Antitrust Evaluation of Horizontal Merger: An Economic Alternative to Market Definition', *The B.E. Journal of Theoretical Economics*, 10:1 (Policies and Perspectives). For the GUPPI, see Salop, S. and Moresi, S. (2009), 'Updating the Merger Guidelines: Comments,' *Georgetown Law Journal*.

This assumption has standard implications in our model. Here, we consider that the increase in the price of large steel drums will equally impact the market shares of plastic drums, reconditioned drums, and, potentially, IBCs. The substitutability patterns in most application sectors are equally weak, corroborating the choice of a logit model that assumes that these differentiated products are equally substitutable in the eyes of the consumers.

The first step in our analysis is to calculate the diversion ratio DR_{ij} from product i to product j, which provides the proportion of sales captured by product j when the price of product i is increased. With the logit specification the diversion ratio is obtained directly from the market shares of products i and j, noted s_i and s_j respectively, according to the following formula:[19]

$$DR_{ij} = \frac{s_j}{(1-s_i)} \tag{1}$$

The simplicity of the data required to calculate these diversion ratios is what further makes the logit model an appropriate framework in this context, where we have limited data on quantities, prices and costs.

Share-based diversion ratios assume that all sales lost by the firm in question are recaptured by other firms in the market, and that all firms are equally close substitutes in the eyes of consumers. This outcome, a direct consequence of the logit model, is appropriate in this setting because of the substitutability patterns discussed in Section 2.1. Furthermore, the merging parties' strategic documents showed that they were close competitors, who monitored and reported on each other's sales and marketing activities.[20] The merging parties strategic documents also showed that their customers often switched volumes between them.[21]

The market shares, and hence diversion ratios, arising from the logit model are closely linked to the definition of the relevant market. In a logit model the substitutability patterns are modelled dividing products in two groups: the inside market, which includes the products under consideration, and the outside market, which is approximated to take into account alternatives to the goods inside the market. In our case, the 'inside' market is comprised of the main large steel drums companies, while the 'outside' option contains plastic or reconditioned drums.

This is a crucial point. Often the UPP and GUPPI are computed on the basis of inside market shares only, forgetting the existence of the outside market. In our paper, these metrics are measured on a coherent microeconomic basis, as specified by the logit model. This is not an innocuous point since, by considering the competitive pressure of the outside market, our evaluation *a priori* favours the point of view of the merging parties.

We now elaborate on the definition and importance of the relevant market in the next section.

3.2.   The relevant market

During the proceedings, there was disagreement on the relevant product and geographic market definitions.

With respect to the product market, the parties' activities interact in the market for large steel drums. The Commission considered that the relevant product market consisted of large steel drums as a distinct

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[19]   See the Technical Appendix for the formula derivation.

[20]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 197.

[21]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 198.

product market.[22] The parties, however, stated that, to the degree that the substitution patterns differ by application sector, the relevant market included all large industrial packaging solutions: steel, plastic and reconditioned drums, as well as IBCs.[23] The Tribunal found the relevant product market to be the market for the manufacture and supply of large steel drums only.[24]

With respect to the geographical market definition, the Commission considered that the relevant product market was constituted on a provincial level, while the parties argued for a national market.[25] Prior to the proceedings both parties' experts met and agreed that the determination of the geographic market would not materially impact the outcome of the analysis. The Tribunal hence chose not to conclude on the geographic market.[26]

Since data are mainly available at a national level, we take a lenient approach that favours the parties and calculate the unilateral effects nationwide.[27] This means that, from a geographical perspective, our estimates constitute a lower bound for the incentives to raise prices. If the incentives to raise prices in the national market are high, we can expect the unilateral effects of the merger in each province to be at least as high, if not higher. This follows since the number of competitors is lower at the regional level than at the national level, and the two merging parties are present in the most important regions.

We transpose these decisions into our logit model. As stated in the previous section, we consider that the inside market is comprised of the main large steel drums companies (relevant market), while the 'outside' option contains less likely substitutes such as plastic or reconditioned drums. The approximation of the 'outside' market is one of the main issues when one considers a microeconomic model covering the whole market, as in the case of the logit model chosen here. Given the discussion above, we stick to the final decision of the Tribunal and consider that the outside option includes plastic and reconditioned drums.

In a preliminary exercise, we considered three additional market definitions as a robustness check, where we varied the products included in the 'outside' market: plastic, reconditioned and small steel manufacturers;[28] only large steel drums; and Greif and Rheem as a pure duopoly with no close substitutes. These different definitions of the outside good would change the overall market size and thus the shares that we allocate to Greif and Rheem, and could possibly impact the results. We find, however, that they all lead to the same conclusion: the merger is likely to induce unilateral effects. We hence decide to only show the analysis using the market definition that most aligns with that of the Tribunal's decision.[29]

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[22] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 5 and 6

[23] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 75.

[24] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 66.

[25] The Commission gathered enough evidence, however, to argue that the relevant market was at a provincial level, with customers in Durban and Gauteng, where production of both companies is located, being the most likely to experience changes after the merger.

[26] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 140.

[27] Anchor provided the Commission data on their Durban based operations.

[28] In 2016, two new entrants accessed the market: Infinity drums and Polydrum. Infinity and Polydrum together have below 2 % of total market share in 2016, which signals that entrants in this market face high barriers to entry. If we consider that the relevant market includes exclusively large steel drums, the merger would be *de facto* a merger to monopoly.

[29] Our computations of the UPP and GUPPI using the other market definition are available upon request.

In this article, thus, the overall market comprises all industrial packaging products. We use monthly data over the period 2014-2016 included.

The relevant margins for computing price pressure indices are those that only take into account variable costs, without considering fixed costs. Variable costs obtained from the accounting system of firms are a natural and adequate measure of marginal costs. We received this information from the Commission, for the relevant period of analysis for Rheem and Greif.[30,31]

3.3. Upward pricing pressure (UPP)

The UPP is a net figure signalling whether the merging firm has an incentive to raise prices post-merger, originally proposed by Farrell and Shapiro (2010).[32] It does not give an indication as to *how much* the prices will increase, but rather if they are likely to increase after the merger.

The advantage of the UPP measure is that it takes into account the two forces that the merger induces: the increase in prices and the efficiency gains. It looks at the incentive firm i has to increase prices if it knows that a certain proportion of its lost sales will switch to firm j, and considers that there may be cost efficiencies passed on to consumers.

The formula for the UPP is:

$$UPP_i = DR_{ij} \times (p_j - c_j) - eff \times c_i \qquad (2)$$

where DR_{ij} is the diversion ratio of firm i to firm j, p are prices and c are the costs of the parties. The *eff* parameter is the percentage decrease in costs induced by the merger, and we assume it to be between 0 and 10 percent.[33]

If the UPP is positive, then the incentives to raise the prices following the merger are not countervailed by the lower costs. On the other hand, if the UPP is negative, the merger induces enough cost efficiencies that the price the consumer will pay is unlikely to increase.

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[30]   In Greif's case, we estimated the margins from December 2015 onwards. We did so by taking the average of the margins of that month in the previous years.

[31] In the so-called "simulation model" in the quantitative analysis of mergers, marginal costs are estimated from the first-order conditions associated with the profit maximization under Bertrand competition (if this is the correct conduct), after having estimated a logit demand. We did not implement this method here precisely because our objective is to propose a simpler and direct procedure to measure the UPP and GUPPI metrics, that is to say, without estimating a demand model but based on coherent assumptions (e.g., logit preferences as here). We then need to use the marginal costs provided by the parties to compute the UPP and GUPPI metrics as in the sequel. One could doubt that they are the true marginal costs. However, using the marginal costs provided by the parties is conservative in the sense that it is favourable to them. Moreover, given that we compute the UPP and GUPPI metrics for different values of the efficiency parameter, that the firms could have lied on the true values of marginal costs has practically no impact on the evaluation of the merger.

[32]   Farrell J., and Shapiro, C. 2010. "*Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*", The B.E. Journal of Theoretical Economics 10(1)).

[33]   In a submission to the South African Competition Commission, the parties claimed that the efficiencies induced by the merger would range below 10 %.

3.4. Gross upward pricing pressure index (GUPPI)

The main drawback of the UPP is that it only signals that the parties have an incentive to raise prices, but it does not state by how much. To make this kind of analysis, Salop and Moresi (2009) proposed the GUPPI.[34]

The GUPPI is a price index that relates the UPP with the market dynamics. It expresses the price change as a percentage of pre-merger prices by connecting the lost sales of one firm to the increase in revenues of the other. It does not, however, take into account the merger synergies nor the competitors' response to the merger.

The formula to calculate the GUPPI is:

$$GUPPI_i = DR_{ij} \times \frac{p_j - c_j}{p_i} \tag{3}$$

The GUPPI has a straight-forward connection to the market definition and the small but significant non-transitory increase in price (SSNIP) test. The products of two parties are assumed to belong to a distinct relevant market if they find it profitable to impose a SSNIP of around 5 percent. In such a case, the merger would be considered a merger to monopoly. Assuming linear demand and equal constant marginal costs, there is a well-known link between the SSNIP and the GUPPI: Two products are assumed to belong to a distinct relevant market if the GUPPI is greater than two times the SSNIP. This means that a GUPPI of less than 5 percent would not raise concerns. A GUPPI above 10 percent, on the other hand, is de-facto eliminating all effective competition. If the GUPPI is between 5 percent and 10 percent, the merger needs further screening and the use of complementary metrics, like the UPP measure, is advised.

3.5. Results of the competitive assessment

We assume that the relevant market incorporates large steel drums, plastic drums and reconditioned drums. We received monthly data available from 2014 to 2016 from the Commission. As to the competitors, we have monthly data for Megapack (plastic drums) and Anchor (reconditioned drums).

Table 3.1 below shows summary statistics of prices and quantities for the market. Greif is a clear leader, followed closely by Rheem. In total, these two firms control almost 80 percent of the total market. The data for Anchor starts in 2015 and it shows a constant market share for the period of analysis. Although Megapack's market share trend is decreasing, it increases slightly in the last months.

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[34]   Salop, S.C., and Moresi, S. 2009, "*Updating the Merger Guidelines: Comments,* Georgetown Law Journal.

Table 3.1: Summary statistics of market shares and prices

	Market Share		Prices			
	Minimum	Maximum	Minimum		Maximum	
Greif	37.19%	52.54%	274.74	R	327.55	R
Rheem	27.99%	39.57%	249.75	R	312.86	R
Megapack	11.95%	33.62%	/		/	
Anchor	0.00%	10.96%	/		/	

Source: Own calculations using data submitted to the Commission.

We have simulated the UPP with different values of the efficiency parameter. A summary of the results is displayed in Table 3.2. For each value of the efficiency parameter (*eff*), we report the average and standard deviation of the resulting monthly UPP.

Table 3.2: UPP summary statistics

		Efficiency parameter					
		0%	2%	4%	6%	8%	10%
Greif	Mean	25.63	20.48	15.34	10.19	5.05	-0.10
	Std. dev.	15.25	15.34	15.44	15.54	15.65	15.77
Rheem	Mean	22.61	18.00	13.39	8.79	4.18	-0.43
	Std. dev.	10.88	10.98	11.12	11.29	11.49	11.61

Source: Own calculations using data submitted to the Commission.

The average UPP is always positive, except if marginal costs decrease by more than 10 percent. A positive UPP means that the resulting entity would have an incentive to raise prices. Only considering efficiencies above 10 percent would the average efficiency gains be enough to countervail the unilateral effects. The parties communicated to the Commission that they expected the efficiencies to be below this threshold.

We therefore conclude that, even under the parties' opinion that the market is national, there is a significant risk that the consolidated entity would set higher prices than the pre-merger ones. The level of efficiencies claimed by Rheem and Greif for the merger is not sufficient to counterbalance these potential unilateral effects.

We then turn to the GUPPI calculations. Table 3.3 displays the summary statistics for Rheem's and Greif's GUPPI. The average GUPPI for the parties is slightly higher than 8 percent. In Greif's case, it is not statistically different from 10 percent.

Table 3.3: GUPPI summary statistics

	Mean	Std. Dev.	Minimum	Maximum
Greif	8.78%	0.05	-3.94%	22.45%
Rheem	8.24%	0.04	-2.40%	20.87%

Source: Own calculations using data submitted to the Commission.
Note: The negative values of GUPPI correspond to months when the data displays outlier negative margins.

Most importantly, on average the parties would have strong incentives to raise prices post-merger. In many months, the GUPPI is well above 10 percent, signalling that the consolidated firm would find it profitable to impose a SSNIP of 5 percent.

This finding corroborates the Commission's view that large steel drums can be considered a relevant market by themselves. In this case, the transaction is effectively a merger to monopoly.

4.   Conclusion

In this paper, we have looked at the unilateral effects of a merger in the South African industrial packaging sector. Using a simple differentiated-products oligopoly model, we retrieve the diversion ratios from lost sales following an increase in prices. These diversion ratios allow us to gauge the incentives to raise prices that the merged firm would face. The incentives to raise prices are assessed using the UPP and GUPPI, two common indices in antitrust investigations. The advantage of our approach is that, based on a coherent microeconomic model, it provides robust conclusions while relying on a limited amount of relatively high-level data.

We show that the prices post-merger for Rheem's and Greif's products would be significantly higher than pre-merger. This finding is robust to different definitions of the market. Although no one type of evidence is dispositive, the analysis remains a useful screening tool to illustrate that the merging parties would increase prices post-merger.[35]

The key lesson from the court case is that empirical analysis, viewed in conjunction with the merging parties' internal documents, and the factual testimony of witnesses, demonstrate that unilateral effects would arise as result of the proposed merger. To our knowledge, this paper provides the first application in the African continent of such empirical tools.

The Tribunal noted the extensive evidence from various strategic documents and customer testimony, which showed that the merging parties were close competitors.[36] A merger that eliminated head-to-head competition between close competitors was likely to result in a substantial lessening of competition. The merging parties conceded that barriers to entry in the large steel drums market were high, with the main barrier to entry being the significant capital outlay required to manufacture large steel drums.[37] The merging parties also conceded that customers did not have countervailing buyer power to mitigate

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[35]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 114.

[36]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 197.

[37]   Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 204.

any competitive harm arising from the proposed merger.[38] The Tribunal also examined and dismissed the merging parties arguments regarding efficiencies and found them to be speculative and not verifiable.[39]

We therefore conclude that, if the merger had been approved, prices would likely have increased, which would have ultimately hurt consumers.

The Tribunal ultimately prohibited the merger in January 2019.

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[38] Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 217.

[39] The efficiencies claimed were not proved to be likely or timely. Further, the efficiencies were not likely to benefit consumers. Greif International Holding B.V and Rheem South Africa (Pty) Ltd vs The Competition Commission of South Africa, Tribunal case no: IM094Jul17, para 192.

Technical Appendix

The market for large steel drums is a differentiated-products market. To model it, let us assume there is a representative consumer k on the market, and his preferences are approximated by a logit-type model.[40] His utility to acquire a unit of good i is given by:

$$u_{ki} = \alpha p_i + x_i \beta + \delta_i + \varepsilon_{ki},$$

where p_i is product i's price, x_i is a set of product i's observed characteristics, δ_i is a random term which represents the product i's unobserved characteristics and ε_{ki} is a random term to account for measurement and optimisation errors.

The market share is a measure of the probability that this consumer k will chose to buy from a certain firm i over a competitor j. Under the logit specification, the product i's market share is given by:

$$s_i = \frac{\exp(\alpha p_i + x_i \beta + \delta_i)}{1 + \sum_{j=1}^{J}(\alpha p_j + x_j \beta + \delta_j)}$$

The diversion ratio from i to j provides the proportion of sales captured by product j when the price of product i is increased. It is defined as:

$$DR_{ij} = \left| \frac{\partial s_j}{\partial s_i} \right| = \frac{\partial s_j}{\partial p_i} \left(\left| \frac{\partial s_i}{\partial p_i} \right| \right)^{-1}.$$

Following the properties of the logit model, the partial derivatives of market shares with respect to price are:

$$\frac{\partial s_i}{\partial p_j} = \begin{cases} -\alpha s_i(1 - s_i) & \forall i = j \\ \alpha s_i s_j & \forall i \neq j \end{cases}.$$

We can hence derive the exact formula for the diversion ratios using the firm's market shares as:

$$DR_{ij} = \frac{s_j}{(1 - s_i)}$$

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[40] See for instance, Ben-Akiva, M., and Lerman, S.R., (1985), *Discrete Choice Analysis: Theory and Application to Travel Demand*, The MIT Press.